

ABSTRACT

Title of Dissertation: MATERNAL POSTPARTUM NUTRITION
EXPOSURES, BREASTFEEDING, AND
INFANT WEIGHT

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Objective: This dissertation investigated relationships between postpartum maternal dietary intakes, breastfeeding exclusivity, intensity, and duration, reasons for weaning before 6 months, and infant weight at 6 months.

Methods: Three aims examined 8 nutritional exposures: magnesium, added sugar, dairy, energy, glycemic load, and macronutrient distributions (percent of calories from carbohydrate, protein, and fat) among participants in the United States Food and Drug Administration (FDA) and Centers for Disease Control and Prevention (CDC)'s second Infant Feeding Practices Study (IFPS II). The first aim employed logistic regression to examine the association between intakes of dietary factors and exclusive breastfeeding at 3 months, partial breastfeeding at 3 months, and any breastfeeding at 6 months (n = 1099). The second aim used logistic regression to investigate the association between intakes of dietary factors and reasons for early weaning (n =

587). The third aim used multivariable linear regression to examine differences in infant weight and weight-for-age z-scores at 6 months by intakes of dietary exposures (n =186). Unadjusted models and models adjusted for relevant covariates were executed.

Results: Those with consumption at or exceeding recommended daily intakes of magnesium, dairy, and energy were more likely to engage in recommended breastfeeding behaviors. Consuming a diet with a low average daily glycemic load was associated with not breastfeeding as recommended. Low average daily glycemic load was associated with a lower likelihood of citing “too much milk” as a reason to wean. No maternal intakes were associated with higher or lower weight or weight-for-age z-scores at 6 months.

Conclusion: Findings support existing nutrition guidelines for women of childbearing age, and suggest that a higher daily intake of magnesium may be appropriate for lactating mothers. Average daily glycemic load may also be important, and should be studied further.

Implications: This dissertation provides an exploration into specific maternal dietary intakes and important outcomes of infant feeding. It provides a foundation for future inquiries into the roles of magnesium and glycemic load in supporting breastfeeding.

MATERNAL POSTPARTUM NUTRITION EXPOSURES, BREASTFEEDING,
AND INFANT WEIGHT

by

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Dedication

To my children: Anna, Simon, and Gabriella

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Chapter 1: Introduction

Overview

Increasing the proportion of families that breastfeed or provide human milk to their infants remains a public health priority in the United States. Health organizations recommend exclusive breastfeeding for the first 6 months of an infant's life (American Academy of Family Physicians, 2014; American Academy of Pediatrics Committee on Breastfeeding, 2012; World Health Organization, 2003), and the United States Department of Health and Human Services' *Healthy People 2020* initiative included objectives concerned with breastfeeding exclusivity/intensity and duration during the first 6 months of life (United States Department of Health and Human Services Office of Disease Prevention and Health Promotion, 2017a). These objectives, which stand in concert with the national and global recommendation to exclusively breastfeed for the first 6 months of life, are:

- MICH-21.2: Increase the proportion of infants who are breastfed at 6 months
- MICH-21.4: Increase the proportion of infants who are breastfed exclusively through 3 months
- MICH-21.5: Increase the proportion of infants who are breastfed exclusively through 6 months

The recommendation to exclusively breastfeed for the first 6 months is supportive of health outcomes for both infants and mothers, in low/middle and high-income nations (Deiterich, Felice, O'Sullivan, & Rasmussen, 2013; Kramer & Kakuma, 2012).

Breastfeeding has been shown to protect against a range of negative outcomes across

the life span, including gastrointestinal infection (Kramer & Kakuma, 2012); diarrhea (Victora et al., 2016); acute otitis media (ear infections), atopic disease (allergy) when the infant has a family history of such (Ip et al., 2007); allergic rhinitis (Victora et al., 2016); hospitalization for lower respiratory tract infections (Ip et al., 2007; Victora et al., 2016); having overweight in childhood, adolescence, and adulthood (Victora et al., 2016); sudden infant death (Victora et al., 2016); and necrotizing enterocolitis, which is often fatal (Victora et al., 2016).

In addition to these outcomes, breastfeeding exclusivity/intensity and duration are associated with infant weight from birth to 6 months. The first 6 months of an infant's life have been identified as a critical window for obesity prevention (Gillman, 2008). The magnitude and rate of weight gain during this window is associated with weight status in childhood, and is influenced by nutritional and environmental exposures that may affect metabolic programming during early infancy (Dennison, Edmunds, Stratton, & Pruzek, 2006; Stettler, Kumanyika, Katz, Zemel, & Stallings, 2003; Taveras et al., 2009). For healthy infants born at term, exclusive breastmilk feeding, without any other foods or liquids, is recommended during this time, and has been found to be supportive of an appropriate rate and magnitude of weight gain (Baird et al., 2005, 2008; Carling, Demment, Kjolhede, & Olson, 2015; Dewey, 2009; Kramer et al., 2004; Zhang et al., 2012).

In consideration of maternal health, exclusive breastfeeding may suppress ovulation and support an extended period of amenorrhea (Su, Pasalich, Lee, & Binns, 2013), which is protective against certain breast and ovarian cancers (Chowdhury et al., 2015; Zhou et al., 2015). Longer suppression of ovulation/amenorrhea protects

against closely-spaced pregnancies (Godfrey & Lawrence, 2010). Adherence to the recommendation to exclusively breastfeed for 6 months may also increase loss of pregnancy-related weight at 6 and 18 months (Baker et al., 2008). A lower risk for type 2 diabetes is found in mothers who breastfeed exclusively for 1-3 months compared with those who never exclusively breastfed (Schwarz et al., 2010), and breastfeeding may also protect against perinatal mood disorders (Pope & Mazmanian, 2016).

Since many of breastfeeding's protective factors, particularly those against infections of the ear and gastrointestinal tract, are most pronounced during the period the infant is fed breastmilk, a longer duration of any breastfeeding beyond the 6-month recommended window of exclusivity allows for a longer protection from these infections (Deiterich et al., 2013). Maternal health outcomes are also heavily dependent upon breastfeeding duration beyond the initial 6 months of the infant's life. Longer duration of breastfeeding is associated with greater postpartum weight loss (Baker et al., 2008), and lactation duration is associated with a decreased incidence of type 2 diabetes in women across the childbearing years (Gunderson et al., 2018).

Current rates of families that breastfeed for at least 3, 6, or 12 months (breastfeeding duration), and rates of families that exclusively breastfeed (breastfeeding intensity) for any length of time in the United States fall short of national goals (Centers for Disease Control and Prevention, 2018a), and there are disparities by maternal race, level of educational attainment, age, income, and region of residence (Anstey, Chen, Elam-Evans, & Perrine, 2017).

When infant feeding recommendations are not adhered to, the compromises in infant and maternal health carry economic consequences associated with excess disease and death (Bartick et al., 2017). One study simulated these excess cases of death and disease among mothers and infants by comparing the breastfeeding rates in 2012 to a 90% adherence to infant feeding recommendations. The study found that, in the United States, over 3300 excess maternal deaths, over 700 pediatric deaths, and medical costs of \$3 billion could be attributable to suboptimal infant feeding practices (Bartick et al., 2017). This study corroborated earlier, similar findings regarding pediatric outcomes (Bartick & Reinhold, 2010) and maternal outcomes (Bartick et al., 2013).

In the United States, there are numerous factors that are associated with non-adherence to the nationally and globally accepted recommendation to breastfeed exclusively for the first 6 months of an infant's life (American Academy of Family Physicians, 2014; American Academy of Pediatrics Committee on Breastfeeding, 2012; Kramer & Kakuma, 2012; World Health Organization, 2003). National surveillance efforts such as the Pregnancy Risk Assessment and Monitoring System (PRAMS) identify maternal intention and commitment to breastfeeding, nipple or breast pain, insufficient milk supply, infant difficulty with feeding mechanics, and concern that the infant isn't satisfied on breastmilk as reasons mothers cite for early weaning (Ahluwalia, 2005). Similar reasons have been explored through the Infant Feeding Practices Study II (IFPS II) data set that is used for this dissertation (Fein et al., 2008). Concern that the baby wasn't satisfied on the mother's milk alone was a top reason at multiple times over the first year that weaning began (Li, Fein, Chen, &

Grummer-Strawn, 2008). Among mothers who did not meet their own intentions for breastfeeding duration, this concern was commonly cited for weaning sooner than planned (Odom, Li, Scanlon, Perrine, & Grummer-Strawn, 2013). The need to return to work is also a significant predictor of whether a mother in the United States meets goals for breastfeeding duration (Mirkovic, Perrine, Scanlon, & Grummer-Strawn, 2014).

Intention to breastfeed, nipple or breast pain, insufficient milk supply, infant difficulty with feeding mechanics, concern that the infant isn't satisfied on breastmilk, and the need to return to work are associated with non-compliance with recommended infant feeding behaviors (breastfeeding duration and intensity) in the first 6 months of life, but no research has investigated associations between specific maternal nutritional exposures during lactation and the achievement of recommended infant feeding behaviors, or reasons for weaning. Similarly, whether differences in maternal postpartum nutritional exposures are associated with differences in weight at 6 months among predominantly breastfed infants has not been studied in detail.

This dissertation sought to investigate whether commonly held clinical practices, observations, and opinions—that what a mother eats during the postpartum period might influence her breastfeeding experience—could be supported by data. Discussions among lactation care providers and between families with breastfeeding infants often turn to maternal elimination or supplementation of certain foods or nutrients as possible solutions for breastfeeding problems. The discussion becomes contentious when one camp believes that every clinical breastfeeding barrier, from breast pain or low milk supply, can be attributable to the mother's postpartum diet,

and another contends that telling mothers to change their diets throws up one more barrier against practicing breastfeeding as a health behavior. In the absence of evidence-based guidance, anecdotal recommendations to adjust the maternal diet may cause more problems than they solve.

Indeed, systemic inflammation is implicated, if not overtly stated or addressed, in reasons mothers cite for breastfeeding cessation, including breast or nipple pain, low milk supply, or oversupply of milk, and maternal diet can be an instigator of that inflammatory state. Both maternal body mass index (Bever Babendure, Reifsnider, Mendias, Moramarco, & Davila, 2015; Stuebe, 2015; Stuebe et al., 2014) and depression are known risk factors for not breastfeeding as recommended, and both are also manifestations of a chronic inflammatory state (Kendall-Tackett, 2007). It has been proposed that disrupted lactation and maternal depression share a common neuroendocrine etiology (Stuebe, Grewen, Pedersen, Propper, & Meltzer-Brody, 2012). Consumption of foods that are known or not known causes of allergic symptoms may lead to systemic, chronic inflammation (Galli, Tsai, & Piliponsky, 2008), and weaning may be attributable to breastfeeding problems, such as pain, that result from that inflammation. Antihistamines may be recommended—cautiously, due to their potential to reduce milk supply in some mothers—for the management of lactation-associated breast pain (Muddana, Asbill, Jerath, & Stuebe, 2018). Investigation into a mother's diet, and whether an aspect of it is causing inflammation, is a consideration for practitioners working with breastfeeding mothers who experience breast pain (University of North Carolina School of Medicine, 2018).

Systemic inflammation and insulin resistance, two physiologic circumstances that can be influenced by maternal diet and complicate the breastfeeding experience, were considered in the selection of our dietary factors, as was the potential for these to influence milk composition in a way that affects the capacity of breastmilk to support healthy infant weight: average daily intakes of magnesium, added sugar, dairy, energy (calories), glycemic load, and the caloric distribution of the three macronutrients (carbohydrate, protein, and fat). While there are other micronutrients that may bear upon inflammation for a postpartum mother, among those available for study in the IFPS II data set, magnesium stands alone as the mineral recommended for supplementation when mothers seek the guidance of a peer breastfeeding counselor or professional lactation consultant.

Therefore, this dissertation has 3 aims to investigate the role of postpartum maternal dietary exposures in each of these interrelated outcomes, using data collected from 2005-2007 via the United States Centers for Disease Control and Prevention and Food and Drug Administration's second Infant Feeding Practices Study (IFPS II). In Aim 1, I examined associations between specific postpartum maternal dietary exposures and breastfeeding exclusivity/intensity and duration. The two research questions in this aim were:

1. Are there associations between specific maternal dietary exposures and breastfeeding exclusivity/intensity or duration, independent of potentially confounding factors?

2. Do postpartum BMI or postpartum depressive symptoms moderate any relationships between maternal dietary exposures and breastfeeding exclusivity/intensity or duration?

In Aim 2, I examined associations between maternal dietary exposures during the postpartum period and the reasons mothers gave for stopping breastfeeding (full weaning) before the infant was 6 months old. I investigated two questions:

1. Are specific maternal dietary intakes associated with differences in the likelihood of citing particular reasons for stopping breastfeeding?
2. Are relationships between maternal dietary exposures during the postpartum period and particular reasons for weaning moderated by postpartum BMI or postpartum depressive symptoms?

Finally, any modifications to the lactating mother's diet need to be considered for their potential to affect the breastfeeding infant—particularly, whether there are maternal dietary exposures that are associated with high or low weight at 6 months for the infant if these levels of intake are higher or lower than recommended. It is impractical and unethical to recommend dietary modifications to protect breastfeeding if changes in the maternal diet could adversely affect infant growth. Therefore, in Aim 3, I examined maternal diet and the weight of infants at 6 months among those predominantly (80% or more of milk feeds were breastmilk) breastfed.

The questions in this aim were:

1. Among mothers who were predominantly breastfeeding, are there associations between certain maternal dietary exposures during the postpartum period and the weight of their infants at 6 months?

2. Are any relationships between certain maternal dietary intakes during the postpartum period and infant weight at 6 months moderated by postpartum BMI or postpartum depressive symptoms?

Hypotheses

Hypothesis Set 1: The highest maternal intakes of energy; carbohydrates as percentage of total energy/calories consumed; average daily glycemic load; added sugar; and dairy were expected to be associated with lower likelihood of exclusive breastfeeding at 3 months, partial breastfeeding at 3 months, and any breastfeeding at 6 months, and the highest intakes of magnesium were expected to be associated with higher likelihoods of exclusive breastfeeding at 3 months and any breastfeeding at 6 months.

Hypothesis Set 2: The highest maternal intakes of energy; carbohydrates as percentage of total calories consumed; average daily glycemic load; added sugar; and dairy were expected to be associated with higher likelihoods of early weaning for reasons that may be attributable to physiologic breastfeeding difficulty, but not those that are attributable to social-ecological barriers to successful engagement in the health behavior of exclusive breastfeeding for 6 months; and that the highest intakes of magnesium will be associated with a lower likelihood of citing reasons that may be attributable to physiologic breastfeeding difficulty, but not those that are attributable to social-ecological barriers to successful engagement in the health behavior of exclusive breastfeeding for 6 months.

Hypothesis Set 3: Among those predominantly breastfeeding, those with the highest intakes of dairy and added sugar, and higher percentage of calories from

carbohydrates—but not percentage of calories from fat or protein, glycemic load, calories, or magnesium—were expected to be associated with higher infant weight at 6 months.

Chapter 2: Literature review

In the United States, *Healthy People 2020* is a national initiative that establishes specific goals for engaging the population in particular health behaviors. These health behaviors are known and accepted means of augmenting the overall health of the nation. Improving the proportion of U.S. families that engage in breastfeeding is among the Maternal, Infant, and Child Health objectives, and is broken down into three main metrics: breastfeeding initiation, breastfeeding exclusivity/intensity, and breastfeeding duration (United States Department of Health and Human Services Office of Disease Prevention and Health Promotion, 2017a). In this dissertation, I examine the latter two. In addition, I examine reasons women report for early weaning, and infant weight at 6 months, two outcomes that are intertwined with breastfeeding exclusivity/intensity and duration.

Breastfeeding exclusivity/intensity

National and international health organizations recommend exclusive breastfeeding—no other food or drink given to the infant—for the first 6 months of life (American Academy of Family Physicians, 2014; American Academy of Pediatrics Committee on Breastfeeding, 2012; World Health Organization, 2003). *Healthy People 2020* (United States Department of Health and Human Services Office of Disease Prevention and Health Promotion, 2017b) proposes goals for breastfeeding exclusivity at both 3 and 6 months. *Healthy People* goals are not intended to be final end points for the proportion of the population that should ideally be breastfeeding; they are calculated by applying the trend—average amount of improvement per year in previous years over the current breastfeeding rates—to the

10-year period the *Healthy People* initiative covers. At 3 months, the goal is to have 46.2% of infants exclusively breastfeeding. When breastfeeding is continued but infant formula or other foods are introduced before the infant is 6 months old, the degree to which the infant's diet consists of breastmilk is called breastfeeding intensity. According to the 2018 *Breastfeeding Report Card* (Centers for Disease Control and Prevention, 2018a), nationally, 46.9% of infants are exclusively breastfed at 3 months, and only 24.9% of infants are exclusively breastfed through their first 6 months of life.

Breastfeeding exclusivity varies by demographic characteristics. In a recent analysis of regional and demographic differences in breastfeeding rates conducted by the CDC, which uses National Immunization Survey (NIS) data comprising a sample of births between 2010-2013 (Anstey et al., 2017), a greater proportion of white, non-Hispanic infants were exclusively breastfed through the first 6 months of life (22.5%, +/- 0.6) than Hispanic (18.2%, +/- 1.2) or non-Hispanic black (14.0%, +/- 1.3) infants (Anstey et al., 2017). As maternal age, educational attainment, and income increase, so does the likelihood of exclusively breastfeeding to 6 months (Anstey et al., 2017). These disparities may be due to groups with lower rates of breastfeeding exclusivity being more likely to return to workplaces where breastfeeding and/or lactation are not supported (Mirkovic et al., 2014), having insufficient availability or access to trained breastfeeding support personnel (Centers for Disease Control and Prevention, 2016), and having disproportionately high exposure to maternity care practices that undermine exclusive breastfeeding (Labbok & Taylor, 2008).

Breastfeeding duration

The World Health Organization recommends that breastfeeding, with the timely introduction of appropriate complementary foods at 6 months of age, continue through the child's first two years of life (World Health Organization, 2003), and the American Academy of Pediatrics recommends that infants in the United States continue to be fed breastmilk through their first year of life, or for as long as is mutually desired by mother and child (American Academy of Pediatrics Committee on Breastfeeding, 2012). *Healthy People 2020* measures breastfeeding duration with any breastfeeding—exclusive or not—at 6 months and 1 year of age (United States Department of Health and Human Services Office of Disease Prevention and Health Promotion, 2017b). The goals for breastfeeding duration are that 60.6% of infants will be breastfed at 6 months, and 34.1% are still breastfeeding at 1 year (United States Department of Health and Human Services Office of Disease Prevention and Health Promotion, 2017b). The *Breastfeeding Report Card* (Centers for Disease Control and Prevention, 2018a) reports that, nationally, 57.6% of infants are still breastfeeding at 6 months, and 35.9% are still breastfeeding at 12 months of age.

Rates of achieving national breastfeeding duration goals are marked by demographic disparities (Anstey et al., 2017), for similar reasons as cited for exclusivity/intensity: nipple or breast pain, insufficient milk supply, infant difficulty with feeding mechanics, and concern that the infant isn't satisfied on breastmilk (Centers for Disease Control and Prevention, 2016; Lobbok & Taylor, 2008; Mirkovic et al., 2014). White, non-Hispanic infants are more likely (30.8%, +/- 0.7) than Hispanic (26.3%, +/- 1.4) or non-Hispanic black (17.1%, +/- 1.3) infants to be

still breastfeeding at 12 months of age (Anstey et al., 2017). As maternal age, educational attainment, and income increase, so does the likelihood of still breastfeeding at 12 months (Anstey et al., 2017).

Reasons for early weaning

Weaning is broadly defined as the introduction of any food or liquid other than human milk; early weaning is characterized by this introduction of another food or liquid before the infant is 6 months of age. As previously mentioned, national surveillance efforts identify nipple or breast pain, insufficient milk supply, infant difficulty with feeding mechanics, and concern that the infant isn't satisfied on breastmilk as reasons mothers cite for early weaning. Insufficient availability or access to trained breastfeeding support personnel (Centers for Disease Control and Prevention, 2016), disproportionately high exposure to maternity care practices that undermine exclusive breastfeeding (Labbok & Taylor, 2008), and a higher likelihood of returning to a workplace that is unsupportive of breastfeeding (Mirkovic et al., 2014), underscore several of these reasons, and these are experienced more among black mothers than among other racial/ethnic groups in the United States (Anstey et al., 2017; Labbok & Taylor, 2008; Mirkovic et al., 2014).

Maternal obesity is also associated with early breastfeeding problems (O'Sullivan, Perrine, & Rasmussen, 2015) and early, undesired weaning (Stuebe et al., 2014). In addition, postpartum depression may be a risk factor for early weaning. In a study to understand contributing causes of early, undesired weaning, in which lactation dysfunction is defined as cessation of breastfeeding earlier than intended due to at least two of these three factors: breast pain, low milk supply, and problems with

infant latch, Stuebe et al. (2014) found that lactation dysfunction was implicated in 12% of cases of early, undesired weaning. Mothers with high BMI and those with higher Edinburgh Postnatal Depression Scale (EPDS) scores at 2 months were more likely to experience this particular constellation of lactation dysfunction than those with normal BMI and without depression.

Weight in early infancy (0 – 6 months)

The first 6 months of an infant's life have been identified as a critical window for obesity prevention. Early weight gain is associated with future weight status, and influenced by nutritional and environmental exposures, both in utero and in the early weeks of life, that may affect metabolic programming during this time (Dennison et al., 2006; Gillman, 2008; Stettler et al., 2003; Taveras et al., 2009). Breastfeeding is a key factor in supporting appropriate weight during this important period (Baird et al., 2005, 2008; Carling et al., 2015; Dewey, 2009; Kramer et al., 2004; Zhang et al., 2012), underscoring the national and global recommendations to exclusively breastfeed, without introduction of other foods or liquids, for the first 6 months. Formula feeding and feeding on a schedule (vs. feeding on demand) have been identified as modifiable risk factors for inappropriate (rapid) weight gain in early infancy (Mihirshahi, Battistutta, Magarey, & Daniels, 2011). Non-modifiable predictors of faster weight gain in early infancy include lower weight at birth and male sex.

Maternal diet

Given that more than 4 in 5 of mothers in the United States initiate breastfeeding, and just under a quarter of infants are exclusively breastfed through 6 months in compliance with recommendations, a more nuanced understanding of the factors that are associated with weaning is a pressing public health need. Little, however, is known about whether or how maternal dietary factors play a role in each of these outcomes. As evidenced by popular, mainstream sources that often recommend significant changes in maternal diet as a solution to breastfeeding problems (Bonyata, 2018; Lapid, 2018; Menon, 2017; Sears, 2018; Smith, 2016), mothers are concerned about whether and how their own diets affect their breastfeeding experiences—most commonly, whether something they are eating, like gluten or dairy, is passing to their baby via their milk and causing acid reflux, colic, eczema, and other allergic symptoms. A blog for parents seeking information about a specialized, hypo-allergenic infant formula also weighs in with a personal account of how a total elimination diet (TED) of all major allergens went for one breastfeeding mother (Miller, 2011) whose baby had reflux, eczema, and mucousy diapers. Having a baby who is considered fussy or colicky is a risk factor for early weaning from breastfeeding (Howard, Lanphear, Lanphear, Eberly, & Lawrence, 2006), so exploration into maternal intakes of specific foods that are associated with infant fussiness or crying—the foods that are recommended to be eliminated, or foods known to be associated with inflammatory states—is warranted in the quest to understand and minimize risk factors for early weaning.

Additionally, clinicians recommend changes in maternal diet when breastfeeding issues or concerns about weight arise, despite the fact that whether specific characteristics of maternal diet are associated with differences in infant symptoms, such as colic, or weight gain, is sparsely covered in the literature (Douglas & Hiscock, 2010). The hardship of dietary modification may deter mothers from breastfeeding exclusively for 6 months as recommended (Kidd, Hnatiuk, Barber, Woolgar, & Palacios Mackay, 2019), and more research is needed to determine whether particular aspects of the maternal diet are, indeed, associated not only with early weaning, but with the reasons early weaning may occur.

In general, it is accepted that mothers who are consuming a “healthy and diverse diet” (Centers for Disease Control and Prevention, 2018b) do not need to make any modifications to that in order to successfully nourish their infants through breastfeeding. It is recommended (Centers for Disease Control and Prevention, 2018b) that breastfeeding mothers ensure they are taking in enough energy (2300 – 2500 calories a day) in their diets, but with the exception of a few specific nutrients (Kominiarek & Rajan, 2016) and supplemental vitamin B12 for mothers following a vegan or lacto-ovo vegetarian diet (Centers for Disease Control and Prevention, 2018b), for well-nourished mothers, there are no prescribed nutritional guidelines for lactating mothers (Centers for Disease Control and Prevention, 2018b). To our knowledge, no literature exists to assert that mothers may prematurely wean their babies because of some aspect of their diet, and there are no references to insufficiency of the maternal diet predicting lactation capability. Rather, it is widely accepted, particularly in high-income countries, that breastmilk is successfully

produced by a mother regardless of the sufficiency of her own diet (Valentine & Wagner, 2013).

To understand whether there is scientific evidence to recommend maternal dietary changes to make breastfeeding easier or more palatable for the mother, and to better understand whether maternal diet plays any role in breastfeeding metrics, reasons for breastfeeding cessation, and infant weight, this dissertation examines the extent to which various aspects of maternal diet—**energy** (in calories), an indicator of over- or undernutrition, both of which may be associated with inflammatory states and insulin resistance (Boden et al., 2015; Meydani et al., 2016); **macronutrient** (carbohydrates, protein, and fat) **distribution**, which is a current focus in nutritional epidemiology and may be associated with inflammation, insulin resistance, or breastmilk composition (Faghfoori, Fazelian, Shadnough, & Goodarzi, 2017; Lopez-Legarrea, Fuller, Zulet, Martinez, & Caterson, 2014; Rajaie, Azadbakht, Khazaei, Sherbafchi, & Esmailzadeh, 2014; Steckhan et al., 2016); **glycemic load**, which provides information about the quality of carbohydrates that are consumed; **magnesium**, a mineral with important anti-inflammatory and insulin sensitizing functions; **added sugar**, which is associated with inflammation (O'Connor et al., 2018); and **dairy**, which is commonly eliminated among breastfeeding mothers (Academy of Breastfeeding Medicine, 2011)—are associated with these outcomes.

Maternal diet and breastfeeding

Literature that has investigated associations between maternal diet and breastfeeding in humans is scarce (Amir & Donath, 2012; Garcia et al., 2016; Oken et al., 2008; Vaarno, Niinikoski, Kaljonen, Aromaa, & Lagström, 2015), and not

focused on dietary intakes during the postpartum/lactation period. A 2016 review that focused on maternal weight status, but also examined whether diet might be a determinant of breastfeeding (Garcia et al., 2016) noted only two studies (Oken et al., 2008; Vaarno et al., 2015) that considered maternal diet relative to infant feeding outcomes. Oken (2008) found that, among a Danish cohort, higher maternal consumption of fish prenatally—not postpartum—was associated with longer duration of breastfeeding (8.6 months, +/- 4.7 for the quartile with the highest consumption of fish vs. 7.9 months, +/- 4.6 for the quartile with the lowest consumption of fish, $p < 0.0001$) and Vaarno et al (2015) found, among a Finnish cohort and after adjustment for demographic characteristics, no statistically significant association between maternal diet and breastfeeding exclusivity or duration. However, an additional paper (Amir & Donath, 2012), asserts that any relationships between maternal dietary intakes, such as daily number of servings of fruits or vegetables, and breastfeeding duration is likely explained by the mother's intention to breastfeed, and should not be, itself, interpreted as evidence of a biologic cause. They state:

“We don't believe anyone would suggest that providing new mothers with a daily apple would increase the proportion of women maintaining breastfeeding. We argue that it is highly unlikely that this gradient is biological ... It would be over-simplistic to begin a programme to increase maternal fruit and vegetable intake in order to improve community breastfeeding rates” (p. 470).

Amir and Donath (2012) recommend that future investigations consider maternal intention to breastfeed as a confounder of associations between diet and the achievement of breastfeeding metrics.

Diet-associated physiology and breastfeeding metrics

The physiologic consequences of dietary excesses or deficiencies that may influence the achievement or non-achievement of the recommendation to breastfeed exclusively for 6 months include decreased insulin sensitivity (insulin resistance) and chronic, systemic inflammation. There is evidence to implicate decreased insulin sensitivity, or insulin resistance, in shorter breastfeeding duration and low milk supply (Lemay et al., 2013; Nommsen-Rivers, 2016). A gene that likely plays a role in the down-regulation of milk production, which normally occurs after the initial period of engorgement and high infant demand for suckling and milk, appears to be overexpressed in mothers who are insulin resistant, resulting in a slower increase in milk supply to meet infant demand in the immediate postpartum (Lemay et al., 2013).

Concerning diet-induced inflammation, one study (Sen et al., 2016) utilized a Dietary Inflammatory Index (DII) (Shivappa, Steck, Hurley, Hussey, & Hébert, 2014) to assess whether maternal diet in pregnancy (not postpartum) was associated with specific outcomes. The breastfeeding outcome that was tested was dichotomous: $\geq$ 1 month or $\leq$ 1 month of breastfeeding, among only those who initiated breastfeeding. In this analysis, a proinflammatory diet was predictive of a lower likelihood of breastfeeding past 1 month in lean women. It was speculated that the effect was not observed in women with overweight or obesity because fewer of those initiated breastfeeding (Sen et al., 2016).

While the presence of these states are associated with obesity, both insulin resistance (Masharani et al., 2011) and chronic, systemic inflammation (Engstrom et al., 2003) can be present prior to, or in absence of obesity, suggesting that diet could be a precipitating factor (Sears & Ricordi, 2011). Systemic inflammation (Shivappa, Steck, Hurley, Hussey, Ma, et al., 2014) as well as insulin resistance (Volek et al., 2004), particularly in women, may also be modifiable by specific aspects of diet, including glycemic index, intake of sugars, and macronutrient distribution (Faghfoori et al., 2017). Therefore, calories, macronutrients, glycemic load, added sugar, magnesium, and dairy were examined as exposures associated with breastfeeding exclusivity/intensity and duration.

Maternal diet and reasons to wean before 6 months

Insulin resistance and inflammation are associated with suboptimal infant feeding practices. The hypothesis that early weaning may be driven, in part, by these physiologic consequences of dietary intakes emerged after the IFPS II was concluded. Yet, several of the reasons respondents to the IFPS II could have cited for weaning early may be attributable to inflammation or insulin resistance. Those attributable to inflammation include: baby had trouble sucking/latching on; breasts were overfull/engorged; breasts were infected/abscessed; breasts leaked too much; nipples were sore/cracked/bleeding, and breastfeeding was too painful. Those attributable to insulin resistance include: breastmilk alone did not satisfy my baby; baby is not gaining enough weight; a health professional said baby is not gaining enough weight; and mom had trouble getting milk to flow. Both inflammation and insulin resistance could cause a mother to cite “breastfeeding is too tiring” as a motivation for weaning.

An additional 2 reasons for weaning are associated with the mother's diet, though not via the mechanisms of insulin resistance or inflammation:

- Mom wanted to go on a weight-loss diet
- Mom wanted to go back to her usual diet

The other possible reasons respondents to the IFPS II could have cited as important to their decision to wean are social-ecological, not physiologic, and were not expected to be influenced by the postpartum maternal diet.

Maternal diet and breastfed infant weight

While associations between maternal diet and breastfeeding metrics and reasons for stopping breastfeeding may be explained in part by physiologic states of inflammation or insulin resistance, the association between maternal diet and infant weight may more likely be influenced by breastmilk composition. That is, the hypothesized mechanism for any associations between maternal dietary exposures and infant weight is that the mother's intakes dictate nutritional and hormonal components of breastmilk, which then influences infant weight. Thus, the present study examined the extent to which calories, macronutrients, glycemic load magnesium, added sugar, and dairy are associated with infant weight at 6 months. These aspects of maternal diet are hypothesized to influence breastmilk composition. It should be noted that information on breastmilk composition just as biomarkers for inflammation and insulin resistance, were not part of the IFPS II dataset. Collecting and analyzing milk and blood samples is extremely costly; this dissertation may provide justification for future such expenditures.

Appropriate nutrition for a healthy weight during any period of the life course considers reasonable caloric intake, macronutrient distribution, and limited intake of sugar (Centers for Disease Control and Prevention, 2019). While dietary guidelines for infants and toddlers in the United States are still in development (United States Department of Agriculture, Center for Nutrition Policy and Promotion, 2019), it is generally accepted that these same dietary constituents—reasonable caloric intake, macronutrient distribution, and limited intake of sugar—should be considered when assessing the infant diet, which, in the early weeks and months, should consist only of breastmilk. The literature regarding whether and to what extent the mother’s diet influences specific dietary or other constituents of breastmilk that are germane to weight gain, such as hormones that regulate the infant’s appetite, is presently inconclusive. Few studies have examined the influence of maternal diet on such constituents of breastmilk, and few others have investigated their influence on weight gain in the breastfed infant.

Maternal postpartum dietary intakes of interest

Magnesium

Magnesium, a micronutrient (comprising a small amount of the diet, and not providing energy/calories) is a mineral found in whole grains, leafy green vegetables, nuts, and legumes (Dibaba, Xun, & He, 2014), which are universally recommended foods to include in a healthy diet. Yet, dietary magnesium tends to be under-consumed in the United States, and because symptomatic magnesium deficiency is rare (National Institutes of Health, Office of Dietary Supplements, 2019), due attention is not paid this mineral despite its major role in mitigating inflammation. It

is one of the most heavily weighted components in the Dietary Inflammatory Index (Shivappa, Steck, Hurley, Hussey, & Hébert, 2014), which supports that its anti-inflammatory effects are non-controversial and widely accepted. Increased intake of magnesium is associated with lower levels of inflammatory markers (Dibaba et al., 2014; Galland, 2010). Among the 45 dietary components included in the Dietary Inflammatory Index, magnesium ranks 6th in its estimated anti-inflammatory effect size, behind turmeric, fiber, flavones, isoflavones, and beta-carotene (Shivappa, Steck, Hurley, Hussey, & Hébert, 2014).

The *Dietary Guidelines for Americans* (United States Department of Agriculture [USDA] and United States Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2015) recommends 310 – 320 milligrams of dietary magnesium each day for women between the ages of 19 and 50. An increase of 40mg/day is recommended during pregnancy, but there is no separate recommendation for lactation vs. non-pregnant.

Added sugar

Sugar can be found in many foods that comprise a healthful diet, but added sugar, most often in the form of fructose, is a nutrient that has earned attention for its possible role in the development of metabolic disease, including insulin resistance and inflammation (O'Connor et al., 2018). Whether sugar consumption is causative of these metabolic complications remains controversial (Ludwig et al., 2018).

Intake of sugars may have implications for breastmilk and its influence on infant weight gain. A study (n = 41) of mothers at 6 weeks postpartum found that consumption of fructose-sweetened beverages increased the amount of fructose in the

breastmilk of those mothers (Berger, Fields, Demerath, Fujiwara, & Goran, 2018), but neither glucose or lactose concentrations changed. The researchers presumed that the fructose in breastmilk originated from the mother's diet, because an earlier report did not contain fructose as a naturally occurring component of human milk (Jenness, 1979). Glucose in breastmilk is correlated with certain infant anthropometrics at 1 month of age (Fields & Demerath, 2012). Similarly, fructose in breastmilk is associated with greater infant weight at 6 months (Goran, Martin, Alderete, Fujiwara, & Fields, 2017).

The current (2015 – 2020) *Dietary Guidelines for Americans* (United States Department of Agriculture [USDA] and United States Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2015) recommend that no more than 10% of daily calories (approximately 14 – 15 teaspoons) come from added sugars.

Dairy

Dairy foods are those which are made from the milk of a mammal, most commonly cows, goats, or sheep. Dairy foods contain carbohydrate, protein, and fat. The evidence for whether consumption of dairy products bears on insulin sensitivity and/or chronic inflammation is mixed, though cow's milk allergy, in the mother or the infant, diagnosed or undiagnosed, is widely accepted as a potentially problematic influence on the breastfeeding relationship (Academy of Breastfeeding Medicine, 2011; Douglas & Hiscock, 2010). A review (Da Silva & Rudkowska, 2014) suggests that daily consumption of dairy may be beneficial in improving insulin sensitivity and in reducing chronic inflammation, and a later laboratory study by some of the same

researchers (Da Silva, Chartrand, Vohl, Barbier, & Rudkowska, 2017) also found that certain individuals could benefit from dairy consumption to prevent insulin resistance. Another review of 10 weight-stable (no change in body weight for the participants) diet interventions that increased dairy intake among healthy individuals and those with metabolic syndrome found improved insulin sensitivity in 4 of the interventions, one with worse insulin sensitivity, and 5 studies with no association between dairy intake and insulin sensitivity (Turner, Keogh, & Clifton, 2015). Of particular interest, given the difficulty some mothers with PCOS have complying with infant feeding recommendations, is a report (Rajaeieh, Marasi, Shahshahan, Hassanbeigi, & Safavi, 2014) that, after controlling for confounding variables such as BMI, dairy intake is associated with polycystic ovarian syndrome (PCOS), of which a major marker is insulin resistance.

It is also notable that cow's milk proteins are known to pass into breastmilk, though in very small amounts (Høst, Husby, Hansen, & Osterballe, 1990), and these can cause symptoms in an exclusively breastfed infant (Academy of Breastfeeding Medicine, 2011), such as fussiness and bloody stools. There is no known literature that reports specifically on any association between maternal intake of dairy products and adherence to the recommendation to breastfeed for the infant's first 6 months. However, symptoms that are associated with cow's milk allergy in breastfed infants, including distress/colic, runny nose, chronic cough, blood in stools, atopic dermatitis (rash) or urticaria (hives), diarrhea, and frequent spitting up (Vandenplas et al., 2007) are also reasons mothers have cited for early full or partial weaning (Li et al., 2008; Odom, Li, Scanlon, Perrine, & Grummer-Strawn, 2013).

With regard to breastmilk composition, one study (n = 16) compared milk composition after maternal consumption of high-dairy and low-dairy diets, and found that breastmilk fat was higher when mothers consumed the high-dairy diet (Park et al., 1999). Whether this changed infant weight was not studied.

The *Dietary Guidelines for Americans* (United States Department of Agriculture [USDA] and United States Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2015) recommend that all adult females, without regard for pregnancy or lactation status, consume 3 1-cup servings of dairy products each day.

Total energy (calories)

A calorie is the measurement of the amount of energy that is required to raise the temperature of 1 gram of water 1 degree Celsius. Too little caloric intake can lead to insufficient energy for the body to carry out its metabolic and homeostatic processes, such as keeping the heart beating regularly, brain function, and movement. Consuming more calories than the body needs leads to the storage of that excess energy as body fat. There are health consequences associated with both deficiency or excess of calories, and recommendations for caloric intake consider an individual's activity level and endogenous energy needs. Particularly notable for this dissertation, an excess intake of calories is associated with the development of insulin resistance (Boden et al., 2015) and inflammation (Meydani et al., 2016).

A moderately active breastfeeding woman should consume 2300 – 2500 calories each day (Centers for Disease Control and Prevention, 2018b), which is approximately 450 – 500 calories more than she should consume before pregnancy.

Glycemic load: carbohydrate quality

When evaluating a carbohydrate food's quality, one consideration is the degree to which the food has the potential to raise the level of glucose, or sugar, in the blood. The glycemic index is a score assigned to the potential of a food to raise blood glucose relative to a reference food (usually glucose); a high score reflects a food that sharply raises blood glucose for a short period of time, and a low score reflects one that raises blood glucose moderately, with a less abrupt drop (Oregon State University, Linus Pauling Institute, 2014). The glycemic load is the mathematical product of a food's glycemic index and the amount of carbohydrate in the food (Oregon State University, Linus Pauling Institute, 2014). The sum of the glycemic loads of all the foods consumed quantifies the daily glycemic load of the total diet, and is useful in epidemiologic studies to assess the risk of this dietary exposure—to low-quality, refined carbohydrates—in the development of disease (Jenkins et al., 2002).

There is no current national recommendation for average daily glycemic load, due to a lack of evidence for or against its utility in disease prevention and management (Sheard et al., 2004), and the only known guidance comes from an Australian organization called the Glycemic Index Foundation (Coyle, 2017). The organization suggests that an average daily glycemic load under 100 is optimal.

Macronutrients: carbohydrates, protein, and fat

Carbohydrates, which come from simple forms like sugars, and complex forms like starches, are the main source of fuel for the brain (Slavin & Carlson, 2014). Fiber, also a complex form of carbohydrate, passes largely undigested into the large intestine, where it provides bulk for stool (Slavin & Carlson, 2014). Because

carbohydrate foods comprise such a wide variety of things people might eat, it's important to consider the quality and quantity of what's consumed (Ludwig, Hu, Tappy, & Brand-Miller, 2018). Milk and fiber-rich vegetables, fruits, and whole grains comprise the majority of carbohydrate intake in a healthy diet (Slavin & Carlson, 2014). Metabolically healthy women were found in one study to have diets higher in fiber and vegetables, but lower in dairy products and saturated, monounsaturated, and trans fat than those who were metabolically unhealthy (Camhi, Crouter, Hayman, Must, & Lichtenstein, 2015).

Proteins are considered building blocks for cells, organs, and tissues, and play a role in their structure, regulation, and function (Oregon State University, Linus Pauling Institute, 2015). Proteins are composed of amino acids, and are considered complete if they have all amino acids, as is usually the case with animal sources of protein, or incomplete, which is more typical of plant-based sources (Comerford & Pasin, 2016). Milk, meat, fish, and eggs are protein-rich animal foods; legumes, nuts, and certain grains are plant sources of protein (Comerford & Pasin, 2016).

Fat is necessary for the absorption of certain vitamins and other nutrients, and should be consumed in moderation from foods like butter, oil, nuts, meat, fish, and some dairy products (National Library of Medicine, PubMed Health, n.d.). There are 4 different types of fat found in foods. Monounsaturated fat, from avocados, olives, and nuts, may play a role in lowering disease risk (National Library of Medicine, PubMed Health, n.d.). Polyunsaturated fats provide two types of polyunsaturated fatty acids (PUFAs): omega-6, from vegetable oils, and omega-3, from certain plant oils, walnuts, and fish (National Library of Medicine, PubMed Health, n.d.). Saturated fat

is found in meat, poultry skin, lard, and dairy products, and trans fat, which carries the greatest risk of increasing heart disease and is not part of a healthy diet, is found in highly processed foods, such as packaged baked goods and fried foods (National Library of Medicine, PubMed Health, n.d.).

While much of the science around dietary macronutrient distributions refers to the potential for a particular diet to promote weight loss, several studies have investigated the predictive impacts of macronutrients on insulin sensitivity and inflammation (Faghfoori et al., 2017; Lopez-Legarrea et al., 2014; Rajaie et al., 2014; Steckhan et al., 2016). There is some evidence to support that a diet that replaces carbohydrates with unsaturated fat (Rajaie et al., 2014) predicts lower markers for inflammation; lower total fat intake predicts lower markers for inflammation (Steckhan et al., 2016); and a diet higher in protein predicts lower markers for inflammation (Lopez-Legarrea et al., 2014).

The *Dietary Guidelines for Americans* (United States Department of Agriculture [USDA] and United States Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2015) recommend that 45%-65% of daily calories come from carbohydrate sources, 10% - 35% come from protein sources, and 25% - 35% of daily calories come from fat sources.

Maternal energy (caloric) and macronutrient intakes and breastmilk composition

The literature is inconclusive about whether macronutrient distribution in the maternal diet is associated with differences in breastmilk composition in ways that might matter for infant weight status. One study (n = 7) found that milk caloric content was higher when the maternal diet was low in carbohydrates and high in fat

than when it was high in carbohydrates and low in fat (Mohammad, Suneag, & Haymond, 2009), and also found a difference in milk fat content when the maternal diet was high fat vs. low fat. No differences were found between diets for milk protein or lactose in this study, and this study did not examine infant weight, only breastmilk composition. A study of healthy, fully lactating mothers ($n = 3$) found a difference in milk protein concentration when mothers consumed a diet of 20% of calories from protein vs. 8% (Forsum & Lönnerdal, 1980). Conversely, three other studies failed to find any influence of maternal fat or carbohydrate intake (Quinn, Largado, Power, & Kuzawa, 2012), type of protein (animal vs. plant) consumed (Finley, Lönnerdal, Dewey, & Grivetti, 1985), or the mother's total caloric intake (Boniglia, Carratù, Chiarotti, Giammarioli, & Sanzini, 2003; Quinn et al., 2012) on milk protein content. Quinn et al. (2012), in a study of 103 mothers, also did not find any influence of maternal caloric intake on breastmilk carbohydrate content or of any maternal intake (calories or macronutrients) on any macronutrient concentration in breastmilk. None of these studies examined effects on infant weight, only breastmilk composition.

With specific regard to infant weight gain, there are known concerns over too much protein in breastmilk substitutes, which contribute to excessive infant weight gain (Dewey, Heinig, Nommsen, Pearson, & Lönnerdal, 1992; Koletzko et al., 2009). Given, also, the global preoccupation with fat and carbohydrate intakes (Elmadfa & Meyer, 2017), it would seem that an exploration of the macronutrient content and energy (calories) of breastmilk as they relate to infant weight status is relevant. However, only two studies have looked into this relationship. The first ($n = 13$)

considered milk fat, and found that only percent increase in milk fat content was correlated to infant weight gain at 1 month (Schueler, Alexander, Hart, Austin, & Enette Larson-Meyer, 2013). There were no associations observed between milk fat content and weight at 6 months in this study. The other examination (n = 614) included analysis of breastmilk caloric content and all three macronutrients (protein, fat, and carbohydrate) (Prentice et al., 2016). Counterintuitively, higher milk caloric content was associated with lower infant BMI and adiposity at 12 months, and a smaller gain in weight between 3 and 12 months. Similarly, the as milk percentage of fat increased, weight gain between 3 and 12 months and BMI/adiposity at 12 months decreased. However, as percentage of milk carbohydrate increased, so did all of these anthropometric measures, and as percentage of milk protein increased, so did infant BMI at 12 months of age (Prentice et al., 2016).

Other relevant factors

There are additional variables that may confound or moderate the associations between maternal dietary exposures and achievement of breastfeeding metrics, reasons for breastfeeding cessation, and infant weight gain.

Maternal body mass index (BMI)

High maternal BMI is a known risk factor for early weaning and non-adherence to exclusive breastfeeding for 6 months (Bever Babendure, Reifsnider, Mendias, Moramarco, & Davila, 2015; Stuebe, 2015; Stuebe et al., 2014), and various behavioral (Lyons, Currie, Peters, Lavender, & Smith, 2018) and physiologic (Nommsen-Rivers, 2016; Rasmussen & Kjolhede, 2004) mechanisms for these associations have been reported. An exploration of variables to explain how maternal

obesity may impede the achievement of breastfeeding metrics (O'Sullivan et al., 2015) found that insufficient milk partly explains the association between obesity and suboptimal breastfeeding outcomes. Similarly, high maternal BMI is strongly associated with larger weight gain in early infancy (Baker, Michaelsen, Rasmussen, & Sørensen, 2004).

Chronic, systemic inflammation and insulin resistance are two metabolic consequences of obesity (Chen, Chen, Wang, & Liang, 2015; Jung & Choi, 2014), and are closely related to each other. Adipose tissue (stored fat) secretes pro-inflammatory proteins, called adipocytokines or adipokines. These adipokines trigger systemic, chronic inflammation, which disrupts and decreases the normal ability of cells to respond to and use insulin to metabolize glucose (Chen et al., 2015; Jung & Choi, 2014).

Depression

The relationships between perinatal depression and breastfeeding have been explored in attempts to elucidate whether and how depression during pregnancy and/or postpartum impact breastfeeding metrics, and whether and how breastfeeding impacts postpartum depression (Dias & Figueiredo, 2015). One study found that depression before the infant was born predicted a shorter breastfeeding duration, postpartum depression was not associated with shorter breastfeeding duration, and that breastfeeding was protective against postpartum depression (Figueiredo, Canário, & Field, 2014). An investigation into associations between postpartum depression and specific reasons for stopping breastfeeding (Brown, Rance, & Bennett, 2015) found that, when a mother stopped breastfeeding for psychosocial reasons such as

embarrassment about feeding in public, there was no association with postpartum depression, but breastfeeding cessation related to pain or physical difficulties was associated with an increased risk of postpartum depression.

Maternal depression could moderate relationships between maternal dietary exposures and the outcomes being studied, because depression is recognized as an inflammatory condition (Kendall-Tackett, 2007). Additionally, lactation failure and maternal depression may share neuroendocrine mechanisms (Stuebe, Grewen, Pedersen, Propper, & Meltzer-Brody, 2012).

Maternal food allergy

There is no specific research into associations between maternal allergy to specific foods and breastfeeding outcomes; however, repeated exposure to foods that are known or not known causes of allergic symptoms may also lead to systemic, chronic inflammation (Galli, Tsai, & Piliponsky, 2008), and weaning may be attributable to breastfeeding problems, such as pain, that result from that inflammation. To illustrate the feasibility of maternal food allergy as a potential influence on breastfeeding behavior via the inflammatory response, antihistamines may be recommended—cautiously, due to their potential to reduce milk supply in some mothers—for the management of lactation-associated breast pain (Muddana, Asbill, Jerath, & Stuebe, 2018). The presence of maternal food allergy may influence both the mother's dietary intakes and her likelihood of exclusively breastfeeding for 6 months. It does not likely bear upon infant weight.

Intention to breastfeed

The maternal intention to exclusively breastfeed is a strong predictor of success in exclusively breastfeeding, both in the short term (Colaizy, Saftlas, & Morriss, 2012) and for 6 months (Bai, Middlestadt, Peng, & Fly, 2010). Amir and Donath (2012) assert that intention to breastfeed is the actual variable of importance, not biologic mechanisms, when examining relationships between such maternal behaviors as diet or smoking and breastfeeding behaviors. Therefore, breastfeeding intention may be a confounding variable in relationships between dietary intakes and whether a mother exclusively breastfeeds for 6 months, but it is likely not a consideration in any relationships between maternal dietary exposures and infant weight.

Chapter 3: Methods

Data source and sample

The data that I analyzed in this dissertation were collected by the United States Food and Drug Administration (FDA) and Centers for Disease Control and Prevention (CDC) in their second Infant Feeding Practices Study (IFPS II). IFPS II was a longitudinal, questionnaire-based study that was administered to healthy mothers of healthy, singleton infants born at term or late pre-term in 2005-2006 in the United States. If the mother reported that either she or her infant had or developed a health problem that might bear on infant feeding and care, they were dropped from the study by the CDC. Mothers were sent a questionnaire during the 3rd trimester of pregnancy (prenatal questionnaire); contacted briefly by telephone to confirm that a healthy, singleton, full-term infant had been born (birth screener); and sent questionnaires during the neonatal period, and at 2, 3, 4, 5, 6, 7, 8, 10.5, and 12 months in their infants' first year (Fein et al., 2008). While the sample was nationally distributed (drawn from all areas of the U.S.), it is not nationally representative and represents a convenience sample drawn from households that participated in a mail-based consumer opinion panel. Therefore, participants in IFPS II were more likely to be of white ethnicity, older, of higher educational attainment, non-smokers, and of a higher income level than adult mothers of singleton infants that participated in the National Survey of Family Growth (Fein et al., 2008). It is the only publicly available data set that contains longitudinal, detailed information about infant feeding, care, and health. An additional limitation of the IFPS II is that its data are completely self-

reported by the mothers surveyed; no clinical observations or medical record abstractions are included.

A subsample (n = 1422) was administered a maternal Diet History Questionnaire (DHQ) around 3 months postpartum. This questionnaire was modified from the National Cancer Institute's (NCI) widely used instrument for measuring dietary intake, the DHQ II (Centers for Disease Control and Prevention, 2008). The DHQ II, a food frequency questionnaire, is a slightly modified version of the DHQ I, which was found in three validation studies to provide reasonable nutrient estimates; it is thus accepted that the DHQ II is also valid for this purpose (National Cancer Institute, personal communication, 2016). Due to their relatively low cost and low participant burden—they are typically self-administered—food frequency questionnaires are the most widely used method of assessing long-term dietary intake in epidemiologic studies (Willett & Lenart, 2013). While caloric and protein intakes were found in one validation study of the DHQ to be underreported (Kipnis et al., 2003), overall, the DHQ, and subsequently, the DHQ II, were found in another validation study to be as reliable as other instruments for assessing nutrient intake (Subar et al., 2001). Flood et al. describe the methodology used to add glycemic index data to the DHQ nutrient database (Flood et al., 2006). The IFPS II DHQ was modified by reducing the DHQ II's time frame for dietary intake from one year to one month, and by adding foods that are of particular interest when studying pregnant and lactating mothers, such as certain types of fish (Centers for Disease Control and Prevention, 2008). Users of the NCI DHQ II may utilize the program Diet*Calc to convert raw dietary data into nutrient and food group estimates for analysis. NCI

processed the raw dietary intake data from the IFPS II DHQ using a Diet*Calc program that was modified to fit the IFPS II DHQ; as a result, the IFPS II DHQ data set includes these Diet*Calc-generated estimates for specific nutrients and food group intakes (Centers for Disease Control and Prevention, 2008).

The IFPS II and postpartum DHQ data sets were merged by sample identification number (SAMPIQ), so that dietary variables could be modeled with infant and maternal variables from the IFPS II data set. Respondents with complete data for exposures, outcomes, and covariates were retained for each of the 3 analyses. Sample 1 included 1099 respondents; sample 2 included 587 respondents; sample 3 included 186 respondents.

Measures: Dietary Factors

I examined 8 dietary factors: magnesium (in milligrams), added sugar (in teaspoons), dairy (in number of servings), energy (in calories), average daily glycemic load, and percentage of daily calories from carbohydrate, protein, and fat. Magnesium, added sugar, dairy, energy, and average daily glycemic load were categorized into quartiles based upon the sample's consumption, as is commonly practiced in nutritional epidemiology (Hsieh et al., 1991; Willett, 2013). These quartiles were assigned for each sample. While analyses for Aim 3 were conducted by sex, we did not stratify by infant sex when creating quartiles as we would have had too few participants. Therefore, quartiles were not evenly distributed for analyses (which were by infant sex) in Aim 3.

Macronutrient distribution was categorized dichotomously to align with the daily intake recommendations presented in the *Dietary Guidelines for Americans*

(United States Department of Agriculture [USDA] and United States Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2015): low or moderate carbohydrate diet (< 45% of daily calories) and high carbohydrate diet (45% or more of daily calories); low protein diet (< 10% of daily calories) and moderate protein diet (10% - 35% of daily calories); and low or moderate fat diet (< 36% of daily calories) and high fat diet (at least 36% of daily calories). The following table illustrates the ranges for each sample-based category (for magnesium, added sugar, dairy, energy, and glycemic load) for each of the three aims.

Table 1: Operationalization of exposure variables

Exposure	Sample 1 (n = 1099)	Sample 2 (n = 587)	Sample 3 (n = 186)	Recommendations
Magnesium (mg)				
Quartile 1	59.46 – 213.03	59.46 – 206.94	117.67 – 243.80	310 – 320 mg/day ^a
Quartile 2	213.04 – 279.84	206.95 – 273.97	243.81 – 317.34	
Quartile 3	279.85 – 371.19	273.98 – 365.50	317.35 – 379.63	
Quartile 4	371.20 – 1103.12	365.51 – 832.76	379.64 – 803.12	
Added sugar (tsp)				
Quartile 1	1.67 – 8.68	1.67 – 8.28	1.67 – 8.62	Less than 10% of daily calories ^a ($< 14 - 15$ tsp/day)
Quartile 2	8.69 – 13.42	8.29 – 13.09	8.63 – 13.00	
Quartile 3	13.43 – 20.43	13.10 – 19.62	13.01 – 18.84	
Quartile 4	20.44 – 147.93	19.63 – 88.24	18.85 – 75.77	
Dairy (servings)				
Quartile 1	0.06 – 1.01	0.06 – 0.96	0.06 – 1.22	3 servings/day ^a
Quartile 2	1.02 – 1.69	0.97 – 1.61	1.23 – 2.01	
Quartile 3	1.70 – 2.83	1.62 – 2.65	2.02 – 3.12	
Quartile 4	2.84 – 12.91	2.66 – 12.91	3.13 – 8.03	
Energy (calories)				
Quartile 1	623.65 – 1373.40	665.01 – 1311.45	855.47 – 1565.46	2300 – 2500 calories/day during lactation ^b
Quartile 2	1373.41 – 1772.58	1311.46 – 1709.20	1565.47 – 1934.48	
Quartile 3	1772.59 – 2270.74	1709.21 – 2238.76	1934.49 – 2262.12	
Quartile 4	2270.75 – 4538.89	2238.77 – 4534.83	2262.13 – 4257.42	
Glycemic load				
Quartile 1	21.56 – 85.36	21.56 – 83.00	39.80 – 91.56	Under 100 ^c
Quartile 2	85.37 – 110.04	83.01 – 105.44	91.57 – 111.54	
Quartile 3	110.05 – 146.68	105.45 – 140.30	111.55 – 153.19	
Quartile 4	146.69 – 412.21	140.31 – 382.52	153.20 – 316.83	
% calories from carbohydrate				
Low/moderate	19.3%	18.7%	22.6%	45% - 65% of daily calories ^a
High	80.7%	81.3%	77.4%	
% calories from protein				
Low	2.7%	2.6%	0.5%	10% - 35% of daily calories ^a
Moderate	97.3%	97.4%	99.5%	
% calories from fat				
Low/moderate	65.0%	65.4%	60.2%	25% - 35% of daily calories ^a
High	35.0%	34.6%	39.8%	

^a *Dietary Guidelines for Americans* (USDA, 2015)

^b Centers for Disease Control and Prevention (CDC, 2018b)

^c Glycemic Index Foundation (Coyle, 2017)

Measures: Outcomes

Aim 1

The outcomes of interest for Aim 1 were breastfeeding intensity at 3 months and duration at 6 months. Information on amount of breastfeeding and whether other foods or liquids had been introduced was used to categorize women into the breastfeeding groups at 3 and 6 months postpartum.

Breastfeeding exclusivity at 3 months

Exclusive breastfeeding at 3 months was characterized by breastfeeding with no foods or liquids fed to the infant except breastmilk from birth through the infant's 12th week of age. Exclusive breastfeeding was compared with partial (non-exclusive) breastfeeding and no breastfeeding.

Partial (non-exclusive) breastfeeding at 3 months was characterized by the feeding of breastmilk plus other foods or liquids to the infant from birth through the 12th week of age. The comparison category, no breastfeeding, represents the feeding of only infant formula and complementary foods and no breastmilk at 12 weeks of age.

Any breastfeeding at 6 months was characterized by the feeding of any breastmilk at 24 weeks of age. The comparison category, no breastfeeding, represents the feeding of only infant formula and complementary foods and no breastmilk at 24 weeks of age.

Aim 2

Aim 2 investigated reasons mothers weaned from breastfeeding, derived from the IFPS II "Module B" which was sent to respondents after they indicated they had

completely stopped breastfeeding. Those respondents were sent the Module B with their next scheduled questionnaire. For instance, if a mother reported on her Month 2 questionnaire that she had stopped breastfeeding, she was sent a Module B with her Month 3 questionnaire. In Module B, mothers were presented with 32 reasons for weaning and asked to indicate how important each reason was to her decision to wean with the following response options: “not at all important,” “not very important,” “somewhat important,” or “very important.”

Table 2 presents the 32 reasons for weaning that were included on Module B, how existing studies in the literature have categorized/clustered them, and the 7 clusters for this study. The clusters were assigned based on this extant literature (Li et al., 2008; Odom et al., 2013; O’Sullivan et al., 2015) and face validity. Face validity was tested via anonymous, online survey of 62 International Board Certified Lactation Consultants (IBCLC), who were asked to categorize each clinical reason for early weaning into one of the clusters “insufficient milk,” “too much milk,” “pain,” or “diet concern,” and to place each social-ecological reason for early weaning into one domain of the Social Ecology of Health Model. All of the clinical classifications were derived from a clear majority (see column 3 of Figure 2-A); most of these had more than 75% of respondents classifying the reason into the same cluster. The social-ecological reasons, for which maternal diet was not expected to be an influential factor, were less clearly classified, but each reason was placed in the domain that was chosen by a majority, even if that majority was small. The clusters are: insufficient milk; too much milk; pain; diet concern; social-ecological: individual; social-ecological: interpersonal or family; and social-ecological: community, institution, or

policy. If a mother indicated that a reason within a cluster was “somewhat important” or “very important” to her decision to stop breastfeeding, her response was categorized as “yes” for that outcome cluster.

Cluster 1: Insufficient milk

Individuals who responded “yes” to at least one of the following: “baby was not gaining enough weight,” “a health professional said baby was not gaining enough weight,” “mom had trouble getting the milk flow to start,” “mom did not have enough milk,” or “breastmilk alone did not satisfy the baby,” were coded as reporting a reason for weaning was insufficient milk supply. Those who responded “no” to all 7 were coded as not reporting this reason.

Cluster 2: Too much milk

Individuals who responded “yes” to at least one of the following: “breasts were overfull/engorged” or “breasts leaked too much” were coded as reporting a reason for weaning was too much milk. Those who responded “no” to both were coded as not reporting this reason.

Cluster 3: Pain

Individuals who responded “yes” to at least one of the following: “baby had trouble sucking/latching on,” “breasts were infected or abscessed,” nipples were sore/cracked/bleeding,” “breastfeeding was too painful,” or “breastfeeding was too tiring” were coded as reporting a reason for weaning was pain. Those who responded “no” to all 5 were coded as not reporting this reason.

Cluster 4: Maternal diet concern

Individuals who responded “yes” to at least one of the following: “mom wanted to go on a weight loss diet” or “mom wanted to go back to her usual diet”

were coded as reporting a reason for weaning was maternal diet concern. Those who responded “no” to both were coded as not reporting this reason.

Cluster 5: Social-ecological: individual

Individuals who responded “yes” to at least one of the following: “mom wanted body back to herself,” “mom got pregnant/wanted to get pregnant,” “breastfeeding was too inconvenient,” “mom did not like breastfeeding,” “mom wanted to smoke again,” or “pumping milk no longer seemed worth the effort” were coded as reporting a reason for weaning was social-ecological: individual. Those who responded “no” to all 6 were coded as not reporting this reason.

Cluster 6: Social-ecological: interpersonal/family

Individuals who responded “yes” to at least one of the following: “mom wanted someone else to feed the baby,” “someone else wanted to feed the baby,” “baby lost interest in nursing,” baby was old enough,” or “mom had too many household duties” were coded as reporting a reason for weaning was social-ecological: interpersonal/family. Those who responded “no” to all 5 were coded as not reporting this reason.

Cluster 7: Social-ecological: community, institutional, policy

Individuals who responded “yes” to at least one of the following: “mom was not present to feed baby,” baby became sick and could not breastfeed,” “mom did not want to breastfeed in public,” “mom was sick or had to take medicine,” “mom wanted to be able to leave baby,” or “mom could not or did not want to breastfeed or pump at work” were coded as reporting a reason for weaning was social-ecological: community, institutional, policy. Those who responded “no” to all 6 were coded as not reporting this reason.

Table 2: IFPS II Module B reasons for weaning and classifications

Reason	Classification of reasons	Number (%) of lactation consultants (n = 62)	Li et al. (2008) & Odom, et al., (2013)	O'Sullivan et al (2014)
Baby was not gaining enough weight	Insufficient milk	60 (96.8%)	Nutritional	Insufficient milk
A health professional said baby was not gaining enough weight	Insufficient milk	60 (96.8%)	Nutritional	
Mom had trouble getting the milk flow to start	Insufficient milk	47 (75.8%)	Nutritional	Breast dysfunction
Mom did not have enough milk	Insufficient milk	60 (96.8%)	Nutritional	Insufficient milk
Breast milk alone did not satisfy baby	Insufficient milk	58 (93.6%)	Nutritional	
Breasts were overfull/engorged	Too much milk	36 (58.1%)	Lactational	Too much milk
Breasts leaked too much	Too much milk	43 (69.4%)	Lactational	Too much milk
Baby had trouble sucking/latching on	Pain	53 (85.5%)	Lactational	Insufficient milk
Breasts were infected or abscessed	Pain	58 (93.6%)	Lactational	Breast dysfunction
Nipples were sore/cracked/bleeding	Pain	62 (100.0%)	Lactational	Insufficient milk
Breastfeeding was too painful	Pain	62 (100.0%)	Lactational	
Breastfeeding was too tiring	Pain	49 (79.0%)	Psychosocial	
Mom wanted to go on a weight loss diet	Maternal diet concern	56 (90.3%)	Lifestyle	
Mom wanted to go back to usual diet	Maternal diet concern	60 (96.8%)	Lifestyle	
Baby began to bite	Social-ecological: Individual	44 (80.0%)	Baby's self-weaning	
Mom wanted body back to herself	Social-ecological: Individual	43 (78.2%)	Lifestyle	
Mom got pregnant/wanted to get pregnant	Social-ecological: Individual	37 (67.2%)	Medical	
Breastfeeding was too inconvenient	Social-ecological: Individual	24 (43.6%)	Psychosocial	
Mom did not like breastfeeding	Social-ecological: Individual	49 (89.1%)	Lifestyle	
Mom wanted to smoke again	Social-ecological: Individual	46 (83.7%)	Lifestyle	
Pumping milk no longer seemed worth the effort	Social-ecological: Individual	30 (54.6%)	Milk pumping	

Mom wanted someone else to feed baby	Social-ecological: Interpersonal/family	35 (63.6%)	Psychosocial	
Someone else wanted to feed baby	Social-ecological: Interpersonal/family	48 (87.3%)	Psychosocial	
Baby lost interest in nursing	Social-ecological: Interpersonal/family	44 (80.0%)	Baby's self-weaning	Infant feeding difficulty
Baby was old enough	Social-ecological: Interpersonal/family	43 (78.2%)	Baby's self-weaning	
Mom had too many household duties	Social-ecological: Interpersonal/family	44 (80.0%)	Psychosocial	
Mom was not present to feed baby	Social-ecological: community, institutional, policy	35 (63.6%)	Medical	
Baby became sick and could not breastfeed	Social-ecological: community, institutional, policy	30 (54.6%)	Medical	
Mom did not want to breastfeed in public	Social-ecological: community, institutional, policy	47 (75.8%)	Psychosocial	
Mom was sick or had to take medicine	Social-ecological: community, institutional, policy	30 (54.6%)	Medical	
Mom wanted to be able to leave baby	Social-ecological: community, institutional, policy	32 (51.6%)	Psychosocial	
Mom could not/did not want to breastfeed/pump at work	Social-ecological: community, institutional, policy	49 (79.0%)	Milk pumping	

Aim 3

Aim 3 investigated infant weight at 6 months and infant weight-for-age z-score at 6 months. Infant weight measures were reported by mothers in response to the prompt “infant weight at last pediatrician visit” on either the month 5 or month 7 survey. Values recorded within 2 weeks of 6 months after the infant’s birth were included for analysis. Weight-for-age z-scores were calculated from reported infant anthropometric data using parameters (median = M, generalized coefficient of variation = S, and the power in Box-Cox transformation = L) published by the Centers for Disease Control and Prevention, National Center for Health Statistics, and the equation $X = M (1 + LSZ)^{1/L}$, $L \neq 0$ (World Health Organization, 2019b).

Measures: Covariates

Maternal age, race/ethnicity, marital status, smoking, and enrollment in the WIC program for families with low income or at nutritional risk were included in statistical models for all three aims. In addition, to consider diagnosable conditions of impaired glucose metabolism (insulin resistance), maternal type 2 diabetes and gestational diabetes were controlled for, and to consider diet-related inflammation in aims 1 and 2, maternal food allergy was controlled for. To account for the tendency for mothers who are more likely to adhere to dietary recommendations for both themselves and their infants, the intention to breastfeed for at least 6 months, which was measured before the infant was born, was included in statistical models for aims 1 and 2. For Aim 3, to account for possible effects on infant weight, whether formula (yes/no) or complementary foods (yes/no) were introduced were controlled for in statistical models.

Postpartum BMI and maternal depression were also controlled for. Postpartum BMI was calculated from the self-reports of height just before pregnancy (the only time height data were collected) on the prenatal questionnaire, and weight during the postpartum period on the Month 3 questionnaire. Postpartum depressive symptoms were assessed during the Month 2 questionnaire using the 10 questions from the Edinburgh Postnatal Depression Scale (J. Cox & Holden, 2003), a tool that has been validated to reliably screen mothers who are at risk for postpartum depression. A variable representing the sum of the 10 items was constructed.

Analyses

Aim 1: To examine the associations between dietary factors and breastfeeding metrics

Chi-square and ANOVA were conducted to examine bivariate associations between dietary factors, covariates, and breastfeeding metrics. Binomial logistic regression was conducted to examine the association between each dietary factor and intensity at 3 months (exclusively breastfeeding vs. partial breastfeeding or not breastfeeding at all, hereafter referred as “not exclusively breastfeeding”); partially breastfeeding vs. not breastfeeding) in 2 crude and 2 adjusted models for each dietary exposure. Unadjusted and adjusted binomial logistic regression was also conducted to examine the association between each dietary factor and any breastfeeding at 6 months. Both BMI and postpartum depressive symptoms were tested for moderation of the association between each dietary factor and outcomes. Moderation was not found for either variable, so both were included as covariates in adjusted models.

Aim 2: To examine the association between dietary factors and reasons for weaning

Chi-square and ANOVA were conducted to examine bivariate associations between exposure, covariate, and outcome variables. Binomial logistic regression was conducted to examine associations between each dietary factor and each weaning reason cluster, in 56 crude models and 56 models adjusted for covariates. Both BMI and postpartum depressive symptoms (EPDS score) were tested for moderation of the association between each dietary factor and our outcomes. Moderation was not found for either variable, so both were included as covariates in adjusted models.

Aim 3: To examine the associations between dietary factors and infant weight at 6 months

Bivariate analyses (chi-square and ANOVA) were conducted to examine associations between maternal dietary intakes and infant weight and weight-for-age z-score, as well as for any relationships between our covariates and outcome variables. Unadjusted and adjusted linear regression analyses were conducted to examine the associations between each dietary exposure and weight at 6 months and weight-for-age z-score at 6 months, in separate models for girl and boy infants. BMI or postpartum depressive symptoms (EPDS score) were both tested for moderation of the association between each dietary factor and outcomes, but no moderation was found. Therefore, BMI and postpartum depressive symptoms were entered as covariates.

Chapter 4: Results

Aim 1: Maternal postpartum dietary intakes and breastfeeding metrics at 3 and 6 months

The sample for Aim 1 ($n = 1099$) was predominantly married, of white race/ethnicity, not enrolled in WIC at 3 months, non-smoking, and fewer than 10% reported having gestational diabetes, type 2 diabetes, depression, or food allergy. Only 30 respondents consumed a low-protein diet. Approximately 2/3 (65%) of the sample consumed a diet that was low to moderate in fat and 80.7% consumed diets that were high in carbohydrate. The full sample's average daily intakes of magnesium, dairy, and energy (calories) were lower than recommended, and the sample's average intake of added sugar was higher than recommended (17.4 teaspoons vs. the recommended 14 – 15 teaspoons or less per day). At 3 months, 25.5% ($n = 280$) were exclusively breastfeeding according to recommendations; 40% ($n = 440$) were feeding other foods or liquids alongside breastmilk, and 34.5% (379) were not feeding any breastmilk to their infants. At 6 months, 52% ($n = 571$) of the sample was still feeding some breastmilk to their infants. Given an alpha level of .05, adjusted odds ratios of 0.40, 0.97, and 1.74, and the sample size of 1099, the statistical power for this study was limited for the smaller effect size with an OR of 0.97 (power = .07), but power = 1 for the larger effect sizes with ORs of 0.40 and 1.74.

In bivariate analyses, intakes of magnesium ($p < .0001$), dairy products ($p = .0004$), and energy ($p = .044$) were higher among mothers who were both exclusively and partially breastfeeding at 3 months. Added sugar intake was higher ($p < .0001$)

among those who were not breastfeeding at all at 3 months. For all nutritional exposures, intakes were similar between those exclusively and partially breastfeeding at 3 months. At 6 months, intakes of magnesium ($p < .0001$) and dairy ($p = .0008$) were higher among those still breastfeeding. Intake of added sugar ($p < .0001$) was higher among those not breastfeeding at 6 months.

Regarding covariates, in bivariate analyses, intention to breastfeed for at least 6 months ($p < .0001$), lower EPDS score ($p = .006$), lower maternal BMI ($p < .0001$), not being enrolled in WIC ($p < .0001$), older age ($p = .003$), not smoking ($p < .0001$), being married ($p < .0001$), and not having gestational diabetes ($p = .033$) were associated with both exclusively or partially breastfeeding at 3 months. At 6 months, intention to breastfeed for at least 6 months ($p < .0001$), lower EPDS score ($p = .002$), lower maternal BMI ($p < .0001$), not being enrolled in WIC ($p < .0001$), higher age ($p = .007$), not smoking ($p < .0001$), and being married ($p < .0001$) were associated with continued breastfeeding at 6 months.

Breastfeeding exclusively and partially at 3 months

In unadjusted models, associations were found between magnesium, dairy, and energy intakes and exclusive breastfeeding vs. not at 3 months and between magnesium, added sugar, and dairy intakes and partial breastfeeding vs. none at 3 months. Specifically, those with higher intakes of magnesium had higher odds of exclusively breastfeeding vs. not at 3 months than those consuming the lowest amounts (Quartile 4: OR: 1.82, 95% CI: 1.27 – 2.61, $p < .01$; Quartile 3: OR: 1.74, 95% CI: 1.20 – 2.51, $p < .01$; Quartile 2: OR: 1.59, 95% CI: 1.10 – 2.31, $p < .05$), and higher odds of partially breastfeeding vs. none at 3 months (Quartile 4: OR: 1.82,

95% CI: 1.23 – 2.69, $p < .0001$). Those with lower intakes of dairy had 45% lower odds of exclusively breastfeeding vs. not at 3 months than those consuming the most (Quartile 1: OR: 0.55, 95% CI: 0.36 – 0.82, $p < .01$), and 51% lower odds of partially vs. not breastfeeding vs. not at 3 months (Quartile 1: OR: 0.49, 95% CI: 0.33 – 0.73 $p < .01$; Quartile 2: OR: 0.62, 95% CI 0.41 – 0.92, $p < .05$). Those consuming just below the recommended daily intake for total energy had higher odds (Quartile 3: OR: 1.52, 95% CI: 1.05 – 2.20, $p < .01$) and those consuming the least energy had lower odds (Quartile 1: OR: 0.50, 95% CI: 0.33 – 0.77, $p < .05$) of exclusively breastfeeding vs. not at 3 months than those consuming the most energy. Those consuming the lowest average daily glycemic load had 40% lower odds of exclusively breastfeeding at 3 months than those consuming the highest (Quartile 1: OR: 0.60, 95% CI: 0.40 – 0.90, $p < .05$). Those consuming moderate protein diets had higher odds of partially breastfeeding vs. none at 3 months than those with the lowest protein intake (OR: 2.38, 95% CI 1.01 – 5.63, $p < .05$).

Models which adjusted for covariates showed that higher intakes of magnesium were associated with exclusively breastfeeding vs. not (Quartile 4: aOR: 2.20, 95% CI 1.42 – 3.40, $p < .01$; Quartile 3: aOR: 1.67, 95% CI 1.08 – 2.59, $p < .05$), and consuming in the second versus first quartile of magnesium was associated with higher odds of partial breastfeeding vs. none at 3 months (Quartile 2: aOR: 1.83, 95% CI 1.14 – 2.96, $p < .05$). The lowest intake of dairy was associated with lower odds of exclusively breastfeeding vs. not at 3 months than the highest intake (Quartile 1: aOR: 0.52, 95% CI 0.33 – 0.80, $p < .01$), and all quartiles consuming less than the 4th had lower odds of breastfeeding partially vs. none at 3 months (Quartile 3: aOR:

0.53, 95% CI 0.32 – 0.87, $p < .01$; Quartile 2: aOR: 0.38, 95% CI 0.23 – 0.62, $p < .01$; Quartile 1: aOR: 0.38, 95% CI 0.23 – 0.62, $p < .0001$). The lowest consumption of energy was also associated with lower odds of exclusively breastfeeding vs. not at 3 months (Quartile 1: aOR: 0.50, 95% CI 0.33 – 0.77, $p < .05$), partial vs. no breastfeeding at 3 months (Quartile 2: aOR: 0.52, 95% CI 0.32 – 0.84, $p < .01$; Quartile 1: aOR: 0.54, 0.34 – 0.87, $p < .05$). The lowest average daily glycemic loads were associated with lower odds of both exclusively breastfeeding vs. not at 3 months (Quartile 1: aOR: 0.49, 95% CI 0.31 – 0.76, $p < .01$) and partial breastfeeding vs. none at 3 months (Quartile 1: aOR: 0.59, 95% CI 0.37 – 0.95, $p < .01$).

Any breastfeeding at 6 months

Unadjusted models showed that at 6 months, those consuming more magnesium had higher odds of still breastfeeding at 6 months than those consuming the least (Quartile 4: OR: 1.76, 95% CI: 1.26 – 2.47, $p < .01$; Quartile 3: OR: 1.63, 95% CI: 1.17 – 2.29, $p < .01$) and those consuming less added sugar had higher odds than those consuming the most (Quartile 3: OR: 1.63, 95% CI: 1.17 – 2.29, $p < .01$; Quartile 2: OR: 1.52, 95% CI: 1.08 – 2.12, $p < .05$) of still breastfeeding at 6 months. Those consuming less dairy had lower odds of still breastfeeding at 6 months than those consuming the most (Quartile 2: OR: 0.71, 95% CI: 0.51 – 0.99, $p < .05$; Quartile 1: OR: 0.54, 95% CI: 0.39 – 0.76, $p < .01$). Those consuming just under the recommended daily intake of energy had higher odds (Quartile 3: OR: 1.43, 95% CI: 1.03 – 2.00, $p < .05$) and those consuming the least amount of energy had lower odds (Quartile 1: OR: 0.66, 95% CI: 0.47 – 0.92, $p < .05$) of still breastfeeding at 6 months than those in the highest intake group. Those consuming the lowest percentage of

calories from carbohydrate had the lowest odds (OR: 0.66, 95% CI: 0.47 – 0.92, $p < .05$) and those in quartile 3 had the highest odds (OR: 1.43, 95% CI 1.03 – 2.00, $p < .05$) of still be breastfeeding at 6 months, compared with those consuming the most energy. Those consuming moderate protein diets had higher odds of still breastfeeding at 6 months than those consuming low protein diets (OR: 2.20, 95% CI: 1.02 – 4.75, $p < .05$).

Models which adjusted for covariates showed that those still breastfeeding at 6 months had higher odds of consuming the most magnesium vs. the least (aOR: 1.74, 95% CI: 1.26 – 2.47, $p < .01$), and those with the lowest intakes of dairy had 54% lower odds of still breastfeeding at 6 months than those consuming the most (Quartile 1: aOR: 0.46, 95% CI: 0.31 – 0.70, $p < .01$; Quartile 2: aOR: 0.53, 95% CI: 0.35 – 0.79, $p < .01$). Similarly, those consuming the lowest amount of total energy had 49% lower odds of still breastfeeding at 6 months than those consuming the most (aOR: 0.51, 95% CI: 0.34 – 0.77, $p < .01$), as those with the lowest average daily glycemic load (aOR: 0.53, 95% CI: 0.35 – 0.80, $p < .01$).

Aim 2: Maternal postpartum dietary intakes and reasons for early weaning

The sample for Aim 2 ($n = 587$) was predominantly married, of white race/ethnicity, not enrolled in WIC at 3 months, non-smoking, and fewer than 10% reported having gestational diabetes, type 2 diabetes, or food allergy. Only 15 respondents consumed a low-protein diet. Approximately 2/3 (65.4%) of the sample consumed a diet that was low to moderate in fat and 81.3% consumed diets that were

high in carbohydrate. The full sample's average daily intakes of magnesium, dairy, and energy (calories) were lower than recommended, and the sample's average intake of added sugar was higher than recommended (16.7 teaspoons vs. the recommended 14 – 15 teaspoons or less per day). The most common reason for weaning was insufficient milk (68.1%). Social ecological reasons were also very popular, with more than half of respondents citing at least one (individual, family, or community/institutional/policy). Just over 1/3 cited pain as an important reason for weaning. Too much milk (7.0%) and concerns about diet (10.7%) were not popular reasons for weaning. Given an alpha level of .05, adjusted odds ratios of 0.40, 0.97, and 1.74, and the sample size of 587, the statistical power for this study was limited for the smaller effect size with an OR of 0.97 (power = .06), but power = 1 for the larger effect sizes with ORs of 0.40 and 1.74.

Bivariate analyses showed that some dietary factors were associated with some reasons for weaning (see Tables 2-1a to 2-1d). For instance, those who reported consuming more added sugar ($p = .041$), more energy ($p = .022$), and a higher glycemic load ($p = .022$) were more likely to report too much milk; those consuming more added sugar ($p = .018$), a higher percentage of calories from carbohydrates ($p = .035$), and a higher percentage of calories from protein ($p = .037$) were more likely to report a social-ecological: individual reason; and those consuming more energy ($p = .029$) and a higher average daily glycemic load ($p = .041$) were more likely to report a reason of social-ecological: interpersonal/family.

Logistic regression models

Below we present unadjusted and adjusted logistic regression models for each reason for weaning. Recall, to be coded as having reported a reason, respondents had to indicate that at least one item coded under that reason for weaning was somewhat important or very important to their decision to stop breastfeeding.

Insufficient milk

In unadjusted models, those in Quartile 2 vs. 1 for magnesium (OR: 0.54, 95% CI 0.33 – 0.89, $p < .05$) had 46% lower odds of reporting insufficient milk as a reason for weaning. This association held in the adjusted model, as well (aOR: 0.54, 95% CI: 0.32 – 0.90, $p < .05$).

Too much milk

In unadjusted models, those in Quartile 3 vs. 4 of added sugar, those in Quartile 2 vs. 4 for energy and those in Quartiles 1, 2 and 3, vs. 4 for average daily glycemic load had lower odds of reporting too much milk as their weaning reason (added sugar: OR: 0.23, 95% CI: 0.08 – 0.70, $p < .01$; energy: OR: 0.25, 95% CI: 0.09 – 0.70, $p < .01$; glycemic load, Quartile 3: OR: 0.42, 95% CI: 0.18 – 0.95, $p < .05$; Quartile 2: OR: 0.27, 95% CI: 0.11 – 0.69, $p < .01$; Quartile 1: OR: 0.27, 95% CI: 0.11 – 0.69, $p < .01$). Each of these associations were also detected in adjusted models (added sugar: aOR: 0.25, 95% CI: 0.08 – 0.81, $p < .05$; energy: aOR: .024, 95% CI: 0.08 – 0.69, $p < .01$; glycemic load Quartile 3: aOR: 0.29, 95% CI: 0.11 – 0.78, $p < .05$; Quartile 2: aOR: 0.29, 95% CI: 0.11 – 0.77, $p < .05$; Quartile 1: aOR: 0.39, 95% CI: 0.16 – 0.95, $p < .05$).

Pain

No dietary intakes were associated with reporting pain as the reason for weaning.

Diet concern

In the unadjusted model, those in Quartile 3 vs. 4 for energy had 70% lower odds (energy: OR: 0.30, 95% CI: 0.13 – 0.68, $p < .01$) of reporting a concern about their diet as an important reason for weaning. This association remained after adjusting for covariates (aOR: 0.31, 95% CI: 0.13 – 0.74 $p < .01$).

Social-ecological

Those in Quartile 2 for added sugar and those in Quartile 3 for dairy had higher odds (added sugar: aOR: 1.70, 95% CI: 1.04 – 2.80, $p < .05$; dairy: aOR: 1.69, 95% CI: 1.04 – 2.74, $p < .05$) than those consuming the most of these of reporting a social-ecological: institutional, community, policy reason for weaning. Neither of these associations were detected in unadjusted models.

Because so many tests were conducted for the associations between dietary factors and reasons for weaning, an examination of whether associations were significant after correcting for these multiple tests in the adjusted models was warranted. The Bonferroni correction, a conservative method to correct for multiple tests, requires dividing the alpha level (.05) by the number of tests conducted (56 adjusted models). Doing this resulted in an alpha value of .0009. When this alpha value was used to determine statistical significance, no dietary factors were significantly associated with any reasons for weaning.

Covariates

Maternal BMI was consistently a risk factor for citing insufficient milk as a reason for weaning (aOR from magnesium model: 1.05, 95% CI: 1.01 – 1.08, $p < .01$). Intending to breastfeed for 6 months appeared to be a protective factor against citing too much milk (aOR from magnesium model: 0.28, 95% CI: 0.14 – 0.56, $p < .01$), pain (aOR from magnesium model: 0.52, 95% CI: 0.34 – 0.79, $p < .01$), or social ecological: community, institutional or policy (aOR from magnesium model: 0.54, 95% CI: 0.36 – 0.83, $p < .01$). Hispanic ethnicity was a strong risk factor (aOR from magnesium model: 2.87, 95% CI: 1.43 – 5.80, $p < .01$) for citing a social-ecological: community, institutional, policy reason for weaning. As mothers got older, their odds of citing pain as a reason for weaning decreased (aOR: 0.93, 95% CI: 0.90 – 0.97, $p < .01$). Enrollment in WIC appeared to be a risk factor (aOR 1.81, 95% CI: 1.16 – 2.84, $p < .01$) for citing a social-ecological: individual reason for weaning.

Aim 3: Maternal postpartum dietary intakes and weight at 6 months among predominantly breastfed infants

The sample used in Aim 3 ($n = 186$) was predominantly married, of white race/ethnicity, not enrolled in WIC at 3 months, and fewer than 10% reported smoking, having gestational diabetes, type 2 diabetes, or depression. 77.4% consumed a diet high in carbohydrates; only one respondent consumed a low-protein diet; and 60.2% consumed a low-fat diet. The full sample's average daily intakes of magnesium, dairy, and energy (calories) were lower than recommended, and the sample's average intake of added sugar was higher than recommended. Given an alpha level of .05, f -squared values of .003 (very small effect size), .02 (small effect

size), and .15 (moderate effect size), and the sample size of 96, the statistical power for this study was limited at .06, .10, and .60, respectively.

In bivariate analyses, no associations were detected between maternal dietary intakes and infant weight at birth or at 6 months for girls or boys. Only gestational diabetes was associated with weight at birth ($p = .036$) and weight at 6 months ($p = .040$) for boys. There were no associations between maternal dietary intakes and weight-for-age z-scores at birth or at 6 months for girls or boys. Marital status was associated ($p = .016$) with weight-for-age z-score at 6 months for boys. Gestational diabetes was associated with weight-for-age z-score at birth ($p = .036$) and at 6 months ($p = .034$) for boys. As expected, infant weight at birth and weight-for-age z-score at birth were strongly associated with infant weight at 6 months and weight-for-age z-score at 6 months, respectively.

In unadjusted models, there were no significant associations found between any maternal dietary exposure and either outcome. In adjusted models, a few small differences in outcomes for boys based on certain maternal dietary intakes were found. Specifically, there were small differences in weight at 6 months between Quartile 1 ($M = 8.20$ kg) and Quartile 2 ($M = 7.60$ kg), $p < .05$, between Quartile 1 ($M = 8.34$) and Quartile 2 ($M = 7.87$), $p < .05$ and Quartile 4 ($M = 7.80$), $p < .05$ for added sugar, and between Quartiles 1 ($M = 8.35$ kg) and 3 ($M = 7.80$ kg) for average daily glycemic load. Similarly, there were few differences in weight-for-age z scores based on maternal intakes for boys. Specifically, there were differences in weight-for-age z-score at 6 months for boys between magnesium intakes in Quartile 1 ($M = 0.22$) and Quartile 2 ($M = -0.43$), $p < .05$ and Quartiles 2 and 3 ($M = 0.12$), $p < .05$;

between added sugar intakes in Quartiles 1 ($M = 0.38$) and 4 ($M = -0.20$), $p < .05$); and between Quartiles 1 ($M = 0.38$) and 3 ($M = -0.20$) for glycemic load $p < .05$).

Among the covariates included in statistical models, only weight at birth and weight-for-age z-score at birth were significant predictors of weight at 6 months and weight-for-age z-score at 6 months, respectively, for girls and boys.

Chapter 5: Discussion and implications

Increasing the proportion of families that adhere to national and international recommendations to breastfeed their infants for the first 6 months of life remains a public health priority. More than 8 in 10 mothers in the United States demonstrate a willingness to breastfeed by initiating the behavior after their babies are born, but fewer than 1 in 4 are still feeding only breastmilk at 6 months. Multiple factors influence mothers' infant feeding experiences.

This dissertation sought to investigate whether commonly held clinical practices, observations, and opinions—that what a mother eats during the postpartum period might influence her breastfeeding experience—could be supported by data. Discussions among lactation care providers and between families with breastfeeding infants often turn to maternal elimination or supplementation of certain foods or nutrients as possible solutions for breastfeeding problems. The discussion becomes contentious when one camp believes that every clinical breastfeeding barrier, from breast pain or low milk supply, can be attributable to the mother's postpartum diet, and another contends that telling mothers to change their diets throws up one more barrier against practicing breastfeeding as a health behavior. In the absence of evidence-based guidance, anecdotal recommendations to adjust the maternal diet may cause more problems than they solve.

Systemic inflammation and insulin resistance, two physiologic circumstances that can be influenced by maternal diet and complicate the breastfeeding experience, were considered in the selection of our independent variables, as was the potential for these to influence milk composition in a way that affects the capacity of breastmilk to support healthy infant weight: average daily intakes of magnesium, added sugar,

dairy, energy (calories), glycemic load, and the caloric distribution of the three macronutrients (carbohydrate, protein, and fat).

Using data collected in 2005 – 2007 by the Centers for Disease Control and Prevention's second Infant Feeding Practices Study (IFPS II), this dissertation delved into whether these 8 postpartum nutritional exposures were associated with breastfeeding metrics including mothers' likelihood of exclusively breastfeeding at 3 months, partially breastfeeding at 3 months, and any breastfeeding at 6 months. It also examined whether the same 8 nutritional exposures were associated with reasons (insufficient milk; too much milk; pain; dietary concern; and social-ecological explanations) mothers who completely stopped breastfeeding before their infants were 6 months old indicated. Finally, in consideration of the important fact that breastmilk is, first and foremost, the infant's source of nutrition to support optimal growth and development, a study of whether our 8 nutritional exposures were associated with differences in infant weight at 6 months was also conducted. It would not have been prudent to observe that certain dietary exposures seem protective of *breastfeeding behavior* without also ensuring that those exposures did not affect breastmilk's capacity to *nourish the infant*. Therefore, Aim 3 focused on participants who were predominantly breastfeeding—providing at least 80% (approximately one bottle or less of breastmilk substitute each day) of their infants' milk feeds as breastmilk, and examined their infants' weight at 6 months, controlling for their weight at birth.

Summary of major findings

The findings of this dissertation revealed important implications concerning certain maternal dietary exposures and whether and why mothers continue breastfeeding as recommended or wean before their infants are 6 months old, but no remarkable differences were detected in infant weight or weight-for-age z-score at 6 months, even where maternal intakes far exceeded or fell short of recommended daily intakes. Therefore, any considerations of increasing maternal intakes in the interest of protecting breastfeeding can be discussed with assurance that the primary function of breastmilk, to nourish the infant toward optimal growth, should not be compromised.

Magnesium

Magnesium is a strong anti-inflammatory micronutrient found in whole grains, leafy green vegetables, nuts, and legumes, and in abundance in the highly-touted Mediterranean Diet. Those with intakes above (for some, substantially above by a factor of 3 times) the recommended daily intake (RDI) had higher odds of exclusively breastfeeding at 3 months, providing some breastmilk at 3 months, and continuing to breastfeed at 6 months compared with those consuming less than—even slightly less than—the RDI, and may be less likely to cite “insufficient milk” as a reason for weaning. It may be argued, since magnesium is abundant in an otherwise “healthy” diet that adheres to general dietary guidance, that those who are including more magnesium in their diets will also tend to follow public health guidance to breastfeed. Indeed, in this study, mothers with a stated intention to breastfeed for at least 6 months had the highest odds of achieving outcomes of breastfeeding intensity and duration. However, controlling for this variable actually increased magnesium’s

association with exclusive breastfeeding at 3 months, and magnesium's association with the 6-month duration outcome stayed nearly the same in the adjusted model. It is notable that the 2015 – 2020 *Dietary Guidelines for Americans* offers a separate recommendation for magnesium intake during pregnancy, which adds 40 mg to the 310 – 320 mg that are recommended for healthy women between the ages of 19 and 50. These findings, which show the best outcomes at levels of intake that meet or exceed this higher daily target, suggest that further investigation of the potential role of magnesium in successful lactation, to drive recommendations for increased intakes during lactation, may be warranted.

Dairy

Dairy products are also widely accepted as constituents of a generally healthy diet, and, similar to the models that tested magnesium's associations with breastfeeding outcomes, breastfeeding intention was by far the strongest predictor of breastfeeding intensity and duration when we tested dairy. Still, consumption of approximately half or fewer of the recommended 3 daily servings was significantly associated with substantially lower odds of achieving the breastfeeding metrics of interest. For exclusive breastfeeding at 3 months, the effect of dairy intensified as consumption declined, with those consuming 1 or fewer servings per day having half the odds of breastfeeding exclusively at 3 months than those consuming just a half serving more each day. Consumption of dairy products was not predictive of early weaning for any reason. There are no differences in recommended daily intakes of dairy for women who are pregnant or lactating, and these findings support the current recommendation to consume 3 one-cup servings daily. Only the highest intake

quartile approximated or exceeded this recommended average daily intake, and was the only quartile with consistent statistical odds of achieving each breastfeeding outcome.

These findings do raise the question of whether there is something inherent to the nutritional make-up of dairy products that is supportive of lactation. It is notable that dairy products are a good source of magnesium, with a one-cup serving of yogurt providing the 40 mg that distinguishes the RDI for pregnancy from that for healthy, non-pregnant women. Future studies might consider whether calcium, also found in abundance in dairy products, plays a role in healthy, robust lactation, and whether any nutrients of interest must be consumed specifically within dairy products, or if other dietary sources, such as supplements, might provide similar support. Further investigation into whether specific breastfeeding problems were *experienced* relative to dairy intakes, even if the mothers who reported those problems didn't wean because of them.

Energy

The recommendation to consume additional energy (calories) during lactation may be breastfeeding mothers' favorite dietary guidance. While some may opt to return to pre-pregnancy energy intakes in order to accelerate postpartum weight loss, the findings of this dissertation suggest that a daily 1000-calorie deficit leads to substantially lower odds of breastfeeding exclusively. The analytic sample includes energy intakes that are up to twice the daily recommendations, without apparent detriment to breastfeeding success. As caloric intake decreased, so did the likelihood of weaning due to too much milk—suggesting that sufficient intake of energy may be

supportive of a robust milk supply. These findings support the current dietary guidelines which recommend increased energy intake during lactation.

Glycemic load

The interest in average daily glycemic load and whether it might influence breastfeeding stems largely from the controversies around whether it may be a guiding measure toward normalizing glucose metabolism in the prevention or management of diabetes. With the understanding that as maternal BMI increases, the odds of successfully breastfeeding decrease, a hypothesis that a lower daily glycemic load, representative of intakes of higher quality carbohydrate foods, seemed reasonable. Working with only a speculative recommendation of what an “optimal” daily glycemic load might be for prevention and management of diabetes, and no recommendation at all for how glycemic load might be considered during lactation, finding that those with the lowest glycemic loads had the *lowest* odds of successful breastfeeding was unexpected, as was the apparent trend that desired breastfeeding outcomes seemed *more* likely as glycemic load increased to up to 4 times the suggested value. In addition, as average daily glycemic load decreased, so did the odds of weaning due to too much milk, suggesting that there may be, among metabolically healthy mothers, a link between glycemic load and milk supply. The IFPS II largely comprised metabolically healthy mothers without diagnoses of gestational or type 2 diabetes, so perhaps these findings imply that limiting, or striving for a low average daily glycemic load has no utility in developing guidance for healthy eating—whether during lactation or not—among the metabolically healthy.

When the analyses of all 8 dietary exposures were taken together, no clear or consistent pattern emerged to support (or refute) that diet-induced inflammation may play a role in mothers' infant feeding behaviors or reasons for early weaning.

Contributions to the literature

This dissertation offers a novel contribution to the literature as the first known investigation of the association between specific maternal postpartum dietary exposures and the achievement of nationally-prioritized breastfeeding metrics, reasons for weaning, and infant weight at 6 months, and may offer direction for future investigations of optimal maternal intakes to support lactation. In Aim 3, the operationalization of “predominantly breastfed” at 80% of the infant’s milk feeds from breastmilk enabled assessment of whether implications of the maternal diet might be communicated to the infant’s weight at 6 months via the breastmilk, and permitted consideration of non-exclusive breastfeeding as it is often practiced in the United States, with one bottle of formula or less per day being offered (Grummer-Strawn et al., 2008). Additionally, this operationalization permitted separate control for the use of infant formula and the introduction of complementary foods. Notably, in this predominantly breastfeeding sample, neither the introduction of this small amount of formula nor the introduction of any complementary foods influenced weight or weight-for-age z-scores at 6 months, providing further support for the protective effect of a predominantly breastmilk diet against both inadequate and excessive growth even when additional sources of nutrition are introduced (Klag et al., 2015).

The covariates that were associated with breastfeeding at 3 and 6 months, and with reasons women gave for weaning are consistent with those in existing literature. That is, those with lower BMI were more likely to continue breastfeeding, and higher BMI was associated with higher odds of citing insufficient milk as a reason to wean. Intention to breastfeed was associated with a higher likelihood of exclusive, partial, or any breastfeeding and a lower likelihood of citing too much milk, pain, or a social-ecological reason in the institutional, community, or policy domains as reasons for weaning. Notably, Hispanic ethnicity was very strongly associated with reporting a social-ecological reason for weaning at the institutional, community, and policy level. This may reflect a disparity in workplace protections for breastfeeding among Hispanic mothers ([Besore, 2014](#)).

Implications for public health and practice

Until recently, little attention has been paid in the United States to specific dietary guidelines for infants; the universal recommendation to breastfeed exclusively for 6 months was accepted and efforts were focused solely on encouraging families to adopt the behavior. In the last decade, the organization 1000 Days “began its work as a partnership to drive greater action and investment to improve nutrition for women and young children throughout the world” ([1000 Days, 2020](#)), focusing on the 1000 days that cover a mother’s pregnancy and the first 2 years after birth. The U. S. government partners with 1000 Days, and has also initiated the Pregnancy and Birth to 24 Months Project ([United States Department of Agriculture, Center for Nutrition Policy and Promotion, 2019](#)). The recognition that this window of development is a critical one, and that the health and nutrition of the mother is as important as the

health and nutrition of the infant has paved the way for scientific inquiry into whether and how maternal nutrition during breastfeeding matters. Further underscoring the timeliness and relevance of this dissertation research was the National Academies of Sciences, Engineering, and Medicine's January 2020 workshop *Nutrition during pregnancy and lactation: Exploring new evidence*, which presented the first such convening of ideas and discussion among scholars in the maternal and infant nutrition field in 30 years.

The findings of this dissertation were largely supportive of existing nutrition guidelines for women of childbearing age, with one exception: intakes of magnesium that were protective of breastfeeding were higher than recommended, and more closely approximated the intake that is recommended for pregnant mothers. While this analysis does not provide sufficient evidence for introducing a higher recommended daily intake of magnesium during lactation, it can be foundational to further explorations into how magnesium supports maternal health and the ability to breastfeed, particularly in communities where social-ecological supports for breastfeeding are strong and infant feeding choices are consequent to maternal physiological factors rather than eco-social ones. The finding that glycemic load may play a role in milk supply prompts interest as well.

Additionally, breastmilk, itself, seems to be remarkably stable, providing for optimal weight among healthy infants whether maternal intakes are in excess of, less than, or within dietary intake guidelines. This may be especially important knowledge in settings where mothers are at nutritional risk, perhaps due to low income or other circumstances that precede enrollment in supplemental nutrition programs such as

WIC for women, infants, and children. A mother can be assured that her milk is nutritionally replete and adequate for her infant and requires no supplementation, even if her own diet is less than ideal. It is prudent, however, to qualify this perspective. The analytic sample of predominantly breastfed infants included only healthy women and infants, and while no differences in infant weight at 6 months were detected, this does not conclusively verify that no associations exist. Future research should include a maternal population that is more diverse than the present study with regard to metabolic health, dietary intakes, and socio-demographic variables.

Because no remarkable effects detrimental to or supportive of breastfeeding were found, this dissertation could neither support nor recommend the elimination of added sugar or dairy, the limitation of energy or glycemic load, or particular distributions of macronutrients in the postpartum maternal diet to improve the likelihood of breastfeeding successfully. In addition, it did not provide evidence that excesses or low intakes of the nutritional components studied could lead to particular reasons for weaning or weight status in early infancy. When taken together, these findings overwhelmingly support the thinking that a mother can breastfeed well and provide the optimal food for her infant regardless of whether her diet is “healthy” or contains sweets, excess fat, too many calories, dairy products, or low-quality carbohydrate sources. Providers of breastfeeding support and lactation care should not need to burden mothers with dietary restrictions or concerns in order to promote or preserve breastfeeding.

Limitations

This dissertation is not without limitations. First, for all 3 aims, many of the maternal dietary exposures had restricted ranges because the data reflect actual nutritional intakes by the study participants, not prospective groups that were prescribed and provided different diets for the purpose of being studied. For example, any effect of a low-protein diet on infant weight would have been impossible to assess because only one participant in that analytic sample (Aim 3) consumed a low-protein diet. Additionally, across the 5 exposures that were studied by quartile groups, there was little variability in quartiles 1, 2, and 3, but a much wider range of intakes in the 4th quartile. This was especially true of dairy intakes. By and large, quartiles 1, 2, and 3, consumed less than the government-recommended 3 daily servings of dairy products, and most of the variability of dairy intake was located in the highest quartile. This may have restricted the ability to detect effects of excess intake, since optimal/recommended intakes comprised the same group as excessive (in some cases more than 4 times the recommended daily) intakes. Future research into maternal diet and breastfeeding should aim to capture a wider variation in eating patterns, or prospectively assign mothers to intake groups to ensure there are adequate comparison groups in the sample.

Second, there were limitations of the measures in the IFPS II survey. The nutrition data were collected before certain dietary constituents were recognized for their potential to cause or prevent disease. A single exposure variable, such as the Dietary Inflammatory Index (DII) (Shapiro et al., 2014), rather than 8 separate exposures, would have been preferable for examining effects of diet-induced

inflammation on breastfeeding; however, the data derived from the IFPS II Dietary History Questionnaire (DHQ) did not include all of the necessary dietary components to construct the DII. A particularly problematic absence was of the four of the five nutritional components that supersede magnesium in their anti-inflammatory properties: turmeric, flavones, isoflavones, and beta-carotene. Fiber which is anti-inflammatory was included in the IFPS II data set, but while fiber is a widely recommended component of a healthy diet, it is not one that peer and clinical breastfeeding or lactation supporters recommend to mothers who seek help for breastfeeding difficulty. Magnesium supplements, however, are often suggested to breastfeeding mothers to relieve temporary low milk output associated with the return of the menstrual cycle ([Bonyata, 2011](#)), as well as to ease constipation and promote more restful sleep. Future research using the DII score as the independent variable can more precisely elucidate whether an inflammatory or anti-inflammatory diet are associated with breastfeeding outcomes, reasons for weaning, or infant weight gain. Similarly, gluten is a commonly suspected irritant and often recommended for mothers to eliminate when they experience certain breastfeeding issues. Gluten consumption would have been an interesting dietary exposure to study had it been available.

While the analyses in this dissertation did control for certain covariates that are suggestive of a mother's tendency toward a lifestyle that would be considered "healthy," such as breastfeeding intention and smoking status, and the IFPS II, itself, only retained mothers and infants without major health concerns and conditions ("healthy mothers and infants"), thereby offering some measure of surety over

maternal health, no objective measure of overall health or healthiness of the maternal diet was included or controlled for.

An additional limitation of the dietary data in the IFPS II is that, while there are sets of dietary intake data that represent non-pregnant, pregnant, and postpartum women, these comprise different respondents. Therefore, there is no opportunity to examine a mother's diet longitudinally—before pregnancy, during pregnancy, and postpartum, which limits the ability to discern whether the intakes a mother reported during the postpartum period are typical for her. This may have implications with regard to the findings about glycemic load and reasons for weaning.

Data were collected by self-report of the mothers surveyed. No clinical observations of maternal characteristics or behaviors such as a provider's observation that a mother is really experiencing insufficient milk output, or medical abstractions, such as documentations of nipple pain or injury, or an infant's weight, are included.

With regard to the reasons mothers cited for early weaning, there was too much missing data for those who partially weaned, and it was impossible to discern whether women who did not wean experienced the breastfeeding problems that prompted others to wean. Such women were not asked these items. With these data, I could have offered expanded insight into breastfeeding difficulties mothers experience and whether their dietary intakes are associated with them.

Furthermore, while the classification of reasons for weaning into clusters was based on extant literature and a survey of 62 practicing lactation consultants, there may be other, more appropriate, means of classification. Fewer reason clusters may have permitted me to find more consistent or strong effects than I was able to detect.

For example, in the analytic sample, all respondents with at least one reason in the “too much milk” cluster also had at least one reason in the “pain” cluster. Thus, these could be combined without compromising veracity of experience. Similarly, it could be argued that the “diet concern” cluster could be considered social-ecological. Collapsing outcome categories to include only “insufficient milk,” “pain,” and one large social-ecological cluster would reduce the number of models from 56 (adjusted) to 24. With these larger outcome clusters, trends worthy of discussion and future investigation may also be detected, even if they do not reach statistical significance.

Results may not generalize to all breastfeeding women in the United States. While the IFPS II sample was nationally distributed (drawn from all areas of the U.S.), it is not nationally representative and represents a convenience sample drawn from households that participated in a mail-based consumer opinion panel. Therefore, participants in IFPS II were more likely to be of white ethnicity, older, of higher educational attainment, non-smokers, and of a higher income level than adult mothers of singleton infants that participated in the National Survey of Family Growth (Fein et al., 2008).

Furthermore, the analytic sample used in Aim 3 was small. This was because I included only infants who were reportedly receiving at least 80% of milk feeds as breastmilk throughout early infancy, on each questionnaire between birth and 6 months. This led to insufficient statistical power to detect even moderate effect sizes.

Finally, the proposed physiological mechanisms by which such effects were expected—inflammation and insulin resistance for Aims 1 and 2, and breastmilk composition for Aim 3—by which such effects were expected, were not studied.

While these are, indeed, limitations of the research presented in this dissertation, they provide ample opportunity to guide and strengthen future attempts to measure associations between maternal diet, infant feeding practices, and maternal and infant health.

Conclusion

This dissertation provides an exploration into the associations between maternal intakes of magnesium, added sugar, dairy, energy, average daily glycemic load, and macronutrient distribution during the postpartum period and breastfeeding intensity and duration, reasons for weaning, and weight status in early infancy. The dissertation findings provide guidance for public health and nutrition policy, and for the practice of breastfeeding support and lactation care. Specifically, magnesium may be protective of breastfeeding, and average daily glycemic load may have some utility for milk supply among metabolically healthy mothers. The research undertaken illuminates strategies to strengthen data collection for future inquiries into maternal diet and infant feeding outcomes.

Tables

Tables: Results for Aim 1

Table 3a: Bivariate associations between dietary factors, covariates and breastfeeding intensity at 3 months (n = 1099)

Variable	Total sample (n = 1099)	Among those exclusively breastfeeding at 3m (n = 280)	Among those partially breastfeeding at 3m (n = 440)	Among those breastfeeding only formula at 3m (n = 379)	p-value
Dietary Factors					
Magnesium, mg, Continuous: Mean (SE)	303.6	323.8 (308.8 – 338.8)	311.9 (299.9 – 323.9)	279.0 (266.1 – 291.9)	< .0001
Magnesium quartiles, % (N)					
Q1 59.46 – 213.03 mg	24.9% (274)	17.5% (49)	23.4% (103)	32.2% (122)	< .001
Q2 213.04 – 279.84 mg	25.0% (275)	24.6% (69)	24.3% (107)	26.1% (99)	
Q3 279.85 – 371.19 mg	25.0% (275)	27.5% (77)	26.1% (115)	21.9% (83)	
Q4 371.20 – 1103.12 mg	25.0% (275)	30.4% (85)	26.1% (115)	19.8% (75)	
Added sugar, tsp Continuous: Mean (SE)	17.4	15.6 (13.9 – 17.2)	16.1 (14.8 – 17.4)	20.1 (18.7 – 21.6)	< .0001
Added sugar quartiles, % (N)					
Q1 1.67 – 8.68 tsp	25.0% (275)	22.5% (63)	26.4% (116)	25.3% (96)	.030
Q2 8.69 – 13.42 tsp	25.0% (275)	28.6% (80)	25.9% (114)	21.4% (81)	
Q3 13.43 – 20.43 tsp	25.0% (275)	27.9% (78)	25.2% (111)	22.7% (86)	
Q4 20.44 – 147.93 tsp	24.9% (274)	21.1% (59)	22.5% (99)	30.6% (116)	
Dairy, # of daily servings Continuous: Mean (SE)	2.1	2.3 (2.10 – 2.47)	2.2 (2.06 – 2.35)	1.9 (1.69 – 2.01)	< .001
Dairy quartiles, % (N)					
Q1 0.06 – 1.01 servings	24.8% (272)	17.5% (49)	23.3% (102)	31.9% (121)	< .001
Q2 1.02 – 1.69 servings	25.1% (276)	25.0% (70)	24.1% (106)	26.4% (100)	
Q3 1.70 – 2.83 servings	25.1% (276)	29.3% (82)	24.6% (108)	22.7% (86)	
Q4 2.84 – 12.91 servings	25.0% (275)	28.2% (79)	28.2% (124)	19.0% (72)	
Energy, # of kcal/day Continuous: Mean (SE) Energy quartiles, % (N)	1898.0	1965.6 (1895.0 – 2036.2)	1926.6 (1858.4 – 1994.8)	1874.9 (1741.5 – 1888.4)	.044
Q1 623.65 – 1373.40	24.9% (274)	14.3% (40)	25.9% (114)	31.7% (120)	< .0001
Q2 1373.41 – 1772.58	25.0% (275)	27.1% (76)	23.4% (103)	25.3% (96)	
Q3 1772.59 – 2270.74	25.0% (275)	33.6% (94)	24.1% (106)	19.8% (75)	
Q4 2270.75 – 4538.89	25.0% (275)	25.0% (70)	26.6% (117)	23.2% (88)	
Glycemic load, daily Continuous: Mean (SE)	122.7	124.8 (118.3 – 131.3)	122.6 (117.4 – 127.8)	121.1 (115.5 – 126.7)	.404
Glycemic load quartiles, % (N)					
Q1 21.56 – 85.36	25.0% (275)	17.1% (48)	25.0% (110)	30.9% (117)	.002
Q2 85.37 – 110.04	25.0% (275)	27.9% (78)	23.6% (104)	24.6% (93)	

Q3 110.05 – 146.68 Q4 146.69 – 412.21	25.0% (274) 25.1% (275)	29.3% (82) 25.7% (72)	27.1% (119) 24.3% (107)	19.3% (73) 25.3% (96)	
Percentage of calories from carbohydrate Continuous: Mean (SE)	51.4	51.5 (50.6 – 52.4)	51.3 (50.6 – 52.1)	51.5 (50.7 – 52.3)	.780
% kcal from carb % (N)					
Low/moderate (<45%) High (>= 45%)	19.3% (212) 80.7% (887)	20.3% (77) 79.7% (302)	18.6% (82) 81.4% (358)	18.9% (53) 81.1% (227)	.818
Percentage of calories from protein Continuous: Mean (SE)	16.1	16.3 (15.9 – 16.7)	16.2 (15.9 – 16.6)	15.9 (15.6 – 16.2)	.129
% kcal from prot % (N)					
Low (<10%) Moderate (10% - 35%)	2.8% (30) 97.3% (1069)	4.2% (16) 95.8% (363)	1.8% (8) 98.2% (432)	2.1% (6) 97.9% (274)	.086
Percentage of calories from fat Continuous: Mean (SE)	33.7	33.8 (33.1 – 34.6)	33.9 (33.4 – 34.5)	33.2 (32.6 – 33.8)	.201
% kcal from fat % (N)					
Low/moderate (<36%) High (>= 36%)	65.0% (714) 35.0% (385)	67.8% (257) 32.2% (122)	62.7% (276) 37.3% (164)	64.6% (181) 35.4% (99)	.312
Demographic variables					
Intention to breastfeed at least 6m					
Yes No/not marked	70.5% (775) 29.5% (324)	89.6% (251) 10.4% (29)	87.5% (385) 12.5% (55)	36.7% (139) 63.3% (240)	< .0001
Edinburgh Postnatal Depression Scale (EPDS) score	6.6	5.5 (5.0 – 6.1)	6.8 (6.4 – 7.2)	7.0 (6.6 – 7.5)	< .0001
>= 13 < 13	991 (90.2%) 108 (9.8%)	6.1% (17) 93.9% (263)	9.1% (40) 90.9% (400)	13.5% (51) 86.5% (328)	.006
Maternal BMI at 3 mos Continuous: Mean (SE)	27.6	25.8 (25.1 – 26.5)	27.7 (27.1 – 28.3)	28.8 (28.1 – 29.4)	< .0001
Race/Ethnicity					
White Black Hispanic Asian/Pacific Islander Other	85.9% (944) 3.7% (41) 5.6% (62) 3.2% (35) 1.4% (17)	89.6% (251) 1.8% (5) 3.2% (9) 3.2% (9) 2.1% (6)	83.4% (367) 4.1% (18) 6.8% (30) 4.6% (20) 1.1% (5)	86.0% (326) 4.8% (18) 6.1% (23) 1.6% (6) 1.6% (6)	.047
Enrolled in WIC at 3mos					
Yes No	26.0% (286) 74.0% (813)	18.2% (51) 81.8% (229)	23.0% (101) 77.0% (339)	35.4% (134) 64.6% (245)	< .0001
Age Continuous: Mean (SE)	29.7	29.9 (29.3 – 30.5)	30.1 (29.6 – 30.6)	29.0 (28.5 – 29.5)	.003
Smoking status					
Yes No	12.1% (133) 87.9% (966)	4.6% (13) 95.4% (267)	6.6% (29) 93.4% (411)	24.0% (91) 76.0% (288)	< .0001
Marital status					
Married Not married	83.5% (918) 16.5% (181)	92.5% (259) 7.5% (21)	86.4% (380) 13.6% (60)	73.6% (279) 26.4% (100)	< .0001

Gestational diabetes					
Yes	7.0% (77)	3.6% (10)	8.2% (36)	8.2% (31)	.033
No/Not sure	93.0% (1022)	96.4% (270)	91.8 (404)	91.8% (348)	
Type 2 diabetes					
Yes	1.0% (11)	1.1% (3)	1.6% (7)	0.3% (1)	.162
No	99.0% (1088)	98.9% (277)	98.4% (433)	99.7% (378)	
Food allergy					
Yes	9.0% (99)	8.9% (25)	9.3% (41)	8.7% (33)	.953
No/not marked	91.0% (1000)	91.1 (255)	90.7% (399)	91.3% (346)	

* Chi-squares were used for categorical variables, and ANOVA for continuous variables.

Table 3b: Bivariate associations between dietary factors, covariates and any breastfeeding at 6 months (n = 1099)

Variable	Total sample (n = 1099)	Among those breastfeeding at 6m (n = 571)	Among those not breastfeeding at 6m (n = 528)	p-value
Dietary Factors				
Magnesium, mg, Continuous: Mean (SE)	303.6	316.8 (306.1 – 327.4)	289.4 (278.5 – 300.3)	< .001
Magnesium quartiles, % (N)				
Q1 59.46 – 213.03 mg	24.9% (274)	20.8% (119)	29.4% (155)	.005
Q2 213.04 – 279.84 mg	25.0% (275)	24.7% (141)	25.4% (134)	
Q3 279.85 – 371.19 mg	25.0% (275)	26.8% (153)	23.1% (122)	
Q4 371.20 – 1103.12 mg	25.0% (275)	27.7% (158)	22.2% (117)	
Added sugar, tsp Continuous: Mean (SE)	17.4	15.7 (14.8 – 16.6)	19.1 (17.7 – 20.6)	< .0001
Added sugar quartiles, % (N)				
Q1 1.67 – 8.68 tsp	25.0% (275)	24.9% (142)	25.2% (133)	.023
Q2 8.69 – 13.42 tsp	25.0% (275)	26.4% (151)	23.5% (124)	
Q3 13.43 – 20.43 tsp	25.0% (275)	27.3% (156)	22.5% (119)	
Q4 20.44 – 147.93 tsp	24.9% (274)	21.4% (122)	28.8% (152)	
Dairy, # of daily servings Continuous: Mean (SE)	2.1	2.3 (2.1 – 2.4)	1.9 (1.8 – 2.1)	.001
Dairy quartiles, % (N)				
Q1 0.06 – 1.01 servings	24.8% (272)	20.5% (117)	29.4% (155)	.001
Q2 1.02 – 1.69 servings	25.1% (276)	24.0% (137)	26.3% (139)	
Q3 1.70 – 2.83 servings	25.1% (276)	27.5% (157)	22.5% (119)	
Q4 2.84 – 12.91 servings	25.0% (275)	28.0% (160)	21.8% (115)	
Energy, # of kcal/day Continuous: Mean (SE) Energy quartiles, % (N)	1898.0	1939.6 (1883.6 – 1995.6)	1853.1 (1786.5 – 1919.6)	.051
Q1 623.65 – 1373.40 kcal	24.9% (274)	20.1% (115)	30.1% (159)	< .001
Q2 1373.41 – 1772.58 kcal	25.0% (275)	25.2% (144)	24.8% (131)	
Q3 1772.59 – 2270.74 kcal	25.0% (275)	29.4% (168)	20.3% (107)	
Q4 2270.75 – 4538.89 kcal	25.0% (275)	25.2% (144)	24.8% (131)	
Glycemic load, daily Continuous: Mean (SE)	122.7	122.8 (118.9 – 126.7)	122.5 (117.1 – 127.9)	.914
Glycemic load quartiles, % (N)				
Q1 21.56 – 85.36	25.0% (275)	20.8% (119)	29.6% (156)	.002
Q2 85.37 – 110.04	25.0% (275)	26.1% (149)	23.9% (126)	
Q3 110.05 – 146.68	25.0% (274)	28.4% (162)	21.2% (112)	
Q4 146.69 – 412.21	25.0% (275)	24.7 % (141)	25.4% (134)	
Percentage of calories from carbohydrate Continuous: Mean (SE)	51.4	51.4 (50.8 – 52.0)	51.5 (50.8 – 52.2)	.845
% kcal from carb % (N)				
Low/moderate (<45%)	19.3% (212)	20.5% (108)	18.2% (104)	.347
High (>= 45%)	80.7% (887)	79.6% (420)	81.8% (467)	

Percentage of calories from protein Continuous: Mean (SE)	16.1	16.3 (16.0 – 16.5)	16.0 (15.7 – 16.3)	.082
% kcal from prot % (N)				
Low (<10%)	2.7% (30)	3.8% (20)	1.8% (10)	.038
Moderate (10% - 35%)	97.3% (1069)	96.2% (508)	98.2% (561)	
Percentage of calories from fat Continuous: Mean (SE)	33.7	33.9 (33.4 – 34.4)	33.4 (32.9 – 33.9)	.172
% kcal from fat % (N)				
Low/moderate (<36%)	65.9% (714)	66.1% (349)	63.9% (365)	.450
High (>= 36%)	35.0% (385)	33.9% (179)	36.1% (206)	
Demographic variables				
Intention to breastfeed at least 6m				
Yes	70.5% (775)	90.2% (515)	49.2% (260)	< .0001
No/not marked	29.5% (324)	9.8% (56)	50.8% (268)	
Edinburgh Postnatal Depression Scale (EPDS) score	6.6	6.1 (5.8 – 6.5)	7.0 (6.6 – 7.4)	.001
>= 13	90.2% (991)	92.8% (530)	87.3% (461)	.002
< 13	9.8% (108)	7.2% (41)	12.7% (67)	
Maternal BMI at 3 mos Continuous: Mean (SE)	27.6	26.6 (26.2 – 27.1)	28.6 (28.0 – 29.2)	< .0001
Race/Ethnicity				
White	85.9% (944)	87.4% (499)	84.3% (445)	.046
Black	3.7% (41)	3.2% (18)	4.4% (23)	
Hispanic	5.6% (62)	4.0% (23)	7.4% (39)	
Asian/Pacific Islander	3.2% (35)	4.0% (23)	2.3% (12)	
Other	1.4% (17)	1.4% (8)	1.7% (9)	
Enrolled in WIC, Month 3				
Yes	26.0% (286)	18.6% (106)	34.1% (180)	< .0001
No	74.0% (813)	81.4% (465)	65.9% (348)	
Age Continuous: Mean (SE)	29.7	30.1 (29.7 – 30.5)	29.2 (28.8 – 29.7)	.007
Smoking status				< .0001
Yes	12.1% (133)	4.6% (26)	20.3% (107)	< .0001
No	87.9% (966)	95.5% (545)	79.7% (421)	
Marital status				< .0001
Married	83.5% (918)	90.9% (519)	75.6% (399)	< .0001
Not married	16.5% (181)	9.1% (52)	24.4% (129)	
Gestational diabetes				
Yes	7.0% (77)	6.5% (37)	7.6% (40)	.477
No/Not sure	93.0% (1022)	93.5 (534)	92.4% (488)	
Type 2 diabetes				
Yes	1.0% (11)	1.2% (7)	0.8% (4)	.436
No	99.0% (1088)	98.8% (564)	99.2% (524)	
Food allergy				
Yes	9.0% (99)	9.6% (55)	8.3% (44)	.452
No/not marked	91.00% (1000)	90.4% (516)	91.7 (484)	

Table 4a: Binomial logistic regression results for magnesium intake (in milligrams) and breastfeeding outcomes at 3 months (n = 1099)

Variable	Exclusive breastfeeding at 3m vs. partial or no breastfeeding (n = 1099)		Partial breastfeeding at 3m vs. no breastfeeding (n = 819)	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Magnesium, crude				
Intake quartile 1 (reference)	1.00		1.00	
Intake quartile 2	1.59 *	1.10 – 2.31	1.28	0.88 – 1.87
Intake quartile 3	1.74 **	1.20 – 2.51	1.64 *	1.12 – 2.41
Intake quartile 4	1.82 **	1.27 – 2.61	1.82 ***	1.23 – 2.69
Magnesium, adjusted				
Intake quartile 1 (reference)	1.00			
Intake quartile 2	1.37	0.88 – 2.14	1.834	1.14 – 2.96 *
Intake quartile 3	1.67 *	1.08 – 2.59	1.401	0.88 – 2.23
Intake quartile 4	2.20 **	1.42 – 3.40	1.041	0.66 – 1.64
Breastfeeding intention (yes vs. no)	4.09 ***	2.67 – 6.28	11.67 ***	8.06 – 16.90
EPDS score (continuous)	0.94 **	0.91 – 0.98	1.01	0.97 – 1.04
Maternal BMI at 3 months (continuous)	0.93 ***	0.90 – 0.96	0.97 **	0.94 – 0.99
WIC enrollment at 3 months (yes vs. no)	1.19	0.80 – 1.76	1.25	0.84 – 1.88
Maternal smoking status (yes vs. no)	2.14 *	1.13 – 4.07	2.82 **	1.66 – 4.80
Maternal age (continuous)	1.00	0.97 – 1.03	1.03	1.00 – 1.07
Maternal race: white (reference)	1.00		1.00	
Maternal race: Black	0.38	0.14 – 1.06	1.01	0.43 – 2.37
Maternal race: Hispanic	0.45 *	0.21 – 0.96	1.04	0.52 – 2.08
Maternal race: AAPI	0.55	0.24 – 1.25	1.80	0.62 – 5.24
Maternal race: other	1.70	0.56 – 5.14	0.69	0.17 – 2.74
Maternal marital status (yes vs. no)	2.03 **	1.19 – 3.46	1.39	0.87 – 2.23
Gestational diabetes (yes vs. no)	2.06	0.98 – 4.33	0.97	0.51 – 1.85
Type 2 diabetes (yes vs. no)	0.52	0.12 – 2.26	0.19	0.02 – 1.69
Maternal food allergy (yes vs. no)	0.91	0.54 – 1.54	0.93	0.52 – 1.67

* p < .05

** p < .01

*** p < .0001

Table 4b: Logistic regression results for magnesium intake (in milligrams) and any breastfeeding at 6 months (n = 1099)

	Any breastfeeding at 6 months vs. no breastfeeding (n = 1099)	
Variable	Odds Ratio	95% Wald Confidence Limits
Magnesium, crude		
Intake quartile 1 (reference)	1.00	
Intake quartile 2	1.37	0.98 – 1.92
Intake quartile 3	1.63 **	1.17 – 2.29
Intake quartile 4	1.76 **	1.26 – 2.47
Magnesium, adjusted		
Intake quartile 1 (reference)	1.00	
Intake quartile 2	1.11	0.95 – 2.10
Intake quartile 3	1.41	0.75 – 1.65
Intake quartile 4	1.74 **	1.16 – 2.62
Breastfeeding intention (yes vs. no)	8.70 ***	6.17 – 12.27
EPDS score (continuous)	0.98	0.94 – 1.01
Maternal BMI at 3 months (continuous)	0.94 ***	0.92 – 0.97
WIC enrollment at 3 months (yes vs. no)	1.46 *	1.03 – 2.08
Maternal smoking status (yes vs. no)	3.17 ***	1.89 – 5.31
Maternal age (continuous)	1.01	0.98 – 1.04
Maternal race: white (reference)	1.00	
Maternal race: Black	0.92	0.42 – 2.04
Maternal race: Hispanic	0.44 **	0.24 – 0.82
Maternal race: AAPI	0.92	0.41 – 2.04
Maternal race: other	0.79	0.26 – 2.43
Maternal marital status (yes vs. no)	1.92 **	1.25 – 2.97
Gestational diabetes (yes vs. no)	0.92	0.52 – 1.64
Type 2 diabetes (yes vs. no)	0.56	0.15 – 2.19
Maternal food allergy (yes vs. no)	0.74	0.45 – 1.23

* p < 0.05

** p < 0.01

*** p < 0.0001

Table 5a: Logistic regression results for average daily added sugar intake (in teaspoons) and breastfeeding intensity at 3 months (n = 1099)

Variable	Exclusive breastfeeding at 3m vs. partial or no breastfeeding (n = 1099)		Partial breastfeeding at 3m vs. no breastfeeding (n = 819)	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Added sugar, crude				
Intake quartile 1	1.08	0.72 – 1.62	1.42	0.97 – 2.07
Intake quartile 2	1.50 *	1.01 – 2.20 *	1.65 *	1.12 – 2.44
Intake quartile 3	1.44	0.98 – 2.13	1.51 **	1.03 – 2.23
Intake quartile 4 (reference)	1.00		1.00	
Added sugar, adjusted				
Intake quartile 1	0.78	0.50 – 1.21	0.77	0.48 – 1.23
Intake quartile 2	0.99	0.65 – 1.52	0.81	0.50 – 1.31
Intake quartile 3	1.08	0.70 – 1.65	0.87	0.55 – 1.39
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	4.27 ***	2.79 – 6.54	11.87 ***	8.19 – 17.20
EPDS score (continuous)	0.94 **	0.91 – 0.98	1.01	0.97 – 1.04
Maternal BMI at 3 months (continuous)	0.93 ***	0.90 – 0.96	0.97 *	0.94 – 0.99
WIC enrollment at 3 months (yes vs. no)	1.14	0.77 – 1.68	1.22	0.82 – 1.82
Maternal smoking status (yes vs. no)	2.20 *	1.16 – 4.17	2.99 ***	1.76 – 5.10
Maternal age (continuous)	1.00	0.97 – 1.04	1.04 *	1.00 – 1.07
Maternal race: white (reference)	1.00		1.00	
Maternal race: Black	0.43	0.16 – 1.17	1.10	0.48 – 2.55
Maternal race: Hispanic	0.47	0.22 – 1.01	1.12	0.56 – 2.24
Maternal race: AAPI	0.64	0.28 – 1.43	1.84	0.64 – 5.24
Maternal race: other	1.82	0.61 – 5.40	0.72	0.18 – 2.85
Maternal marital status (yes vs. no)	1.95 *	1.15 – 3.32	1.35	0.85 – 2.17
Gestational diabetes (yes vs. no)	2.02	0.97 – 4.19	1.00	0.53 – 1.87
Type 2 diabetes (yes vs. no)	0.52	0.12 – 2.37	0.16	0.02 – 1.38
Maternal food allergy (yes vs. no)	0.87	0.52 – 1.47	0.91	0.51 – 1.63

* p < .05

** p < .01

*** p < .0001

Table 5b: Logistic regression results for average daily added sugar intake (in teaspoons) and any breastfeeding at 6 months (n = 1099)

Variable	Any breastfeeding at 6 months vs. no breastfeeding (n = 1099)	
	Odds Ratio	95% Wald Confidence Limits
Added sugar, crude		
Intake quartile 1	1.33	0.95 – 1.86
Intake quartile 2	1.52 *	1.08 – 2.12
Intake quartile 3	1.63 **	1.17 – 2.29
Intake quartile 4 (reference)	1.00	
Added sugar, adjusted		
Intake quartile 1	0.79	0.52 – 1.20
Intake quartile 2	0.79	0.52 – 1.19
Intake quartile 3	1.04	0.69 – 1.56
Intake quartile 4 (reference)	1.00	
Breastfeeding intention (yes vs. no)	9.019 ***	6.39 – 12.73
EPDS score (continuous)	0.97	0.944 – 1.006
Maternal BMI at 3 months (continuous)	0.94 ***	0.921 – 0.967 ***
WIC enrollment at 3 months (yes vs. no)	1.43 *	1.004 – 2.026 *
Maternal smoking status (yes vs. no)	3.28 ***	1.957 – 5.499 ***
Maternal age (continuous)	1.02	0.99 – 1.05
Maternal race: white (reference)	1.00	
Maternal race: Black	1.02	0.46 – 2.22
Maternal race: Hispanic	0.47 *	0.25 – 0.87
Maternal race: AAPI	1.01	0.46 – 2.22
Maternal race: other	0.83	0.28 – 2.53
Maternal marital status (yes vs. no)	1.89 **	1.23 – 2.92
Gestational diabetes (yes vs. no)	0.94	0.53 – 1.65
Type 2 diabetes (yes vs. no)	0.51	0.13 – 2.03
Maternal food allergy (yes vs. no)	0.73	0.44 – 1.21

* p < .05

** p < .01

*** p < .0001

Table 6a: Logistic regression results for average daily dairy intake (in servings) and breastfeeding intensity at 3 months (n = 1099)

Variable	Exclusive breastfeeding at 3m vs. partial or no breastfeeding (n = 1099)		Partial breastfeeding at 3m vs. no breastfeeding (n = 819)	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Dairy, crude				
Intake quartile 1	0.55 **	0.36 – 0.82	0.49 **	0.33 – 0.73
Intake quartile 2	0.84	0.58 – 1.23	0.62 *	0.41 – 0.92
Intake quartile 3	1.05	0.73 – 1.51	0.73	0.49 – 1.09
Intake quartile 4 (reference)	1.00		1.00	
Dairy, adjusted				
Intake quartile 1	0.52 **	0.33 – 0.80	0.38 ***	0.23 – 0.62
Intake quartile 2	0.76	0.51 – 1.15	0.38 **	0.23 – 0.62
Intake quartile 3	0.97	0.65 – 1.45	0.53 *	0.32 – 0.87
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	4.16 ***	2.71 – 6.38	12.60 ***	8.62 – 18.40
EPDS score (continuous)	0.94 **	0.91 – 0.98	1.01	0.97 – 1.05
Maternal BMI at 3 months (continuous)	0.93 ***	0.90 – 0.96	0.97 *	0.94 – 0.99
WIC enrollment at 3 months (yes vs. no)	1.19	0.80 – 1.76	1.29	0.86 – 1.94
Maternal smoking status (yes vs. no)	2.11 *	1.11 – 4.01	2.68 **	1.58 – 4.57
Maternal age (continuous)	1.00	0.97 – 1.04	1.04	1.00 – 1.07
Maternal race: white (reference)	1.00		1.00	
Maternal race: Black	0.47	0.17 – 1.30	1.28	0.54 – 3.03
Maternal race: Hispanic	0.46 *	0.22 – 0.99	1.11	0.55 – 2.24
Maternal race: AAPI	0.67	0.30 – 1.51	2.05	0.70 – 5.97
Maternal race: other	1.91	0.64 – 5.67	0.76	0.19 – 3.05
Maternal marital status (yes vs. no)	1.99 *	1.17 – 3.40	1.42	0.88 – 2.29
Gestational diabetes (yes vs. no)	2.13 *	1.02 – 4.45	0.97	0.51 – 1.86
Type 2 diabetes (yes vs. no)	0.56	0.12 – 2.55	0.25	0.03 – 2.28
Maternal food allergy (yes vs. no)	0.88	0.52 – 1.49	0.97	0.54 – 1.73

* p < .05

** p < .01

*** p < .0001

Table 6b: Logistic regression results for average daily dairy intake (in servings) and any breastfeeding at 6 months (n = 1099)

Variable	Any breastfeeding at 6 months vs. no breastfeeding (n = 1099)	
	Odds Ratio	95% Wald Confidence Limits
Dairy, crude		
Intake quartile 1	0.54 **	0.39 – 0.76
Intake quartile 2	0.71 *	0.51 – 0.99
Intake quartile 3	0.95	0.68 – 1.33
Intake quartile 4 (reference)	1.00	
Dairy, adjusted		
Intake quartile 1	0.46 **	0.31 – 0.70
Intake quartile 2	0.53 **	0.35 – 0.79
Intake quartile 3	0.79	0.53 – 1.19
Intake quartile 4 (reference)	1.00	
Breastfeeding intention (yes vs. no)	9.02 ***	6.37 – 12.77
EPDS score (continuous)	0.98	0.95 – 1.01
Maternal BMI at 3 months (continuous)	0.94 ***	0.92 – 0.97
WIC enrollment at 3 months (yes vs. no)	1.51 *	1.06 – 2.15
Maternal smoking status (yes vs. no)	3.06 ***	1.82 – 5.13
Maternal age (continuous)	1.02	0.99 – 1.05
Maternal race: white (reference)	1.00	
Maternal race: Black vs. white	1.12	0.51 – 2.48
Maternal race: Hispanic vs. white	0.46 *	0.25 – 0.85
Maternal race: AAPI vs. white	1.07	0.48 – 2.38
Maternal race: other vs. white	0.88	0.29 – 2.70
Maternal marital status (yes vs. no)	1.95 **	1.26 – 3.02
Gestational diabetes (yes vs. no)	0.94	0.53 – 1.68
Type 2 diabetes (yes vs. no)	0.65	0.16 – 2.57
Maternal food allergy (yes vs. no)	0.75	0.45 – 1.24

* p < .05

** p < .01

*** p < .0001

Table 7a: Logistic regression results for average daily energy intake (in calories) and breastfeeding intensity at 3 months (n = 1099)

Variable	Exclusive breastfeeding at 3m vs. partial or no breastfeeding (n = 1099)		Partial breastfeeding at 3m vs. no breastfeeding (n = 819)	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Energy, crude				
Intake quartile 1	0.50 *	0.33 – 0.77	0.72	0.49 – 1.04
Intake quartile 2	1.12	0.77 – 1.63	0.81	0.55 – 1.19
Intake quartile 3	1.52 **	1.05 – 2.20	1.06	0.71 – 1.60
Intake quartile 4 (reference)	1.00		1.00	
Energy, adjusted				
Intake quartile 1	0.50 *	0.33 – 0.77	0.54 *	0.34 – 0.87
Intake quartile 2	0.82	0.54 – 1.24	0.52 **	0.32 – 0.84
Intake quartile 3	1.30	0.87 – 1.94	0.71	0.43 – 1.15
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	3.93 ***	2.56 – 6.04	11.86 ***	8.17 – 17.22
EPDS score (continuous)	0.94 **	0.90 – 0.97	1.01	0.97 – 1.04
Maternal BMI at 3 months (continuous)	0.92 ***	0.90 – 0.95	0.96 **	0.94 – 0.99
WIC enrollment at 3 months (yes vs. no)	1.25	0.84 – 1.86	1.27	0.85 – 1.91
Maternal smoking status (yes vs. no)	2.22 *	1.17 – 4.24	2.95 ***	1.74 – 5.00
Maternal age (continuous)	1.00	0.97 – 1.03	1.03	1.00 – 1.07
Maternal race: white (reference)	1.00			
Maternal race: Black	0.37	0.13 – 1.03	1.01	0.43 – 2.40
Maternal race: Hispanic	0.46 *	0.21 – 1.00	1.06	0.53 – 2.11
Maternal race: AAPI	0.54	0.23 – 1.23	1.76	0.61 – 5.12
Maternal race: other	1.76	0.58 – 5.33	0.65	0.16 – 2.62
Maternal marital status (yes vs. no)	2.00 *	1.17 – 3.42	1.37	0.85 – 2.20
Gestational diabetes (yes vs. no)	2.02	0.97 – 4.22	0.98	0.52 – 1.85
Type 2 diabetes (yes vs. no)	0.46	0.11 – 2.03	0.18	0.02 – 1.62
Maternal food allergy (yes vs. no)	0.87	0.51 – 1.48	0.95	0.53 – 1.71

* p < .05

** p < .01

*** p < .0001

Table 7b: Logistic regression results for average daily energy intake (in calories) and any breastfeeding at 6 months (n = 1099)

Variable	Any breastfeeding at 6 months vs. no breastfeeding (n = 1099)	
	Odds Ratio	95% Wald Confidence Limits
Energy, crude		
Intake quartile 1	0.66 *	1.03 – 2.00
Intake quartile 2	1.00	0.72 – 1.40
Intake quartile 3	1.43 *	0.47 – 0.92
Intake quartile 4 (reference)	1.00	
Energy, adjusted		
Intake quartile 1	0.51 **	0.34 – 0.77
Intake quartile 2	0.67	0.45 – 1.01
Intake quartile 3	1.08	0.72 – 1.62
Intake quartile 4 (reference)	1.00	
Breastfeeding intention (yes vs. no)	8.52 ***	6.04 – 12.03
EPDS score (continuous)	0.97	0.944 – 1.006
Maternal BMI at 3 months (continuous)	0.94 ***	0.92 – 0.97
WIC enrollment at 3 months (yes vs. no)	1.52 *	1.07 – 2.17
Maternal smoking status (yes vs. no)	3.28 ***	1.96 – 5.50
Maternal age (continuous)	1.01	0.98 – 1.04
Maternal race: white (reference)	1.00	
Maternal race: Black	0.92	0.41 – 2.05
Maternal race: Hispanic	0.45 **	0.24 – 0.84
Maternal race: AAPI	0.92	0.41 – 2.06
Maternal race: other	0.77	0.25 – 2.35
Maternal marital status (yes vs. no)	1.92 **	1.24 – 2.96
Gestational diabetes (yes vs. no)	0.91	0.51 – 1.62
Type 2 diabetes (yes vs. no)	0.53	0.14 – 2.03
Maternal food allergy (yes vs. no)	0.74	0.44 – 1.22

* p < .05

** p < .01

*** p < .0001

Table 8a: Logistic regression results for average daily glycemic load and breastfeeding intensity at 3 months (n = 1099)

Variable	Exclusive breastfeeding at 3m vs. partial or no breastfeeding (n = 1099)		Partial breastfeeding at 3m vs. no breastfeeding (n = 819)	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Glycemic load, crude				
Intake quartile 1	0.60 *	0.40 – 0.90	0.84	0.58 – 1.23
Intake quartile 2	1.12	0.77 – 1.63	1.00	0.68 – 1.49
Intake quartile 3	1.20	0.83 – 1.75	1.46	0.98 – 2.18
Intake quartile 4 (reference)	1.00		1.00	
Glycemic load, adjusted				
Intake quartile 1	0.49 **	0.31 – 0.76	0.59 **	0.37 – 0.95
Intake quartile 2	0.82	0.54 – 1.24	0.66	0.41 – 1.07
Intake quartile 3	1.03	0.68 – 1.54	1.06	0.65 – 1.72
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	4.09 ***	2.67 – 6.27	11.69 ***	8.07 – 16.93
EPDS score (continuous)	0.94 **	0.90 – 0.97	1.00	0.97 – 1.04
Maternal BMI at 3 months (continuous)	0.93 ***	0.90 – 0.96	0.96 **	0.94 – 0.99
WIC enrollment at 3 months (yes vs. no)	1.18	0.80 – 1.76	1.28	0.85 – 1.91
Maternal smoking status (yes vs. no)	2.21 *	1.16 – 4.18	2.87 ***	1.69 – 4.87
Maternal age (continuous)	1.00	0.97 – 1.04	1.04 *	1.00 – 1.07
Maternal race: white (reference)	1.00		1.00	
Maternal race: Black	0.39	0.14 – 1.08	1.09	0.55 – 2.20
Maternal race: Hispanic	0.44 *	0.21 – 0.96	1.09	0.55 – 2.20
Maternal race: AAPI	0.57	0.25 – 1.29	1.83	0.62 – 5.36
Maternal race: other	1.78	0.59 – 5.32	0.71	0.18 – 2.84
Maternal marital status (yes vs. no)	1.99 *	1.17 – 3.39	1.40	0.87 – 2.24
Gestational diabetes (yes vs. no)	2.00	0.96 – 4.18	0.98	0.52 – 1.85
Type 2 diabetes (yes vs. no)	0.50	0.11 – 2.24	0.16	0.02 – 1.39
Maternal food allergy (yes vs. no)	0.88	0.52 – 1.49	0.89	0.50 – 1.61

* p < .05

** p < .01

*** p < .0001

Table 8b: Logistic regression results for average daily glycemic load and any breastfeeding at 6 months (n = 1099)

	Any breastfeeding at 6 months vs. no breastfeeding (n = 1099)	
Variable	Odds Ratio	95% Wald Confidence Limits
Glycemic load, crude		
Intake quartile 1	0.73	0.52 – 1.01
Intake quartile 2	1.12	0.80 – 1.57
Intake quartile 3	1.38	0.98 – 1.93
Intake quartile 4 (reference)	1.00	
Glycemic load, adjusted		
Intake quartile 1	0.53 **	0.35 – 0.80
Intake quartile 2	0.78	0.52 – 1.12
Intake quartile 3	1.06	0.71 – 1.59
Intake quartile 4 (reference)	1.00	
Breastfeeding intention (yes vs. no)	8.67 ***	6.15 – 12.23
EPDS score (continuous)	0.97	0.94 – 1.01
Maternal BMI at 3 months (continuous)	0.94 ***	0.92 – 0.97
WIC enrollment at 3 months (yes vs. no)	1.49 *	1.05 – 2.12
Maternal smoking status (yes vs. no)	3.24 ***	1.94 – 5.43
Maternal age (continuous)	1.02	0.99 – 1.05
Maternal race: white (reference)	1.00	
Maternal race: black	0.93	0.42 – 2.06
Maternal race: Hispanic	0.45 *	0.24 – 0.83
Maternal race: AAPI	0.95	0.42 – 2.13
Maternal race: other	0.81	0.26 – 2.47
Maternal marital status (yes vs. no)	1.91 **	1.24 – 2.94
Gestational diabetes (yes vs. no)	0.89	0.50 – 1.59
Type 2 diabetes (yes vs. no)	0.51	0.130 – 2.00
Maternal food allergy (yes vs. no)	0.71	0.43 – 1.18

* p < .05

** p < .01

*** p < .0001

Table 9a: Logistic regression results for average daily percentage of calories from carbohydrate and breastfeeding intensity at 3 months (n = 1099)

Variable	Exclusive breastfeeding at 3m vs. partial or no breastfeeding		Partial breastfeeding at 3m vs. no breastfeeding	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from carbohydrates, crude Low/moderate (< 45%) vs. high (45%+)	0.97	0.69 – 1.37	0.90	0.64 – 1.27
Calories, crude				
Intake quartile 1	0.90	0.07 – 1.33	0.72	0.49 – 1.04
Intake quartile 2	1.02	0.69 – 1.50	0.81	0.55 – 1.19
Intake quartile 3	1.16	0.79 – 1.69	1.06	0.71 – 1.59
Intake quartile 4 (reference)	1.00		1.00	
% of calories from carbohydrates, adjusted Low/moderate (< 45%) vs. high (45%+)	1.01	0.69 – 1.47	0.86	0.57 – 1.31
% of calories from carbohydrates, adjusted				
Intake quartile 1	0.89	0.58 – 1.37	0.88	0.55 – 1.41
Intake quartile 2	0.96	0.64 – 1.46	0.86	0.54 – 1.36
Intake quartile 3	1.01	0.67 – 1.53	1.17	0.73 – 1.89
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	4.30 ***	2.81 – 6.59	11.67 ***	8.08 – 16.86
EPDS score (continuous)	0.94 **	0.91 – 0.98	1.01	0.97 – 1.04
Maternal BMI at 3 months (continuous)	0.93 ***	0.90 – 0.96	0.97 *	0.94 – 0.99
WIC enrollment at 3 months (yes vs. no)	1.12	0.76 – 1.66	1.21	0.81 – 1.80
Maternal smoking status (yes vs. no)	2.22 *	1.18 – 4.21	2.89 ***	1.71 – 4.89
Maternal age (continuous)	1.00	0.97 – 1.03	1.04 *	1.00 – 1.07
Maternal race: white (reference)	1.00		1.00	
Maternal race: Black	0.43	0.16 – 1.18	1.10	0.47 – 2.57
Maternal race: Hispanic	0.46 *	0.22 – 0.99	1.11	0.56 – 2.21
Maternal race: AAPI	0.59	0.26 – 1.32	1.83	0.62 – 5.36
Maternal race: other	1.78	0.60 – 5.30	0.71	0.18 – 2.84
Maternal marital status (yes vs. no)	1.91 *	1.13 – 3.24	1.40	0.87 – 2.24
Gestational diabetes (yes vs. no)	2.04	0.98 – 4.24	0.98	0.52 – 1.85
Type 2 diabetes (yes vs. no)	0.52	0.12 – 2.32	0.16	0.02 – 1.39
Maternal food allergy (yes vs. no)	0.87	0.51 – 1.47	0.89	0.50 – 1.61

Covariate statistics correspond to the logistic regression model for low/moderate vs. high intake

* p < .05

** p < .01

*** p < .0001

Table 9b: Logistic regression results for average daily percentage of calories from carbohydrate and any breastfeeding at 6 months (n = 1099)

Variable	Any breastfeeding at 6 months vs. no breastfeeding (n = 1099)	
	Odds Ratio	95% Wald Confidence Limits
% of calories from carbohydrates, crude Low/moderate (< 45%) vs. high (45%+)	0.87	0.64 – 1.17
Calories, crude		
Intake quartile 1	0.66 *	0.47 – 0.92
Intake quartile 2	1.00	0.72 – 1.40
Intake quartile 3	1.43 *	1.03 – 2.00
Intake quartile 4 (reference)	1.00	
% of calories from carbohydrates, adjusted Low/moderate (< 45%) vs. high (45%+)	0.82	0.57 – 1.17
% of calories from carbohydrates, adjusted		
Intake quartile 1	0.86	0.58 – 1.29
Intake quartile 2	0.89	0.60 – 1.33
Intake quartile 3	1.11	0.74 - 1.66
Intake quartile 4 (reference)	1.00	
Breastfeeding intention (yes vs. no)	8.89 ***	6.31 – 12.52
EPDS score (continuous)	0.97	0.94 – 1.01
Maternal BMI at 3 months (continuous)	0.95 ***	0.92 – 0.97
WIC enrollment at 3 months (yes vs. no)	1.41	0.99 – 2.00
Maternal smoking status (yes vs. no)	3.24 ***	1.94 – 5.40
Maternal age (continuous)	1.02	0.99 – 1.05
Maternal race: white (reference)	1.00	
Maternal race: Black	1.00	0.46 – 2.19
Maternal race: Hispanic	0.46 *	0.25 – 0.85
Maternal race: AAPI	0.92	0.42 – 2.02
Maternal race: other	0.84	0.27 – 2.57
Maternal marital status (yes vs. no)	1.87 **	1.21 – 2.87
Gestational diabetes (yes vs. no)	0.92	0.52 – 1.62
Type 2 diabetes (yes vs. no)	0.48	0.12 – 1.89
Maternal food allergy (yes vs. no)	0.73	0.44 – 1.20

Covariate statistics correspond to the logistic regression model for low/moderate vs. high intake

* p < .05

** p < .01

*** p < .0001

Table 10a: Logistic regression results for average daily percentage of calories from protein and breastfeeding intensity at 3 months (n = 1099)

	Exclusive breastfeeding at 3m vs. partial or no breastfeeding (n = 1099)		Partial breastfeeding at 3m vs. no breastfeeding (n = 819)	
Variable	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from protein, crude Moderate (10% - 35%) vs. low (<10%)	1.38	0.56 – 3.40	2.38 *	1.01 – 5.63
% of calories from protein, crude Intake quartile 1 (reference)	1.00		1.00	
Intake quartile 2	1.20	0.81 – 1.78	1.39	0.95 – 2.05
Intake quartile 3	1.16	0.78 – 1.71	1.57	1.07 – 2.32
Intake quartile 4	1.33	0.90 – 1.96	1.43	0.97 – 2.11
% of calories from protein, adjusted Moderate (10% - 35%) vs. low (<10%)	0.80	0.29 – 2.22	1.06	0.36 – 3.07
% of calories from protein, adjusted Intake quartile 1 (reference)	1.00		1.00	
Intake quartile 2	1.03	0.74 – 1.72	1.08	0.67 – 1.72
Intake quartile 3	0.97	0.63 – 1.48	1.09	0.68 – 1.74
Intake quartile 4	1.12	1.03 – 1.58	1.16	0.72 – 1.87
Breastfeeding intention (yes vs. no)	4.31 ***	2.82 – 6.61	11.669 ***	8.10 – 16.86
EPDS score (continuous)	0.94 *	0.91 – 0.98	1.01	0.97 – 1.04
Maternal BMI at 3 months (continuous)	0.93 ***	0.90 – 0.96	0.97 *	0.94 – 0.99
WIC enrollment at 3 months (yes vs. no)	1.12	0.76 – 1.66	1.20	0.80 – 1.78
Maternal smoking status (yes vs. no)	2.26 *	1.19 – 4.30	2.89 **	1.70 – 4.91
Maternal age (continuous)	1.00	0.97 – 1.04	1.04	1.00 – 1.07
Maternal race: white (reference)	1.00		1.00	
Maternal race: Black vs. white	0.43	0.16 – 1.17	1.11	0.48 – 2.60
Maternal race: Hispanic vs. white	0.46 *	0.21 – 0.98	1.11	0.55 – 2.20
Maternal race: AAPI vs. white	0.59	0.26 – 1.33	1.76	0.62 – 5.00
Maternal race: other vs. white	1.79	0.60 – 5.34	0.71	0.18 – 2.78
Maternal marital status (yes vs. no)	1.90 *	1.12 – 3.23	1.33	0.83 – 2.12
Gestational diabetes (yes vs. no)	2.04	0.99 – 4.23	1.01	0.54 – 1.89
Type 2 diabetes (yes vs. no)	0.51	0.11 – 2.30	0.15	0.02 – 1.36
Maternal food allergy (yes vs. no)	0.87	0.51 – 1.46	0.92	0.51 – 1.64

Covariate statistics correspond to the logistic regression model for moderate vs. low intake

* p < .05

** p < .01

*** p < .0001

Table 10b: Logistic regression results for average daily percentage of calories from protein and any breastfeeding at 6 months (n = 1099)

Variable	Any breastfeeding at 6 months vs. no breastfeeding (n = 1099)	
	Odds Ratio	95% Wald Confidence Limits
% of calories from protein, crude Moderate (10% - 35%) vs. low (<10%)	2.20 *	1.02 – 4.75
% of calories from protein, crude Intake quartile 1 (reference)	1.00	
Intake quartile 2	1.35	0.97 – 1.89
Intake quartile 3	1.37	0.98 – 1.91
Intake quartile 4	1.59 **	1.13 – 2.22
% of calories from protein, adjusted Moderate (10% - 35%) vs. low (<10%)	1.13	0.43 – 2.97
% of calories from protein, adjusted Intake quartile 1 (reference)	1.00	
Intake quartile 2	1.09	0.73 – 1.63
Intake quartile 3	1.00	0.67 – 1.49
Intake quartile 4	1.35	0.90 – 2.04
Breastfeeding intention (yes vs. no)	8.88 ***	6.31 – 12.51
EPDS score (continuous)	0.98	0.95 – 1.01
Maternal BMI at 3 months (continuous)	0.95 ***	0.92 – 0.97
WIC enrollment at 3 months (yes vs. no)	1.40	0.99 – 1.98
Maternal smoking status (yes vs. no)	3.23 ***	1.93 – 5.41
Maternal age (continuous)	1.02	0.99 – 1.05
Maternal race: white (reference)	1.00	
Maternal race: Black	1.00	0.46 – 2.23
Maternal race: Hispanic	0.46 *	0.25 – 0.85
Maternal race: AAPI	0.94	0.43 – 2.06
Maternal race: other	0.81	0.27 – 2.48
Maternal marital status (yes vs. no)	1.86 **	1.21 – 2.86
Gestational diabetes (yes vs. no)	0.94	0.53 – 1.66
Type 2 diabetes (yes vs. no)	0.50	0.13 – 1.97
Maternal food allergy (yes vs. no)	0.73	0.45 – 1.21

Covariate statistics correspond to the logistic regression model for moderate vs. low intake

* p < .05

** p < .01

*** p < .0001

Table 11a: Logistic regression results for average daily percentage of calories from fat and breastfeeding intensity at 3 months (n = 1099)

Variable	Exclusive breastfeeding at 3m vs. partial or no breastfeeding (n = 1099)		Partial breastfeeding at 3m vs. no breastfeeding (n = 819)	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from fat, crude Low/moderate (<36%) vs. high (36%+)	0.98	0.73 – 1.30	0.87	0.63 – 1.20
% of calories from fat, crude Intake quartile 1	1.03	0.70 – 1.51	0.76	0.52 – 1.12
Intake quartile 2	1.08	0.74 – 1.59	0.89	0.60 – 1.31
Intake quartile 3	1.03	0.70 – 1.52	0.90	0.61 – 1.33
Intake quartile 4 (reference)	1.00		1.00	
% of calories from fat, adjusted Low/moderate (<36%) vs. high (36%+)	1.02	0.75 – 1.38	0.920	0.651 – 1.300
% of calories from fat, adjusted Intake quartile 1	1.08	0.71 – 1.65	0.96	0.60 – 1.54
Intake quartile 2	1.08	0.71 – 1.63	0.98	0.61 – 1.56
Intake quartile 3	1.02	0.67 – 1.55	0.93	0.59 – 1.48
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	4.30 ***	2.18 – 6.59	11.64 ***	8.05 – 16.81
EPDS score (continuous)	0.94 *	0.91 – 0.98	1.01	0.97 – 1.04
Maternal BMI at 3 months (continuous)	0.93 ***	0.90 – 0.96	0.97 *	0.94 – 0.99
WIC enrollment at 3 months (yes vs. no)	1.12	0.76 – 1.66	1.20	0.80 – 1.78
Maternal smoking status (yes vs. no)	2.23 *	1.18 – 4.21	2.89 ***	1.71 – 4.89
Maternal age (continuous)	1.00	0.97 – 1.03	1.04	1.00 – 1.07
Maternal race: white (reference)	1.00		1.00	
Maternal race: Black	0.43	0.16 – 1.18	1.11	0.48 – 2.58
Maternal race: Hispanic	0.46 *	0.22 – 0.99	1.11	0.56 – 2.21
Maternal race: AAPI	0.59	0.26 – 1.32	1.79	0.63 – 5.08
Maternal race: other	1.78	0.60 – 5.31	0.70	0.18 – 2.76
Maternal marital status (yes vs. no)	1.91 *	1.13 – 3.25	1.32	0.82 – 2.11
Gestational diabetes (yes vs. no)	2.03	0.98 – 4.22	1.03	0.55 – 1.94
Type 2 diabetes (yes vs. no)	0.52	0.12 – 2.31	0.15	0.02 – 1.36
Maternal food allergy (yes vs. no)	0.87	0.52 – 1.47	0.92	0.51 – 1.64

Covariate statistics correspond to the logistic regression model for low/moderate vs. high intake

* p < .05

** p < .01

*** p < .0001

Table 11b: Logistic regression results for average daily percentage of calories from fat and any breastfeeding at 6 months (n = 1099)

	Any breastfeeding at 6 months vs. no breastfeeding (n = 1099)	
Variable	Odds Ratio	95% Wald Confidence Limits
% of calories from fat, crude Low/moderate (<36%) vs. high (36%+)	0.91	0.71 – 1.16
% of calories from fat, crude Intake quartile 1	0.96	0.69 – 1.35
Intake quartile 2	1.10	0.79 – 1.54
Intake quartile 3	0.81	0.58 – 1.13
Intake quartile 4 (reference)	1.00	
% of calories from fat, adjusted Low/moderate (<36%) vs. high (36%+)	1.04	0.777 – 1.397
% of calories from fat, adjusted Intake quartile 1	0.94	0.63 – 1.41
Intake quartile 2	1.24	0.83 – 1.84
Intake quartile 3	1.01	0.68 – 1.49
Intake quartile 4 (reference)	1.00	
Breastfeeding intention (yes vs. no)	8.91 ***	6.33 – 12.55
EPDS score (continuous)	0.98	0.95 – 1.01
Maternal BMI at 3 months (continuous)	0.95 ***	0.92 – 0.97
WIC enrollment at 3 months (yes vs. no)	1.40	0.99 – 1.98
Maternal smoking status (yes vs. no)	3.26 ***	1.95 – 5.44
Maternal age (continuous)	1.02	0.99 – 1.05
Maternal race: white (reference)	1.00	
Maternal race: Black vs. white	1.01	0.46 – 2.21
Maternal race: Hispanic vs. white	0.46 *	0.25 – 0.85
Maternal race: AAPI vs. white	0.93	0.42 – 2.06
Maternal race: other vs. white	0.82	0.27 – 2.50
Maternal marital status (yes vs. no)	1.86 **	1.21 – 2.87
Gestational diabetes (yes vs. no)	0.93	0.53 – 1.65
Type 2 diabetes (yes vs. no)	0.49	0.13 – 1.95
Maternal food allergy (yes vs. no)	0.73	0.44 – 1.21

Covariate statistics correspond to the logistic regression model for moderate vs. low intake

* p < .05

** p < .01

*** p < .0001

Tables: Results for Aim 2

Table 12a: Bivariate associations between dietary factors, covariates, and reasons for stopping breastfeeding (n = 587)

Variable	Total sample	Insufficient milk			Too much milk		
Dietary factors	(n = 587)	Yes (n = 400)	No (n = 187)	p-value	Yes (n = 41)	No (n = 546)	p-value
Magnesium milligrams, Continuous: Mean (95% CI)	295.4	294.2 (281.5 – 306.9)	298.0 (280.4 – 315.5)	.737	330.0 (284.0 – 376.0)	292.8 (282.3 – 303.3)	.070
Quartiles, % (N)							
Q1 59.46 – 206.94 mg	24.9% (146)	26.8% (107)	20.9% (39)	.067	24.4% (10)	24.9% (136)	.304
Q2 206.95 – 273.97 mg	25.0% (147)	22.0% (88)	31.6% (59)		17.1% (7)	25.6% (140)	
Q3 273.98 – 365.50 mg	25.0% (147)	26.3% (105)	22.5% (42)		21.8% (9)	25.3% (138)	
Q4 365.51 – 832.76 mg	25.0% (147)	25.0% (100)	25.1% (47)		36.6% (15)	24.2% (132)	
Added sugar, teaspoons Continuous: Mean (95% CI)	16.7	16.4 (15.2 – 17.7)	17.3 (15.1 – 19.4)	.491	23.2 (16.6 – 29.9)	16.2 (15.2 – 17.3)	.041
Quartiles, % (N)							
Q1 1.67 – 8.28 tsp	24.9% (146)	25.8% (103)	23.0% (43)	.812	22.0% (9)	25.1% (137)	.046
Q2 8.29 – 13.09 tsp	25.0% (147)	25.2% (101)	24.6% (46)		29.3% (12)	24.7% (135)	
Q3 13.10 – 19.62 tsp	25.0% (147)	24.0% (96)	27.3% (51)		9.8% (4)	26.2% (143)	
Q4 19.63 – 88.24 tsp	25.0% (147)	25.0% (100)	25.1% (47)		39.0% (16)	24.0% (131)	
Dairy, # of daily servings Continuous: Mean (95% CI)	2.0	2.0 (1.8 – 2.1)	2.2 (1.9 – 2.4)	.246	2.5 (2.0 – 3.0)	2.0 (1.9 – 2.1)	.059
Quartiles, % (N)							
Q1 0.06 – 0.96 servings	24.4% (143)	24.0% (96)	25.1% (47)	.548	14.6% (6)	25.1% (137)	.127
Q2 0.97 – 1.61 servings	25.0% (147)	26.8% (107)	21.4% (40)		17.1% (7)	25.6% (140)	
Q3 1.62 – 2.65 servings	25.6% (150)	25.3% (101)	26.2% (49)		36.6% (15)	24.7% (135)	
Q4 2.66 – 12.91 servings	25.0% (147)	24.0% (96)	27.3% (51)		31.7% (13)	24.5% (134)	

Energy, # of kcal/day Continuous: Mean (95% CI)	1865.0	1866.4 (1788.1 – 1944.7)	1862.1 (1762.6 – 1961.6)	.949	2205.1 (1899.6 – 2510.5)	1839.5 1777.2 – 1901.8)	.022
Quartiles, % (N)							
Q1 665.01 – 1311.45	24.9% (146)	26.3% (105)	21.9% (41)	.466	22.0% (9)	25.1% (137)	.024
Q2 1311.46 – 1709.20	25.0% (147)	24.5% (98)	26.2% (49)		12.2% (5)	26.0% (142)	
Q3 1709.21 – 2238.76	25.0% (147)	23.5% (94)	28.3% (53)		22.0% (9)	25.3% (138)	
Q4 2238.77 – 4534.83	25.0% (147)	25.8% (103)	23.53% (44)		43.9% (18)	23.6% (129)	
Glycemic load, daily Continuous: Mean (95% CI)	119.9	119.0 (113.5 – 124.6)	121.7 (113.6 – 129.7)	.598	146.9 (122.7 – 171.1)	117.8 113.3 – 122.4)	.022
Quartiles, % (N)							
Q1 21.56 – 83.00	24.9% (146)	27.8% (111)	18.7% (35)	.031	22.0% (9)	25.1% (137)	.003
Q2 83.01 – 105.44	25.0% (147)	22.0% (88)	31.6% (59)		14.6% (6)	25.8% (141)	
Q3 105.45 – 140.30	25.0% (147)	25.0% (100)	25.1% (47)		14.6% (6)	25.8% (141)	
Q4 140.31 – 382.52	25.0% (147)	25.3% (101)	24.6% (46)		48.8% (20)	23.3% (127)	
Percentage of calories from carbohydrate Continuous: Mean (95% CI)	51.1	50.9 (50.2 – 51.6)	51.5 (50.4 – 52.6)	.350	51.6 (48.9 – 54.3)	51.1 (50.4 – 51.7)	.668
% of calories from carbohydrate % (N)							
Low/moderate (<45%)	18.8% (110)	20.0% (80)	16.0% (30)	.252	26.8% (11)	18.1% (99)	.169
High (>= 45%)	81.3% (477)	80.0% (320)	84.0% (157)		73.2% (30)	81.9% (447)	
Percentage of calories from protein Continuous: Mean (95% CI)	16.2	16.2 (15.8 – 16.7)	16.2 (15.8 – 16.7)	.855	16.4 (15.3 – 17.6)	16.2 (15.9 – 16.5)	.656
% kcal from prot, % (N)							
Low (<10%)	2.6% (15)	3.0% (12)	1.6% (3)	.318	4.9% (2)	2.4% (13)	.329
Moderate (10% - 35%)	97.4% (572)	97.0% (572)	98.4% (184)		95.1% (39)	97.6% (533)	
Percentage of calories from fat Continuous: Mean (95% CI)	33.7	33.9 (33.4 – 34.5)	33.3 (32.5 – 34.1)	.225	33.1 (31.1 – 35.1)	33.8 (33.3 – 34.2)	.490
% kcal from fat, % (N)							
Low/moderate (<36%)	65.4% (384)	64.0% (256)	68.5% (128)	.291	70.7% (29)	65.0% (355)	.458

High ($\geq 36\%$)	34.6% (203)	36.0% (144)	31.6% (59)		29.3% (12)	35.0% (191)	
Demographic variables							
Edinburgh Postnatal Depression Scale (EPDS) score	6.6	6.8 (6.4 – 7.3)	6.26 (5.6 – 6.9)	.172	8.0 (6.3 – 9.7)	6.54 (6.2 – 6.9)	.051
≥ 13	10.2% (60)	11.3% (45)	8.0% (15)		22.0% (9)	9.3% (51)	.010
< 13	89.8% (527)	88.8% (355)	92.0% (172)		78.0% (32)	90.7% (495)	
Maternal BMI at 3mos Continuous: Mean (95% CI)	27.6	28.0 (27.4 – 28.6)	26.6 (25.8 – 27.5)	.012	28.2 (26.3 – 30.0)	27.5 (27.0 – 28.1)	.518
Race/Ethnicity				.255			.940
White	85.5% (502)	83.3% (333)	90.4% (169)		87.8% (36)	85.4% (466)	
Black	3.9% (23)	4.5% (18)	2.6% (5)		2.4% (1)	4.0% (22)	
Hispanic	6.6% (39)	7.8% (31)	4.3% (8)		7.3% (3)	6.6% (36)	
Asian/Pacific Islander	2.9% (17)	3.3% (13)	2.1% (4)		2.4% (1)	2.9% (16)	
Other	1.0% (6)	1.3% (5)	0.5% (1)		0% (0)	1.1% (6)	
Enrolled in WIC, Month 3				.445			.189
Yes	23.3% (137)	24.3% (97)	21.4% (40)		31.7% (13)	22.7% (124)	
No	76.7% (450)	75.7% (303)	78.6% (147)		68.3% (28)	77.3% (422)	
Age Continuous: Mean (95% CI)	29.7	29.6 (29.0 – 30.1)	29.9 (29.1 – 30.6)	.509	28.6 (27.2 – 30.1)	29.7 (29.3 – 30.2)	.198
Smoking							
Yes	12.4% (73)	13.0% (52)	11.2% (21)	.545	7.3% (3)	12.8% (70)	.303
No	87.6% (514)	87.0% (348)	88.8% (166)		92.7% (38)	87.2% (476)	
Marital status				.338			.337
Married	82.3% (483)	81.3% (325)	84.5% (158)		87.8% (36)	81.9% (447)	
Not married	17.7% (104)	18.7% (75)	15.5% (29)		12.2% (5)	18.1% (99)	
Gestational diabetes				.287			.583
Yes	7.0% (41)	7.8% (31)	5.4% (10)		4.9% (2)	7.1% (39)	
No/Not sure	93.0% (546)	92.2% (369)	94.7% (177)		95.1% (39)	92.9% (507)	
Type 2 diabetes				.435			.582
Yes	0.7% (4)	0.5% (2)	1.1% (2)		0% (0)	0.7% (4)	
No	99.3% (583)	99.5% (398)	98.9% (185)		100% (41)	99.3% (542)	

Food allergy				.768			.146
Yes	8.5% (50)	8.8% (35)	8.0% (15)		14.6% (6)	8.1% (44)	
No/not marked	91.5% (537)	91.2% (365)	92.0% (172)		85.4% (35)	91.9% (502)	
Intention to breastfeed at least 6m				.607			.001
Yes	77.9% (457)	77.3% (309)	79.1% (148)		56.1% (23)	79.5% (434)	
No/not marked	22.2% (130)	22.8% (91)	20.9% (39)		43.9% (18)	20.5% (112)	

χ^2 were used for categorical variables, and ANOVA for continuous variables

Table 12b: Bivariate associations between dietary factors, covariates, and reasons for stopping breastfeeding (n = 587)

Variable	Total sample	Pain			Concern about diet		
Dietary factors	(n = 587)	Yes n = 198	No n = 389	p-value	Yes n = 63	No n = 524	p-value
Magnesium milligrams, Continuous: Mean (95% CI)	295.4	287.9 (269.7 – 306.1)	299.2 (286.7 – 311.7)	.309	323.7 (291.3 – 356.1)	292.0 (281.1 – 302.8)	.060
Quartiles, % (N)							
Q1 59.46 – 206.94 mg	24.9% (146)	29.3% (58)	22.6% (88)	.336	19.1% (12)	25.6% (134)	.234
Q2 206.95 – 273.97 mg	25.0% (147)	22.7% (45)	26.2% (102)		20.6% (13)	25.6% (134)	
Q3 273.98 – 365.50 mg	25.0% (147)	24.8% (49)	25.2% (98)		25.4% (16)	25.0% (131)	
Q4 365.51 – 832.76 mg	25.0% (147)	23.2% (46)	26.0% (101)		34.9% (22)	23.9% (125)	
Added sugar, teaspoons Continuous: Mean (95% CI)	16.7	17.2 (15.2 – 19.2)	16.4 (15.2 – 17.7)	.525	17.0 (13.2 – 20.8)	16.7 (15.5 – 17.8)	.854
Quartiles, % (N)							
Q1 1.67 – 8.28 tsp	24.9% (146)	27.8% (55)	23.39% (91)	.101	28.6% (18)	24.4% (128)	.360
Q2 8.29 – 13.09 tsp	25.0% (147)	21.7% (43)	26.74% (104)		28.6% (18)	24.6% (129)	
Q3 13.10 – 19.62 tsp	25.0% (147)	21.2% (42)	26.99% (105)		15.9% (10)	26.2% (137)	
Q4 19.63 – 88.24 tsp	25.0% (147)	29.3% (58)	22.88% (89)		27.0% (17)	24.8% (130)	
Dairy, # of daily servings Continuous: Mean (95% CI)	2.0	1.9 (1.7 – 2.1)	2.1 (2.0 – 2.3)	.057	2.0 (1.7 – 2.4)	2.0 (1.9 – 2.2)	0.957
Quartiles, % (N)							
Q1 0.06 – 0.96 servings	24.4% (143)	25.8% (51)	23.7% (92)	.408	27.0% (17)	24.1% (126)	.837
Q2 0.97 – 1.61 servings	25.0% (147)	27.8% (55)	23.7% (92)		20.6% (13)	25.6% (134)	
Q3 1.62 – 2.65 servings	25.6% (150)	25.2% (50)	25.7% (100)		25.4% (16)	25.6% (134)	
Q4 2.66 – 12.91 servings	25.0% (147)	21.2% (42)	27.0% (105)		27.0% (17)	24.8% (130)	

Energy, # of kcal/day Continuous: Mean (95% CI)	1865.0	1848.3	1873.6	.704	1977.4	1851.5	.217
		(1738.0 – 1958.5)	(1798.6 – 1948.6)		(1780.2 – 2174.6)	(1786.2 – 1916.8)	
Quartiles, % (N)							
Q1 665.01 – 1311.45	24.9% (146)	26.3% (52)	24.2% (94)	.541	22.2% (14)	25.2% (132)	.024
Q2 1311.46 – 1709.20	25.0% (147)	22.7% (45)	26.2% (102)		27.0% (17)	24.8% (130)	
Q3 1709.21 – 2238.76	25.0% (147)	27.8% (55)	23.7% (92)		12.7% (8)	26.5% (139)	
Q4 2238.77 – 4534.83	25.0% (147)	23.2% (46)	26.0% (101)		38.1% (24)	23.5% (123)	
Glycemic load, daily Continuous: Mean (95% CI)	119.9	118.8	120.4	.748	127.6	118.9	.249
		(110.8 – 126.8)	(114.8 – 126.0)		(112.5 – 142.6)	114.2 – 123.7)	
Quartiles, % (N)							
Q1 21.56 – 83.00	24.9% (146)	30.8% (61)	21.85% (85)	.008	23.8% (15)	25.0% (131)	.275
Q2 83.01 – 105.44	25.0% (147)	17.17% (34)	29.05% (113)		20.6% (13)	25.6% (134)	
Q3 105.45 – 140.30	25.0% (147)	25.76% (51)	24.68% (96)		20.6% (13)	25.6% (134)	
Q4 140.31 – 382.52	25.0% (147)	26.26% (52)	24.42% (95)		34.9% (22)	23.9% (125)	
Percentage of calories from carbohydrate Continuous: Mean (95% CI)	51.1	50.6	51.3	.292	51.8	51.0	.426
		(49.49 – 51.77)	(50.60 – 52.05)		(49.8 – 53.8)	(50.4 – 51.7)	
% of calories from carbohydrate % (N)							
Low/moderate (<45%)	18.8% (110)	20.7% (41)	17.7% (69)	.383	20.6% (13)	18.5% (97)	.683
High (>= 45%)	81.3% (477)	79.3% (157)	82.3% (320)		79.4% (50)	81.5% (427)	
Percentage of calories from protein Continuous: Mean (95% CI)	16.2	16.2	16.2	.978	16.5	16.2	.460
		(15.7 – 16.8)	(15.9 – 16.5)		(15.7 – 17.4)	(15.9 – 16.5)	
% kcal from prot, % (N)							
Low (<10%)	2.6% (15)	4.6% (9)	1.5% (6)	.029	3.2% (2)	2.5% (13)	.742
Moderate (10% - 35%)	97.4% (572)	95.4% (189)	98.5% (383)		96.8% (61)	97.5% (511)	

Percentage of calories from fat	33.7	33.9	33.6	.522	32.9	33.8	.247
Continuous: Mean (95% CI)		(33.0 – 34.8)	(33.1 – 34.1)		(31.5 – 34.4)	(33.3 – 34.3)	
% kcal from fat, % (N)							
Low/moderate (<36%)	65.4% (384)	65.2% (129)	65.5% (255)	.923	74.60% (47)	64.3% (337)	.105
High (>= 36%)	34.6% (203)	34.8% (69)	34.5% (134)		25.40% (16)	35.7% (187)	
Demographic variables							
Edinburgh Postnatal Depression Scale (EPDS) score	6.6	7.2 (6.5 – 7.9)	6.4 (5.9 – 6.8)	.037	7.2 (5.8 – 8.5)	6.6 (6.2 – 7.0)	.332
>= 13	10.2% (60)	14.7% (29)	8.0% (31)	.012	15.9% (10)	9.54% (50)	.117
< 13	89.8% (527)	85.3% (169)	92.0% (358)		84.1% (53)	90.46% (474)	
Maternal BMI at 3mos	27.6	27.9	27.4	.417	28.2 (26.8 – 29.5)	27.5 (27.0 – 28.0)	.417
Continuous: Mean (95% CI)		(27.0 – 28.7)	(26.8 – 28.0)				
Race/Ethnicity				.568			.582
White	85.5% (502)	86.9% (172)	84.8% (330)		81.0% (51)	86.1% (451)	
Black	3.9% (23)	3.0% (6)	4.4% (17)		6.4% (4)	3.6% (19)	
Hispanic	6.6% (39)	5.1% (10)	7.5% (29)		9.5% (6)	6.3% (33)	
Asian/Pacific Islander	2.9% (17)	3.5% (7)	2.5% (10)		3.2% (2)	2.9% (15)	
Other	1.0% (6)	1.5% (3)	0.8% (3)		0% (0)	1.2% (6)	
Enrolled in WIC, Month 3				.232			.469
Yes	23.3% (137)	26.3% (52)	21.9% (85)		27.0% (17)	22.9% (120)	
No	76.7% (450)	73.7% (146)	78.2% (304)		73.0% (46)	77.1% (404)	
Age	29.7	28.6 (27.8 – 29.3)	30.2 (29.7 – 30.7)	< .001	30.7 (29.5 – 32.0)	29.5 (29.1 – 30.0)	.085
Continuous: Mean (95% CI)							
Smoking				.051			.303
Yes	12.4% (73)	16.2% (32)	10.5% (41)		7.3% (3)	12.8% (70)	
No	87.6% (514)	83.8% (166)	89.5% (348)		92.7% (38)	87.2% (476)	
Marital status				.041			.685
Married	82.3% (483)	77.8% (154)	84.6% (329)		84.1% (53)	82.1% (430)	
Not married	17.7% (104)	22.2% (44)	15.4% (60)		15.9% (10)	17.9% (94)	

Gestational diabetes				.153			.076
Yes	7.0% (41)	9.1% (18)	5.9% (23)		1.6% (1)	7.6% (40)	
No/Not sure	93.0% (546)	90.9% (180)	94.1% (366)		98.4% (62)	92.4% (484)	
Type 2 diabetes				.152			.487
Yes	0.7% (4)	0% (0)	1.0% (4)		0% (0)	0.8% (4)	
No	99.3% (583)	100% (198)	99.0% (385)		100% (63)	99.2% (520)	
Food allergy				.966			.514
Yes	8.5% (50)	8.6% (17)	8.5% (33)		6.4% (4)	8.8% (46)	
No/not marked	91.5% (537)	91.4% (181)	91.5% (356)		93.6% (59)	91.2% (478)	
Intention to breastfeed at least 6m				< .001			.737
Yes	77.9% (457)	69.2% (137)	82.3% (320)		76.2% (48)	78.1% (409)	
No/not marked	22.2% (130)	30.8% (61)	17.7% (69)		23.8% (15)	21.9% (115)	

χ^2 were used for categorical variables, and ANOVA for continuous variables

Table 12c: Bivariate associations between dietary factors, covariates, and reasons for stopping breastfeeding (n = 587)

Variable	Total sample (n = 587)	Social-ecological: Individual			Social-ecological: Interpersonal, Family		
		Yes (n = 298)	No (n = 289)	p-value	Yes (n = 327)	No (n = 260)	p-value
Dietary factors							
Magnesium milligrams, Continuous: Mean (95% CI)	295.4	298.7 (284.5 – 312.9)	292.0 (277.0 – 307.0)	.521	302.1 (288.4 – 315.8)	286.9 (271.4 – 302.5)	.149
Quartiles, % (N)							
Q1 59.46 – 206.94 mg	24.9% (146)	23.8% (71)	26.0% (75)	.184	23.2% (76)	6.9% (70)	.583
Q2 206.95 – 273.97 mg	25.0% (147)	24.2% (72)	26.0% (75)		24.2% (79)	26.2% (68)	
Q3 273.98 – 365.50 mg	25.0% (147)	28.8% (86)	21.1% (61)		26.3% (86)	23.5% (61)	
Q4 365.51 – 832.76 mg	25.0% (147)	23.2% (69)	27.0% (78)		26.3% (86)	23.5% (61)	
Added sugar, teaspoons Continuous: Mean (95% CI)	16.7	15.4 (14.1 – 16.7)	18.0 (16.3 – 19.8)	.018	16.9 (15.4 – 18.3)	16.5 (14.9 – 18.1)	.717
Quartiles, % (N)							
Q1 1.67 – 8.28 tsp	24.9% (146)	25.2% (75)	24.6% (71)	.506	24.5% (80)	25.4% (66)	.684
Q2 8.29 – 13.09 tsp	25.0% (147)	27.2% (81)	22.8% (66)		25.4% (83)	24.6% (64)	
Q3 13.10 – 19.62 tsp	25.0% (147)	24.8% (74)	25.3% (73)		23.9% (78)	26.5% (69)	
Q4 19.63 – 88.24 tsp	25.0% (147)	22.8% (68)	27.3% (79)		26.3% (86)	23.5% (61)	
Dairy, # of daily servings Continuous: Mean (95% CI)	2.0	2.0 (1.9 – 2.2)	2.0 (1.8 – 2.2)	.924	2.1 (2.0 – 2.3)	1.9 (1.7 – 2.1)	.090
Quartiles, % (N)							
Q1 0.06 – 0.96 servings	24.4% (143)	22.8% (68)	26.0% (75)	.780	23.2% (76)	25.8% (67)	.642
Q2 0.97 – 1.61 servings	25.0% (147)	25.8% (77)	24.2% (70)		23.9% (78)	26.5% (69)	
Q3 1.62 – 2.65 servings	25.6% (150)	25.2% (75)	26.0% (75)		26.3% (86)	24.6% (64)	
Q4 2.66 – 12.91 servings	25.0% (147)	26.2% (78)	23.9% (69)		26.6% (87)	23.1% (60)	

Energy, # of kcal/day Continuous: Mean (95% CI)	1865.0	1864.7 (1779.7 – 1949.7)	1865.4 (1774.7 – 1956.1)	.991	1926.3 (1848.4 – 2011.1)	1788.0 (1698.0 – 1878.1)	.029
Quartiles, % (N)							
Q1 665.01 – 1311.45							
Q2 1311.46 – 1709.20	24.9% (146)	24.5% (73)	25.3% (73)	.967	22.6% (74)	27.7% (72)	.409
Q3 1709.21 – 2238.76	25.0% (147)	25.2% (75)	24.9% (72)		24.5% (80)	25.8% (67)	
Q4 2238.77 – 4534.83	25.0% (147) 25.0% (147)	25.8% (77) 24.5% (73)	24.2% (70) 25.6% (74)		26.0% (85) 26.9% (88)	23.9% (62) 22.7% (59)	
Glycemic load, daily Continuous: Mean (95% CI)	119.9	118.0 (111.9 – 124.2)	121.7 (115.0 – 128.5)	.427	124.1 (117.8 – 130.4)	114.5 (108.0 – 121.1)	.041
Quartiles, % (N)							
Q1 21.56 – 83.00							
Q2 83.01 – 105.44	24.9% (146)	25.5% (76)	24.2% (70)	.424	20.8% (68)	30.0% (78)	.069
Q3 105.45 – 140.30	25.0% (147)	23.8% (71)	26.3% (76)		26.6% (87)	23.1% (60)	
Q4 140.31 – 382.52	25.0% (147) 25.0% (147)	27.5% (82) 23.2% (69)	22.5% (65) 27.0% (78)		25.4% (83) 27.2% (89)	24.6% (64) 22.3% (58)	
Percentage of calories from carbohydrate Continuous: Mean (95% CI)	51.1	50.4 (49.6 – 51.3)	51.8 (50.9 – 52.7)	.035	51.3 (50.5 – 52.1)	50.9 (49.9 – 51.8)	.519
% of calories from carbohydrate % (N)							
Low/moderate (<45%)	18.8% (110)	19.5% (58)	18.0% (52)	.648	19.0% (62)	18.5% (48)	.878
High (>= 45%)	81.3% (477)	80.5% (240)	82.00% (237)		81.0% (265)	81.5% (212)	
Percentage of calories from protein Continuous: Mean (95% CI)	16.2	16.49 (16.1 – 16.9)	15.91 (15.5 – 16.3)	.037	16.31 (16.0 – 16.7)	16.1 (15.6 – 16.5)	.382
% kcal from prot, % (N)							
Low (<10%)							
Moderate (10% - 35%)	2.6% (15) 97.4% (572)	2.35% (7) 97.65% (291)	2.77% (8) 97.23% (281)	.748	2.1% (7) 97.9% (572)	3.1% (8) 96.9% (252)	.475

Percentage of calories from fat	33.7	33.7	33.8	.848	33.51	33.98	.330
Continuous: Mean (95% CI)		(33.0 – 34.3)	(33.09 – 34.44)		(32.9 – 34.1)	(33.3 – 34.7)	
% kcal from fat, % (N)							
Low/moderate (<36%)	65.4% (384)	67.1% (200)	63.7% (184)	.380	67.6% (221)	62.69% (163)	.216
High (>= 36%)	34.6% (203)	32.9% (98)	36.3% (105)		32.4% (106)	37.31% (97)	
Demographic variables							
Edinburgh Postnatal Depression Scale (EPDS) score	6.6	7.0 (6.5 – 7.5)	6.30 (5.8 – 6.9)	.079	6.8 (6.3 – 7.3)	6.5 (5.9 – 7.0)	.429
>= 13	10.2% (60)	11.1% (33)	9.3% (27)	.489	11.3% (37)	8.9% (23)	.327
< 13	89.8% (527)	88.9% (265)	90.7% (262)		88.7% (290)	91.1% (237)	
Maternal BMI at 3mos	27.6	26.9	28.3	.008	27.3	28.0	0.163
Continuous: Mean (SE)		(26.3 – 27.6)	(27.5 – 29.0)		(26.6 – 27.9)	(27.2 – 28.8)	
Race/Ethnicity							
White	85.5% (502)	86.6% (258)	84.4% (244)	.614	85.3% (279)	85.8% (223)	.997
Black	3.9% (23)	2.7% (8)	5.2% (15)		4.0% (13)	3.9% (10)	
Hispanic	6.6% (39)	7.1% (21)	6.2% (18)		6.7% (22)	6.5% (17)	
Asian/Pacific Islander	2.9% (17)	2.7% (8)	3.1% (9)		3.1% (10)	2.7% (7)	
Other	1.0% (6)	1.0% (3)	1.0% (3)		0.9% (3)	1.2% (3)	
Enrolled in WIC, Month 3							
Yes	23.3% (137)	17.1% (51)	29.8% (86)	< .001	22.6% (74)	24.2% (63)	.649
No	76.7% (450)	82.9% (247)	70.2% (203)		77.4% (253)	75.8% (197)	
Age	29.7	29.7	29.6	.864	29.7	29.7	.985
Continuous: Mean (SE)		(29.1 – 30.3)	(29.0 – 30.3)		(29.1 – 30.2)	(29.0 – 30.3)	
Smoking				.012			.093
Yes	12.4% (73)	9.1% (27)	15.9% (46)		10.4% (34)	15.0% (39)	
No	87.6% (514)	90.9% (271)	84.1% (243)		89.6% (293)	85.0% (221)	
Marital status				.020			.392
Married	82.3% (483)	85.9% (256)	78.6% (227)		83.5% (273)	80.8% (210)	
Not married	17.7% (104)	14.1% (42)	21.5% (62)		16.5% (54)	19.2% (50)	

Gestational diabetes				.217			.355
Yes	7.0% (41)	5.7% (17)	8.3% (24)		6.1% (20)	8.1% (21)	
No/Not sure	93.0% (546)	94.3% (281)	91.7% (265)		93.9% (307)	91.9% (239)	
Type 2 diabetes				.042			.024
Yes	0.7% (4)	0% (0)	1.4% (4)		0% (0)	1.5% (4)	
No	99.3% (583)	100% (298)	98.6% (285)		100% (327)	98.5% (256)	
Food allergy				.910			.149
Yes	8.5% (50)	8.34% (25)	8.65% (25)		7.03% (23)	10.38% (27)	
No/not marked	91.5% (537)	91.6% (273)	91.35% (264)		92.97% (304)	89.62% (233)	
Intention to breastfeed at least 6m				.233			.908
Yes	77.9% (457)	79.9% (238)	75.8% (219)		77.7% (254)	78.1% (203)	
No/not marked	22.2% (130)	20.1% (60)	24.2% (70)		22.3% (73)	21.9% (57)	

χ^2 were used for categorical variables, and ANOVA for continuous variables

Table 12d: Bivariate associations between dietary factors, covariates, and reasons for stopping breastfeeding (n = 587)

Variable	Total sample	Social-ecological: Community, Institutional, Policy		
		Yes (n = 341)	No (n = 246)	p-value
Dietary factors	(n = 587)			
Magnesium milligrams, Continuous: Mean (95% CI)	295.4	298.2 (282.3 – 314.2)	293.3 (279.8 – 306.9)	.645
Quartiles, % (N)				
Q1 59.46 – 206.94 mg	24.9% (146)	25.2% (62)	24.6% (84)	.985
Q2 206.95 – 273.97 mg	25.0% (147)	24.8% (61)	25.2% (86)	
Q3 273.98 – 365.50 mg	25.0% (147)	25.6% (63)	24.6% (84)	
Q4 365.51 – 832.76 mg	25.0% (147)	24.3% (60)	25.5% (87)	
Added sugar, teaspoons Continuous: Mean (95% CI)	16.7	16.6 (14.9 – 18.3)	16.8 (15.4 – 18.2)	.884
Quartiles, % (N)				
Q1 1.67 – 8.28 tsp	24.9% (146)	23.2% (57)	26.1% (89)	.313
Q2 8.29 – 13.09 tsp	25.0% (147)	28.1% (69)	22.9% (78)	
Q3 13.10 – 19.62 tsp	25.0% (147)	26.4% (65)	24.1% (82)	
Q4 19.63 – 88.24 tsp	25.0% (147)	22.4% (55)	27.0% (92)	
Dairy, # of daily servings Continuous: Mean (95% CI)	2.04	1.9 (1.8 – 2.1)	2.1 (1.9 – 2.3)	.158
Quartiles, % (N)				
Q1 0.06 – 0.96 servings	24.4% (143)	24.0% (59)	24.6% (84)	.326
Q2 0.97 – 1.61 servings	25.0% (147)	25.2% (62)	24.9% (85)	
Q3 1.62 – 2.65 servings	25.6% (150)	28.9% (71)	23.2% (79)	
Q4 2.66 – 12.91 servings	25.0% (147)	22.0% (54)	27.3% (93)	
Energy, # of kcal/day Continuous: Mean (95% CI)	1865.0	1890.9 (1793.4 – 1988.4)	1846.4 (1765.9 – 1926.8)	.487
Quartiles, % (N)				
Q1 665.01 – 1311.45	24.9% (146)	24.8% (61)	24.9% (85)	.741
Q2 1311.46 – 1709.20	25.0% (147)	23.6% (58)	26.1% (89)	
Q3 1709.21 – 2238.76	25.0% (147)	27.2% (67)	23.5% (80)	
Q4 2238.77 – 4534.83	25.0% (147)	24.4% (60)	25.5% (87)	
Glycemic load, daily Continuous: Mean (95% CI)	119.9	121.5 (114.2 – 128.8)	118.7 (112.8 – 124.5)	.544
Quartiles, % (N)				
Q1 21.56 – 83.00	24.9% (146)	25.2% (62)	24.6% (84)	.985
Q2 83.01 – 105.44	25.0% (147)	24.8% (61)	25.2% (86)	
Q3 105.45 – 140.30	25.0% (147)	25.6% (63)	24.6% (84)	
Q4 140.31 – 382.52	25.0% (147)	24.4% (60)	25.5% (87)	

Percentage of calories from carbohydrate Continuous: Mean (95% CI)	51.1	51.00 (50.1 – 51.9)	51.2 (50.4 – 52.0)	.791
% of calories from carbohydrate % (N)				
Low/moderate (< 45%) High (>= 45%)	18.8% (110) 81.3% (477)	19.1% (47) 80.9% (199)	18.5% (63) 81.5% (278)	.847
Percentage of calories from protein Continuous: Mean (95% CI)	16.2	16.2 (15.8 – 16.6)	16.2 (15.8 – 16.6)	0.988
% kcal from prot, % (N)				
Low (<10%) Moderate (10% - 35%)	2.6% (15) 97.4% (572)	2.44% (6) 97.6% (240)	2.6% (9) 97.4% (332)	0.879
Percentage of calories from fat Continuous: Mean (95% CI)	33.7	33.8 (33.0 – 34.5)	33.7 (33.1 – 34.3)	.900
% kcal from fat, % (N)				
Low/moderate (<36%) High (>= 36%)	65.4% (384) 34.58% (203)	65.9% (162) 34.2% (84)	65.1% (222) 34.9% (119)	.850
Demographic variables				
Edinburgh Postnatal Depression Scale (EPDS) score	6.6	7.2 (6.6 – 7.9)	6.2 (5.7 – 6.7)	.009
>= 13 < 13	10.2% (60) 89.8% (527)	14.2% (35) 85.8% (211)	7.3% (25) 92.7% (316)	
Maternal BMI at 3mos Continuous: Mean (95% CI)	27.6	27.4 (26.7 – 28.1)	27.7 (27.0 – 28.4)	.629
Race/Ethnicity				.065
White Black Hispanic Asian/Pacific Islander Other	85.5% (502) 3.9% (23) 6.6% (39) 2.9% (17) 1.0% (6)	82.5% (203) 4.1% (10) 10.2% (25) 2.4% (6) 0.8% (2)	87.6% (299) 3.8% (13) 4.1% (14) 3.2% (11) 1.2% (4)	
Enrolled in WIC, Month 3				.754
Yes No	23.3% (137) 76.7% (450)	24.0% (59) 76.0% (187)	22.9% (78) 77.1% (263)	
Age Continuous: Mean (95% CI)	29.7	29.7 (29.1 – 30.4)	29.6 (29.1 – 30.2)	0.823
Smoking				0.362
Yes No	12.4% (73) 87.6% (514)	11.0% (27) 89.0% (219)	13.5% (46) 86.5% (295)	
Marital status				.927
Married Not married	82.3% (483) 17.7% (104)	82.1% (202) 17.9% (44)	82.4% (281) 17.6% (60)	
Gestational diabetes				0.44
Yes No/Not sure	7.0% (41) 93.0% (546)	6.1% (15) 93.9% (231)	7.6% (26) 92.4% (315)	
Type 2 diabetes				.178
Yes No	0.7% (4) 99.3% (583)	1.2% (3) 98.8% (243)	0.3% (1) 99.7% (340)	

Food allergy				.540
Yes	8.5% (50)	9.4% (23)	7.9% (27)	
No/not marked	91.5% (537)	90.7% (223)	92.1% (314)	
Intention to breastfeed at least 6m				.020
Yes	77.9% (457)	73.2% (180)	81.2% (277)	
No/not marked	22.2% (130)	26.8% (66)	18.8% (64)	

χ^2 were used for categorical variables, and ANOVA for continuous variables

Table 13a: Logistic regression results for average daily magnesium intake (in milligrams) and reasons for stopping breastfeeding (n = 587)

Variable	Insufficient milk		Too much milk	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Magnesium, crude				
Intake quartile 1 (reference)	1.00		1.00	
Intake quartile 2	0.54 *	0.33 – 0.89	0.68	0.25 – 1.84
Intake quartile 3	0.91	0.55 – 1.52	0.89	0.35 – 2.25
Intake quartile 4	0.78	0.47 – 1.28	1.55	0.67 – 3.56
Magnesium, adjusted				
Intake quartile 1 (reference)	1.00		1.00	
Intake quartile 2	0.54 *	0.32 – 0.90	0.58	0.20 – 1.64
Intake quartile 3	0.90	0.53 – 1.51	0.89	0.34 – 2.36
Intake quartile 4	0.72	0.42 – 1.21	1.57	0.62 – 3.73
Breastfeeding intention (yes vs. no)	0.95	0.61 – 1.49	0.28 **	0.14 – 0.56
EPDS score (continuous)	1.02	0.98 – 1.06	1.05	0.98 – 1.12
Maternal BMI at 3 months (continuous)	1.05 **	1.01 – 1.08	1.02	0.97 – 1.08
WIC enrollment at 3 months (yes vs. no)	1.00	0.62 – 1.62	0.68	0.30 – 1.51
Maternal smoking (yes vs. no)	1.03	0.57 – 1.83	2.99	0.82 – 10.93
Maternal age (continuous)	0.98	0.95 – 1.02	0.93 *	0.86 – 1.00
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	1.64	0.58 – 4.62	0.44	0.05 – 3.72
Maternal race: Hispanic	1.95	0.86 – 4.42	1.15	0.31 – 4.26
Maternal race: AAPI	2.05	0.64 – 6.57	1.16	0.14 – 9.84
Maternal race: other	2.67	0.30 – 24.12	--	--
Maternal marital status (yes vs. no)	0.98	0.58 – 1.68	3.09 *	1.02 – 9.37
Gestational diabetes (yes vs. no)	0.68	0.31 – 1.47	1.433	0.31 – 6.62
Type 2 diabetes (yes vs. no)	3.50	0.43 – 28.70	--	--
Maternal food allergy (yes vs. no)	0.86	0.45 – 1.66	0.45	0.17 – 1.21

* p < .05

** p < .01

*** p < .0001

Table 13b: Logistic regression results for average daily magnesium intake (in milligrams) and reasons for stopping breastfeeding (n = 587)

Variable	Pain		Diet concern	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Magnesium, crude				
Intake quartile 1 (reference)	1.00		1.00	
Intake quartile 2	0.67	0.41 – 1.09	1.08	0.48 – 2.46
Intake quartile 3	0.76	0.47 – 1.22	1.36	0.62 – 2.99
Intake quartile 4	0.69	0.43 – 1.12	1.97	0.93 – 4.14
Magnesium, adjusted				
Intake quartile 1 (reference)	1.00		1.00	
Intake quartile 2	0.71	0.43 – 1.18	1.04	0.45 – 2.42
Intake quartile 3	0.87	0.53 – 1.43	1.17	0.52 – 2.60
Intake quartile 4	0.75	0.45 – 1.25	1.68	0.78 – 3.64
Breastfeeding intention (yes vs. no)	0.52 **	0.34 – 0.79	0.90	0.47 – 1.74
EPDS score (continuous)	1.03	0.99 – 1.07	1.03	0.98 – 1.09
Maternal BMI at 3 months (continuous)	1.02	0.99 – 1.05	1.01	0.97 – 1.06
WIC enrollment at 3 months (yes vs. no)	1.05	0.66 – 1.68	0.74	0.37 – 1.47
Maternal smoking (yes vs. no)	0.93	0.54 – 1.62	1.52	0.56 – 4.15
Maternal age (continuous)	0.94 **	0.90 – 0.97	1.05	0.99 – 1.11
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	0.57	0.21 – 1.54	1.77	0.55 – 5.70
Maternal race: Hispanic	0.61	0.28 – 1.33	1.63	0.63 – 4.21
Maternal race: AAPI	1.68	0.60 – 4.71	1.24	0.26 – 5.82
Maternal race: other	2.05	0.39 – 10.84	--	--
Maternal marital status (yes vs. no)	0.83	0.50 – 1.38	1.32	0.59 – 2.97
Gestational diabetes (yes vs. no)	0.52	0.26 – 1.05	5.89	0.78 – 44.51
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	0.77	0.40 – 1.47	1.80	0.61 – 5.30

* p < .05

** p < .01

*** p < .0001

Table 13c: Logistic regression results for average daily magnesium intake (in milligrams) and reasons for stopping breastfeeding (n = 587)

Variable	Social-Ecological, individual		Social-Ecological, family	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Magnesium, crude				
Intake quartile 1 (reference)	1.00		1.00	
Intake quartile 2	1.01	0.64 – 1.60	1.07	0.68 – 1.69
Intake quartile 3	1.49	0.94 – 1.60	1.30	0.82 – 2.06
Intake quartile 4	0.93	0.59 – 1.48	1.30	0.82 – 2.06
Magnesium, adjusted				
Intake quartile 1 (reference)	1.00		1.00	
Intake quartile 2	0.96	0.59 – 1.55	1.05	0.65 – 1.68
Intake quartile 3	1.40	0.87 – 2.26	1.23	0.77 – 1.97
Intake quartile 4	1.08	0.67 – 1.76	1.39	0.86 – 2.24
Breastfeeding intention (yes vs. no)	1.10	0.73 – 1.68	0.94	0.62 – 1.41
EPDS score (continuous)	1.04 *	1.00 – 1.08	1.02	0.98 – 1.06
Maternal BMI at 3 months (continuous)	0.97	0.94 – 1.00	0.99	0.96 – 1.01
WIC enrollment at 3 months (yes vs. no)	1.81 **	1.16 – 2.84	1.00	0.65 – 1.56
Maternal smoking (yes vs. no)	1.77 *	1.02 – 3.09	1.51	0.89 – 2.57
Maternal age (continuous)	0.99	0.95 – 1.02	1.00	0.96 – 1.03
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	0.58	0.23 – 1.45	1.04	0.43 – 2.49
Maternal race: Hispanic	1.24	0.62 – 2.49	1.03	0.52 – 2.02
Maternal race: AAPI	0.69	0.25 – 1.87	1.05	0.38 – 2.86
Maternal race: other	1.99	0.37 – 10.78	0.96	0.18 – 5.06
Maternal marital status (yes vs. no)	1.29	0.79 – 2.13	1.21	0.74 – 1.96
Gestational diabetes (yes vs. no)	1.28	0.64 – 2.56	1.24	0.63 – 2.43
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	1.04	0.57 – 1.91	1.60	0.88 – 2.90

* p < .05

** p < .01

*** p < .0001

Table 13d: Logistic regression results for average daily magnesium intake (in milligrams) and reasons for stopping breastfeeding (n = 587)

Variable	Social-Ecological, policy	
	Odds Ratio	95% Wald Confidence Limits
Magnesium, crude		
Intake quartile 1 (reference)	1.00	
Intake quartile 2	0.96	0.60 – 1.53
Intake quartile 3	1.02	0.64 – 1.62
Intake quartile 4	0.93	0.59 – 1.49
Magnesium, adjusted		
Intake quartile 1 (reference)	1.00	
Intake quartile 2	0.95	0.59 – 1.55
Intake quartile 3	0.97	0.60 – 1.57
Intake quartile 4	0.84	0.51 – 1.37
Breastfeeding intention (yes vs. no)	0.59 *	0.39 – 0.89
EPDS score (continuous)	1.05 *	1.01 – 1.09
Maternal BMI at 3 months (continuous)	0.99	0.96 – 1.02
WIC enrollment at 3 months (yes vs. no)	0.95	0.61 – 1.49
Maternal smoking (yes vs. no)	1.46	0.84 – 2.53
Maternal age (continuous)	1.01	0.97 – 1.04
Maternal race: white (reference)	1.00	
Maternal race: black	1.23	0.51 – 2.96
Maternal race: Hispanic	2.87 **	1.43 – 5.80
Maternal race: AAPI	0.74	0.26 – 2.09
Maternal race: other	1.15	0.20 – 6.67
Maternal marital status (yes vs. no)	1.12	0.68 – 1.84
Gestational diabetes (yes vs. no)	1.46	0.72 – 2.95
Type 2 diabetes (yes vs. no)	0.16	0.11 – 1.63
Maternal food allergy (yes vs. no)	0.89	0.48 – 1.62

* p < .05

** p < .01

*** p < .0001

Table 14a: Logistic regression results for average daily added sugar intake (in teaspoons) and reasons for stopping breastfeeding (n = 587)

Variable	Insufficient milk		Too much milk	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Added sugar, crude				
Intake quartile 4 (reference)	1.00		1.00	
Intake quartile 3	0.89	0.55 – 1.44	0.23 **	0.08 – 0.70
Intake quartile 2	1.03	0.63 – 1.69	0.73	0.33 – 1.60
Intake quartile 1	1.13	0.69 – 1.85	0.54	0.23 – 1.26
Added sugar, adjusted				
Intake quartile 4 (reference)	1.00		1.00	
Intake quartile 3	0.91	0.55 – 1.50	0.25 *	0.08 – 0.81
Intake quartile 2	1.13	0.68 – 1.89	0.91	0.38 – 2.19
Intake quartile 1	1.20	0.71 – 2.01	0.61	0.24 – 1.57
Breastfeeding intention (yes vs. no)	0.93	0.60 – 1.46	0.29 **	0.14 – 0.58
EPDS score (continuous)	1.02	0.98 – 1.06	1.05	0.98 – 1.12
Maternal BMI at 3 months (continuous)	1.05 **	1.01 – 1.08	1.02	0.97 – 1.08
WIC enrollment at 3 months (yes vs. no)	1.05	0.65 – 1.68	0.75	0.33 – 1.73
Maternal smoking (yes vs. no)	0.96	0.54 – 1.72	3.26	0.89 – 11.98
Maternal age (continuous)	0.98	0.95 – 1.02	0.93 *	0.86 – 1.00
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	1.79	0.64- 5.02	0.46	0.05 – 3.88
Maternal race: Hispanic	0.93	0.55 – 1.58	1.29	0.35 – 4.76
Maternal race: AAPI	2.00	0.63 – 6.38	1.15	0.14 – 9.70
Maternal race: other	2.27	0.25 – 20.48	--	--
Maternal marital status (yes vs. no)	0.93	0.55 – 1.58	2.79	0.92 – 8.48
Gestational diabetes (yes vs. no)	0.69	0.32 – 1.49	1.24	0.26 – 5.92
Type 2 diabetes (yes vs. no)	4.25	0.53 – 33.91	--	--
Maternal food allergy (yes vs. no)	0.93	0.48 – 1.78	0.48	0.18 – 1.30

* p < .05

** p < .01

*** p < .0001

Table 14b: Logistic regression results for average daily added sugar intake (in teaspoons) reasons for stopping breastfeeding (n = 587)

Variable	Pain		Diet concern	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Added sugar, crude				
Intake quartile 1	0.93	0.58 – 1.49	1.08	0.53 – 2.18
Intake quartile 2	0.63	0.39 – 1.03	1.07	0.53 – 2.16
Intake quartile 3	0.61 *	0.38 – 1.00	0.56	0.25 – 1.26
Intake quartile 4 (reference)	1.00		1.00	
Added sugar, adjusted				
Intake quartile 1	1.08	0.64 – 1.80	1.31	0.62 – 2.79
Intake quartile 2	0.73	0.43 – 1.23	1.26	0.59 – 2.69
Intake quartile 3	0.65	0.38 – 1.08	0.63	0.27 – 1.48
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	0.54 **	0.35 – 0.83	0.91	0.47 – 1.76
EPDS score (continuous)	1.03	0.99 – 1.07	1.04	0.98 – 1.10
Maternal BMI at 3 months (continuous)	1.02	0.99 – 1.05	1.02	0.97 – 1.06
WIC enrollment at 3 months (yes vs. no)	1.09	0.68 – 1.74	0.65	0.33 – 1.31
Maternal smoking (yes vs. no)	0.96	0.55 – 1.67	1.54	0.56 – 4.22
Maternal age (continuous)	0.93 **	0.90 – 0.97	1.05	0.99 – 1.11
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	0.56	0.21 – 1.52	1.89	0.58 – 6.14
Maternal race: Hispanic	0.58	0.26 – 1.28	1.65	0.64 – 4.27
Maternal race: AAPI	1.68	0.60- 4.67	1.08	0.23 – 5.14
Maternal race: other	1.77	0.34 – 9.34	--	--
Maternal marital status (yes vs. no)	0.81	0.48 – 1.34	1.30	0.59 – 2.91
Gestational diabetes (yes vs. no)	0.56	0.21 – 1.52	6.23	0.82 – 47.41
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	0.80	0.42 – 1.53	1.91	0.65 – 5.64

* p < .05

** p < .01

*** p < .0001

Table 14c: Logistic regression results for average daily added sugar intake (in teaspoons) reasons for stopping breastfeeding (n = 587)

Variable	Social-Ecological, individual		Social-Ecological, family	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Added sugar, crude				
Intake quartile 1	1.23	0.78 – 1.94	0.86	0.54 – 1.37
Intake quartile 2	1.43	0.90 – 2.26	0.92	0.58 – 1.46
Intake quartile 3	1.18	0.75 – 1.86	0.80	0.56 – 1.27
Intake quartile 4 (reference)	1.00		1.00	
Added sugar, adjusted				
Intake quartile 1	1.08	0.62 – 1.64	0.85	0.52 – 1.39
Intake quartile 2	1.21	0.74 – 1.97	0.88	0.54 – 1.43
Intake quartile 3	1.01	0.66 – 1.76	0.74	0.46 – 1.19
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	1.11	0.73 – 1.68	0.97	0.64 – 1.46
EPDS score (continuous)	1.04 *	1.00 – 1.08	1.02	0.99 – 1.06
Maternal BMI at 3 months (continuous)	0.97	0.94 – 1.00	0.99	0.96 – 1.01
WIC enrollment at 3 months (yes vs. no)	1.79 *	1.14 – 2.81	0.99	0.63 – 1.53
Maternal smoking (yes vs. no)	1.75 *	1.01 – 3.05	1.57	0.92 – 2.68
Maternal age (continuous)	0.99	0.95 – 1.02	1.00	0.96 – 1.03
Maternal race: white (reference)				
Maternal race: black	0.61	0.24 – 1.52	1.11	0.47 – 2.64
Maternal race: Hispanic	1.27	0.64 – 2.54	1.07	0.55 – 2.10
Maternal race: AAPI	0.67	0.25 – 1.83	1.04	0.38 – 2.84
Maternal race: other	2.01	0.37 – 10.87	0.99	0.189 – 5.16
Maternal marital status (yes vs. no)	1.29	0.79 – 2.11	1.20	0.74 – 1.94
Gestational diabetes (yes vs. no)	1.37	0.69 – 2.74	1.21	0.61 – 2.37
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	1.10	0.60 – 2.00	1.62	0.90 – 2.95

* p < .05

** p < .01

*** p < .0001

Table 14d: Logistic regression results for average daily added sugar intake (in teaspoons) reasons for stopping breastfeeding (n = 587)

Variable	Social-Ecological, policy	
	Odds Ratio	95% Wald Confidence Limits
Added sugar, crude		
Intake quartile 1	1.07	
Intake quartile 2	1.48	0.67 – 1.72
Intake quartile 3	1.33	0.93 – 2.36
Intake quartile 4 (reference)	1.00	0.83 – 2.11
Added sugar, adjusted		
Intake quartile 1	1.14	0.69 – 1.89
Intake quartile 2	1.70 *	1.04 – 2.80
Intake quartile 3	1.50	0.91 – 2.45
Intake quartile 4 (reference)	1.00	
Breastfeeding intention (yes vs. no)	0.54 **	0.36 – 0.83
EPDS score (continuous)	1.05 *	1.01 – 1.09
Maternal BMI at 3 months (continuous)	0.99	0.96 – 1.02
WIC enrollment at 3 months (yes vs. no)	0.94	0.60 – 1.48
Maternal smoking (yes vs. no)	1.36	0.78 – 2.37
Maternal age (continuous)	1.01	0.97 – 1.05
Maternal race: white (reference)	1.00	
Maternal race: black	1.21	0.51 – 2.91
Maternal race: Hispanic	2.89 **	1.43 – 5.82
Maternal race: AAPI	0.74	0.26 – 2.11
Maternal race: other	1.24	0.21 – 7.19
Maternal marital status (yes vs. no)	1.13	0.69 – 1.85
Gestational diabetes (yes vs. no)	1.56	0.77 – 3.17
Type 2 diabetes (yes vs. no)	0.16	0.02 – 1.59
Maternal food allergy (yes vs. no)	0.89	0.49- 1.64

* p < .05

** p < .01

*** p < .0001

Table 15a: Logistic regression results for average daily dairy intake (in servings) and reasons for stopping breastfeeding (n = 587)

Variable	Insufficient milk		Too much milk	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Dairy, crude				
Intake quartile 1	1.09	0.67 – 1.77	0.45	0.17 – 1.22
Intake quartile 2	1.42	0.86 – 2.34	0.52	0.20 – 1.33
Intake quartile 3	1.10	0.68 – 1.77	1.15	0.53 – 2.50
Intake quartile 4 (reference)	1.00		1.00	
Dairy, adjusted				
Intake quartile 1	0.92	0.59 – 1.43	0.42	0.14 – 1.23
Intake quartile 2	1.39	0.83 – 2.30	0.54	0.20 – 1.46
Intake quartile 3	1.06	0.64 – 1.73	1.21	0.52 – 2.82
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	0.92	0.59 – 1.43	0.26 **	0.13 – 0.53
EPDS score (continuous)	1.02	0.98 – 1.06	1.06	0.99 – 1.13
Maternal BMI at 3 months (continuous)	1.05 **	1.01 – 1.08	1.02	0.96 – 1.08
WIC enrollment at 3 months (yes vs. no)	1.06	0.66 – 1.70	0.74	0.33 – 1.65
Maternal smoking (yes vs. no)	0.94	0.53 – 1.68	2.79	0.76 -10.25
Maternal age (continuous)	0.98	0.95 – 1.02	0.93	0.87 – 1.00
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	1.77	0.63 – 4.97	0.54	0.06 – 4.69
Maternal race: Hispanic	1.97	0.87 – 4.44	1.34	0.36 – 4.95
Maternal race: AAPI	2.06	0.64 – 6.59	1.54	0.18 – 14.47
Maternal race: other	2.11	0.24 – 19.01	--	--
Maternal marital status (yes vs. no)	0.95	0.56 – 1.62	2.80	0.91 – 8.58
Gestational diabetes (yes vs. no)	0.68	0.31 – 1.47	1.36	0.30 – 6.22
Type 2 diabetes (yes vs. no)	3.767	0.48 – 29.65	--	--
Maternal food allergy (yes vs. no)	0.90	0.47 – 1.73	0.46	0.17 – 1.24

* p < .05

** p < .01

*** p < .0001

Table 15b: Logistic regression results for average daily dairy intake (in servings) reasons for stopping breastfeeding (n = 587)

Variable	Pain		Diet concern	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Dairy, crude				
Intake quartile 1	1.39	0.85 – 2.27	1.03	0.50 – 2.11
Intake quartile 2	1.50	0.92 – 2.43	0.74	0.35 – 1.59
Intake quartile 3	1.25	0.76 – 2.05	0.91	0.44 – 1.88
Intake quartile 4 (reference)	1.00		1.00	
Dairy, adjusted				
Intake quartile 1	1.44	0.85 – 2.44	1.05	0.49 – 2.23
Intake quartile 2	1.51	0.91 – 2.53	0.80	0.36 – 1.76
Intake quartile 3	1.30	0.77 – 2.18	0.89	0.42 – 1.90
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	0.51 **	0.33 – 0.77	0.91	0.48 – 1.75
EPDS score (continuous)	1.02	0.98 – 1.06	1.03	0.98 – 1.10
Maternal BMI at 3 months (continuous)	1.02	0.99 – 1.05	1.02	0.97 – 1.06
WIC enrollment at 3 months (yes vs. no)	1.09	0.68 – 1.74	0.70	0.35 – 1.39
Maternal smoking (yes vs. no)	0.91	0.52 – 1.59	1.51	0.55 – 4.12
Maternal age (continuous)	0.94 *	0.90 – 0.97	1.05	1.00 – 1.11
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	0.54	0.20 – 1.47	1.88	0.58 – 6.13
Maternal race: Hispanic	0.61	0.28 – 1.33	1.70	0.66 – 4.38
Maternal race: AAPI	1.63	0.58 – 4.56	1.18	0.25 – 5.57
Maternal race: other	1.80	0.34 – 9.55	--	--
Maternal marital status (yes vs. no)	0.80	0.48 – 1.34	1.25	0.56 – 2.79
Gestational diabetes (yes vs. no)	0.52	0.26 – 1.04	6.07	0.80 – 46.12
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	0.79	0.41 – 1.50	1.86	0.63 – 5.47

* p < .05

** p < .01

*** p < .0001

**Table 15c: Logistic regression results for average daily dairy intake (in servings)
reasons for stopping breastfeeding (n = 587)**

Variable	Social-Ecological, individual		Social-Ecological, family	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Dairy, crude				
Intake quartile 1	0.80	0.51 – 1.27	0.78	0.49 – 1.25
Intake quartile 2	0.97	0.62 – 1.54	0.78	0.49 – 1.24
Intake quartile 3	0.89	0.56 – 1.40	0.93	0.58 – 1.47
Intake quartile 4 (reference)	1.00		1.00	
Dairy, adjusted				
Intake quartile 1	0.74	0.46 – 1.20	0.73	0.45 – 1.19
Intake quartile 2	0.92	0.57 – 1.48	0.75	0.46 – 1.20
Intake quartile 2	0.89	0.55 – 1.44	0.89	0.55 – 1.42
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	1.11	0.73 – 1.69	0.94	0.62 – 1.42
EPDS score (continuous)	1.04 *	1.01 – 1.08	1.02	0.99 – 1.06
Maternal BMI at 3 months (continuous)	0.97 *	0.94 – 1.00	0.99	0.96 – 1.01
WIC enrollment at 3 months (yes vs. no)	1.84 **	1.17 – 2.88	0.99	0.64 – 1.54
Maternal smoking (yes vs. no)	1.72	0.99 – 2.99	1.49	0.88 – 2.54
Maternal age (continuous)	0.99	0.95 – 1.02	1.00	0.96 – 1.03
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	0.63	0.25 – 1.59	1.16	0.48 – 2.76
Maternal race: Hispanic	1.27	0.63 – 2.53	1.07	0.55 – 2.10
Maternal race: AAPI	0.74	0.27 – 2.01	1.10	0.40 – 3.04
Maternal race: other	1.91	0.35 – 10.34	1.00	0.19 – 5.26
Maternal marital status (yes vs. no)	1.32	0.81 – 2.18	1.25	0.74 – 1.95
Gestational diabetes (yes vs. no)	1.36	0.68 – 2.70	1.25	0.64 – 2.45
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	1.07	0.59 – 1.97	1.61	0.89 – 2.92

* p < .05

** p < .01

*** p < .0001

Table 15d: Logistic regression results for average daily dairy intake (in servings) reasons for stopping breastfeeding (n = 587)

Variable	Social-Ecological, policy	
	Odds Ratio	95% Wald Confidence Limits
Dairy, crude		
Intake quartile 1	1.21	0.75 – 1.94
Intake quartile 2	1.26	0.79 – 2.01
Intake quartile 3	1.55	0.97 – 2.46
Intake quartile 4 (reference)	1.00	
Dairy, adjusted		
Intake quartile 1	1.26	0.77 – 2.08
Intake quartile 2	1.32	0.81 – 2.15
Intake quartile 3	1.69 *	1.04 – 2.74
Intake quartile 4 (reference)	1.00	
Breastfeeding intention (yes vs. no)	0.58 **	0.38 – 0.87
EPDS score (continuous)	1.05 *	1.01– 1.09
Maternal BMI at 3 months (continuous)	0.99	0.96 – 1.02
WIC enrollment at 3 months (yes vs. no)	1.01	0.64 – 1.58
Maternal smoking (yes vs. no)	1.48	0.85 – 2.58
Maternal age (continuous)	1.01	0.97 – 1.04
Maternal race: white (reference)	1.00	
Maternal race: black	1.11	0.46 – 2.68
Maternal race: Hispanic	2.90 **	1.44 – 5.83
Maternal race: AAPI	0.76	0.27 – 2.19
Maternal race: other	1.09	0.19 – 6.36
Maternal marital status (yes vs. no)	1.09	0.66 – 1.80
Gestational diabetes (yes vs. no)	1.45	0.72 – 2.93
Type 2 diabetes (yes vs. no)	0.14	0.01 – 1.42
Maternal food allergy (yes vs. no)	0.89	0.48 – 1.63

* p < .05

** p < .01

*** p < .0001

Table 16a: Logistic regression results for average daily energy intake (in calories) and reasons for stopping breastfeeding (n = 587)

Variable	Insufficient milk		Too much milk	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Calories, crude				
Intake quartile 1	1.09	0.66 – 1.81	0.47	0.20 – 1.08
Intake quartile 2	0.85	0.52 – 1.40	0.25 **	0.09 – 0.70
Intake quartile 3	0.76	0.47 – 1.23	0.47	0.20 – 1.09
Intake quartile 4 (reference)	1.00		1.00	
Calories, adjusted				
Intake quartile 1	1.20	0.71 – 2.03	0.43	0.17 – 1.04
Intake quartile 2	0.98	0.59 – 1.64	0.24 **	0.08 – 0.69
Intake quartile 3	0.82	0.50 – 1.35	0.54	0.22 – 1.31
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	0.96	0.61 – 1.51	0.26 **	0.13 – 0.54
EPDS score (continuous)	1.02	0.98 – 1.06	1.05	0.98 – 1.12
Maternal BMI at 3 months (continuous)	1.04 *	1.01 – 1.08	1.01	0.96 – 1.07
WIC enrollment at 3 months (yes vs. no)	1.04	0.65 – 1.67	0.74	0.33 – 1.67
Maternal smoking (yes vs. no)	0.96	0.54 – 1.72	3.15	0.86 – 11.53
Maternal age (continuous)	0.98	0.95 – 1.02	0.93	0.86 – 1.00
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	1.77	0.63 – 5.00	0.40	0.05 – 3.60
Maternal race: Hispanic	2.02	0.89 – 4.56	1.11	0.30 – 4.17
Maternal race: AAPI	2.05	0.64 – 6.52	1.14	0.13 – 9.84
Maternal race: other	2.25	0.25 – 20.17	--	--
Maternal marital status (yes vs. no)	0.92	0.54 – 1.55	2.85	0.92 – 8.76
Gestational diabetes (yes vs. no)	0.67	0.31 – 1.45	1.32	0.28 – 6.17
Type 2 diabetes (yes vs. no)	3.99	0.51 – 31.28	--	--
Maternal food allergy (yes vs. no)	0.93	0.48 – 1.78	0.42	0.16 – 1.14

* p < .05

** p < .01

*** p < .0001

Table 16b: Logistic regression results for average daily energy intake (in calories) and reasons for stopping breastfeeding (n = 587)

Variable	Pain		Diet concern	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Calories, crude				
Intake quartile 1	1.22	0.75 – 1.98	0.54	0.27 – 1.10
Intake quartile 2	0.97	0.59 – 1.59	0.67	0.34 – 1.31
Intake quartile 3	1.31	0.81 – 2.13	0.30 **	0.13 – 0.68
Intake quartile 4 (reference)	1.00		1.00	
Calories, adjusted				
Intake quartile 1	1.20	0.71 – 2.02	0.64	0.30 – 1.33
Intake quartile 2	1.01	0.60 – 1.70	0.76	0.28 – 1.54
Intake quartile 3	1.49	0.89 – 2.49	0.31 **	0.13 – 0.74
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	0.49 **	0.32 – 0.76	0.98	0.51 – 1.89
EPDS score (continuous)	1.03	0.99 – 1.07	1.03	0.98 – 1.09
Maternal BMI at 3 months (continuous)	1.02	0.99 – 1.05	1.01	0.97 – 1.06
WIC enrollment at 3 months (yes vs. no)	1.08	0.68 – 1.73	0.74	0.37 – 1.48
Maternal smoking (yes vs. no)	0.91	0.53 – 1.58	1.49	0.55 – 4.09
Maternal age (continuous)	0.94 **	0.90 – 0.97	1.05	1.00 – 1.11
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	0.58	0.21 – 1.57	1.77	0.54 – 5.75
Maternal race: Hispanic	0.60	0.27 – 1.32	1.78	0.68 – 4.63
Maternal race: AAPI	1.72	0.62 – 4.78	1.24	0.26 – 5.86
Maternal race: other	2.06	0.38 – 11.05	--	--
Maternal marital status (yes vs. no)	0.80	0.48 – 1.34	1.28	0.57 – 2.87
Gestational diabetes (yes vs. no)	0.52	0.26 – 1.04	5.64	0.75 – 42.63
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	0.77	0.40 – 1.46	1.89	0.64 – 5.57

* p < .05

** p < .01

*** p < .0001

Table 16c: Logistic regression results for average daily energy intake (in calories) and reasons for stopping breastfeeding (n = 587)

Variable	Social-ecological: individual		Social-ecological: family	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Calories, crude				
Intake quartile 1	1.01	0.64 – 1.60	0.69	0.43 – 1.09
Intake quartile 2	1.06	0.67 – 1.67	0.80	0.50 – 1.27
Intake quartile 3	1.12	0.71 – 1.76	0.92	0.58 – 1.46
Intake quartile 4 (reference)	1.00		1.00	
Calories, adjusted				
Intake quartile 1	0.84	0.52 – 1.37	0.65	0.40 – 1.06
Intake quartile 2	0.87	0.54 – 1.41	0.73	0.45 – 1.06
Intake quartile 3	0.98	0.60 – 1.58	0.87	0.54 – 1.40
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	1.11	0.73 – 1.69	0.92	0.61 – 1.40
EPDS score (continuous)	1.04 *	1.00 – 1.08	1.02	0.96 – 1.06
Maternal BMI at 3 months (continuous)	0.97	0.94 – 1.00	0.99	0.96 – 1.01
WIC enrollment at 3 months (yes vs. no)	1.88 **	1.20 – 2.94	1.03	0.67 – 1.61
Maternal smoking (yes vs. no)	1.79 *	1.03 – 3.10	1.53	0.90 – 2.60
Maternal age (continuous)	0.99	0.95 – 1.02	1.00	0.96 – 1.03
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	0.58	0.23 – 1.46	1.04	0.43 – 2.49
Maternal race: Hispanic	1.26	0.63 – 2.51	1.04	0.53 – 2.04
Maternal race: AAPI	0.69	0.25 – 1.87	1.05	0.38 – 2.86
Maternal race: other	1.92	0.36 – 10.39	0.92	0.17 – 4.84
Maternal marital status (yes vs. no)	1.29	0.79 – 2.11	1.20	0.74 – 1.95
Gestational diabetes (yes vs. no)	1.34	0.67 – 2.66	1.23	0.63 – 2.40
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	1.07	0.59 – 1.96	1.59	0.88 – 2.89

* p < .05

** p < .01

*** p < .0001

Table 16d: Logistic regression results for average daily energy intake (in calories) and reasons for stopping breastfeeding (n = 587)

Variable	Social-ecological: policy	
	Odds Ratio	95% Wald Confidence Limits
Calories, crude		
Intake quartile 1	1.04	0.65 – 1.66
Intake quartile 2	0.95	0.59 – 1.51
Intake quartile 3	1.21	0.77 – 1.93
Intake quartile 4 (reference)	1.00	
Calories, adjusted		
Intake quartile 1	1.10	0.67 – 1.79
Intake quartile 2	1.01	0.62 – 1.65
Intake quartile 3	1.33	0.82 – 2.15
Intake quartile 4 (reference)	1.00	
Breastfeeding intention (yes vs. no)	0.57 **	0.38 – 0.87
EPDS score (continuous)	1.05 *	1.01 – 1.09
Maternal BMI at 3 months (continuous)	0.99	0.96 – 1.02
WIC enrollment at 3 months (yes vs. no)	0.97	0.62 – 1.52
Maternal smoking (yes vs. no)	1.46	0.85 – 2.54
Maternal age (continuous)	1.01	0.97 – 1.04
Maternal race: white (reference)	1.00	
Maternal race: black	1.21	0.50 – 2.91
Maternal race: Hispanic	2.81 **	1.40 – 5.66
Maternal race: AAPI	0.74	0.26 – 2.11
Maternal race: other	1.20	0.21 – 6.97
Maternal marital status (yes vs. no)	1.13	0.69 – 1.85
Gestational diabetes (yes vs. no)	1.47	0.73 – 2.98
Type 2 diabetes (yes vs. no)	0.17	0.02 – 1.71
Maternal food allergy (yes vs. no)	0.87	0.48 – 1.60

* p < .05

** p < .01

*** p < .0001

Table 17a: Logistic regression results for average daily glycemic load and reasons for stopping breastfeeding (n = 587)

Variable	Insufficient milk		Too much milk	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Glycemic load, crude				
Intake quartile 1	1.44	0.86 – 2.41	0.27 **	0.11 – 0.69
Intake quartile 2	0.68	0.42 – 1.10	0.27 **	0.11 – 0.69
Intake quartile 3	0.97	0.59 – 1.58	0.42 *	0.18 – 0.95
Intake quartile 4 (reference)	1.00		1.00	
Glycemic load, adjusted				
Intake quartile 1	1.54	0.91 – 2.62	0.39 *	0.16 – 0.95
Intake quartile 2	0.78	0.47 – 1.28	0.29 *	0.11 – 0.77
Intake quartile 3	1.04	0.63 – 1.72	0.29 *	0.11 – 0.78
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	0.97	0.62 – 1.52	0.30 **	0.15 – 0.60
EPDS score (continuous)	1.02	0.98 – 1.07	1.05	0.98 – 1.12
Maternal BMI at 3 months (continuous)	1.04*	1.01 – 1.08	1.01	0.96 – 1.07
WIC enrollment at 3 months (yes vs. no)	1.06	0.66 – 1.70	0.77	0.34 – 1.76
Maternal smoking (yes vs. no)	0.98	0.55 – 1.76	3.26	0.89 – 11.95
Maternal age (continuous)	0.98	0.95 – 1.02	0.93	0.86 – 1.00
Maternal race: white	1.00		1.00	
Maternal race: black	1.75	0.62 – 4.95	0.41	0.05 – 3.59
Maternal race: Hispanic	2.03	0.90 – 4.58	1.22	0.33 – 4.56
Maternal race: AAPI	1.92	0.60 – 6.17	1.06	0.12 – 9.07
Maternal race: other	2.41	0.27 – 21.69	--	--
Maternal marital status (yes vs. no)	0.94	0.55 – 1.60	3.00	0.97 – 9.24
Gestational diabetes (yes vs. no)	0.71	0.33 – 1.54	1.37	0.29 – 6.43
Type 2 diabetes (yes vs. no)	3.23	0.40 – 25.85	--	--
Maternal food allergy (yes vs. no)	0.94	0.49 – 1.81	0.50	0.18 – 1.37

* p < .05

** p < .01

*** p < .0001

Table 17b, continued: Logistic regression results for average daily glycemic load and reasons for stopping breastfeeding (n = 587)

Variable	Pain		Diet concern	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Glycemic load, crude				
Intake quartile 1	1.31	0.82 – 2.10	0.65	0.32 – 1.31
Intake quartile 2	0.55 *	0.33 – 0.92	0.55	0.27 – 1.14
Intake quartile 3	0.97	0.60 – 1.57	0.55	0.27 – 1.14
Intake quartile 4 (reference)	1.00		1.00	
Glycemic load, adjusted				
Intake quartile 1	1.38	0.83 – 2.28	0.73	0.35 – 1.51
Intake quartile 2	0.62	0.36 – 1.08	0.61	0.28 – 1.32
Intake quartile 3	1.13	0.68 – 1.87	0.53	0.25 – 1.14
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	0.53 **	0.35 – 0.81	0.95	0.49 – 1.84
EPDS score (continuous)	1.03	0.99 – 1.07	1.03	0.98 – 1.10
Maternal BMI at 3 months (continuous)	1.02	0.99 – 1.05	1.01	0.97 – 1.06
WIC enrollment at 3 months (yes vs. no)	1.09	0.68 – 1.75	0.73	0.37 – 1.45
Maternal smoking (yes vs. no)	0.91	0.53 – 1.59	1.58	0.58 – 4.31
Maternal age (continuous)	0.93 **	0.90 – 0.97	1.05	1.00 – 1.11
Maternal race: white	1.00		1.00	
Maternal race: black	0.54	0.20 – 1.48	1.86	0.58 – 5.95
Maternal race: Hispanic	0.83	0.50 – 1.33	1.75	0.68 – 4.52
Maternal race: AAPI	1.57	0.56 – 4.42	1.23	0.26 – 5.75
Maternal race: other	2.08	0.39 – 11.20	--	--
Maternal marital status (yes vs. no)	0.83	0.50 – 1.38	1.33	0.59 – 2.97
Gestational diabetes (yes vs. no)	0.54	0.27 – 1.08	5.83	0.77 – 44.02
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	0.81	0.42 – 1.56	1.92	0.65 – 5.65

* p < .05

** p < .01

*** p < .0001

Table 17c: Logistic regression results for average daily glycemic load and reasons for stopping breastfeeding (n = 587)

Variable	Social-ecological: individual		Social-ecological: family	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
Glycemic load, crude				
Intake quartile 1	1.23	0.78 – 1.94	0.57	0.36 – 0.90
Intake quartile 2	1.06	0.67 – 1.67	0.95	0.59 – 1.51
Intake quartile 3	1.43	0.90 – 2.26	0.85	0.53 – 1.35
Intake quartile 4 (reference)	1.00		1.00	
Glycemic load, adjusted				
Intake quartile 1	1.04	0.64 – 1.69	0.54	0.33 – 0.87
Intake quartile 2	0.80	0.49 – 1.30	0.88	0.54 – 1.44
Intake quartile 3	1.23	0.76 – 1.99	0.78	0.48 – 1.25
Intake quartile 4 (reference)	1.00		1.00	
Breastfeeding intention (yes vs. no)	1.13	0.74 – 1.72	0.92	0.61 – 1.40
EPDS score (continuous)	1.04 *	1.00 – 1.08	1.02	0.96 – 1.06
Maternal BMI at 3 months (continuous)	0.97 *	0.94 – 1.00	0.99	0.96 – 1.02
WIC enrollment at 3 months (yes vs. no)	1.89 **	1.20 – 2.98	1.04	0.67 – 1.62
Maternal smoking (yes vs. no)	1.77	1.02 – 3.08	1.53	0.90 – 2.60
Maternal age (continuous)	0.99	0.95 – 1.02	1.00	0.96 – 1.03
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	0.58	0.23 – 1.46	1.06	0.44 – 2.54
Maternal race: Hispanic	1.26	0.63 – 2.51	1.05	0.54 – 2.07
Maternal race: AAPI	0.66	0.24 – 1.81	1.11	0.40 – 3.06
Maternal race: other	2.08	0.39 – 11.10	0.94	0.18 – 5.06
Maternal marital status (yes vs. no)	1.30	0.79 – 2.13	1.20	0.74 – 1.95
Gestational diabetes (yes vs. no)	1.36	0.68 – 2.72	1.19	0.61 – 2.35
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	1.07	0.58 – 1.96	1.59	0.87 – 2.90

* p < .05

** p < .01

*** p < .0001

Table 17d: Logistic regression results for average daily glycemic load and reasons for stopping breastfeeding (n = 587)

Variable	Social-ecological: policy	
	Odds Ratio	95% Wald Confidence Limits
Glycemic load, crude		
Intake quartile 4 (reference)	1.07	0.67 – 1.70
Intake quartile 3	1.03	0.65 – 1.64
Intake quartile 2	1.09	0.68 – 1.73
Intake quartile 1	1.00	
Glycemic load, adjusted		
Intake quartile 1	1.14	0.70 – 1.86
Intake quartile 2	1.06	0.65 – 1.74
Intake quartile 3	1.10	0.68 – 1.78
Intake quartile 4 (reference)	1.00	
Breastfeeding intention (yes vs. no)	0.59 *	0.39 – 0.89
EPDS score (continuous)	1.05 *	1.01 – 1.09
Maternal BMI at 3 months (continuous)	0.99	0.96 – 1.02
WIC enrollment at 3 months (yes vs. no)	0.96	0.61 – 1.51
Maternal smoking (yes vs. no)	1.45	0.84 – 2.52
Maternal age (continuous)	1.01	0.97 – 1.04
Maternal race: white (reference)	1.00	
Maternal race: black	1.21	0.50 – 2.91
Maternal race: Hispanic	2.83 **	1.41 – 5.70
Maternal race: AAPI	0.73	0.26 – 2.09
Maternal race: other	1.15	0.20 – 6.61
Maternal marital status (yes vs. no)	1.12	0.68 – 1.84
Gestational diabetes (yes vs. no)	1.47	0.73 – 2.980
Type 2 diabetes (yes vs. no)	0.17	0.02 – 1.71
Maternal food allergy (yes vs. no)	0.89	0.48 – 1.63

* p < .05 ** p < .01

*** p < .0001

Table 18a: Logistic regression results for average daily percentage of calories from carbohydrate and reasons for stopping breastfeeding (n = 587)

Variable	Insufficient milk		Too much milk	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from carbohydrates, crude Low/moderate (< 45%) vs. high (45%+)	1.31	0.83 – 2.08	1.66	0.80 – 3.42
% of calories from carbohydrates, adjusted Low/moderate (< 45%) vs. high (45%+)	1.32	0.82 – 2.12	2.13	0.98 – 4.65
Breastfeeding intention (yes vs. no)	0.93	0.60 – 1.45	0.27 **	0.13 – 0.54
EPDS score (continuous)	1.02	0.98 – 1.06	1.06	0.99 – 1.13
Maternal BMI at 3 months (continuous)	1.04 *	1.01 – 1.08	1.03	0.97 – 1.08
WIC enrollment at 3 months (yes vs. no)	1.06	0.66 – 1.69	0.66	0.30 – 1.48
Maternal smoking (yes vs. no)	0.97	0.54 – 1.72	2.78	0.77 – 10.03
Maternal age (continuous)	0.98	0.95 – 1.02	0.93 *	0.86 – 1.00
Maternal race: white (reference)	1.00			
Maternal race: black	1.78	0.63 – 4.99	0.60	0.07 – 4.45
Maternal race: Hispanic	2.00	0.89 – 4.51	1.22	0.33 – 4.92
Maternal race: AAPI	2.16	0.68 – 6.86	1.35	0.16 – 11.48
Maternal race: other	2.22	0.25 – 20.07	--	--
Maternal marital status (yes vs. no)	0.93	0.55 – 1.57	2.91	0.95 – 8.88
Gestational diabetes (yes vs. no)	0.71	0.33 – 1.53	1.67	0.36 – 7.75
Type 2 diabetes (yes vs. no)	3.89	0.49 – 31.21	--	--
Maternal food allergy (yes vs. no)	0.90	0.47 – 1.72	0.45	0.17 – 1.21

* p < .05

** p < .01

*** p < .0001

Table 18b: Logistic regression results for average daily percentage of calories from carbohydrate and reasons for stopping breastfeeding (n = 587)

Variable	Pain		Diet concern	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from carbohydrates, crude Low/moderate (< 45%) vs. high (45%+)	1.21	0.79 – 1.86	1.15	0.60 – 2.19
% of calories from carbohydrates, adjusted Low/moderate (< 45%) vs. high (45%+)	1.30	0.83 – 2.05	1.27	0.65 – 2.49
Breastfeeding intention (yes vs. no)	0.51 **	0.34 – 0.78	0.90	0.47 – 1.71
EPDS score (continuous)	1.03	0.99 – 1.07	1.03	0.98 – 1.01
Maternal BMI at 3 months (continuous)	1.02	0.99 – 1.05	1.02	0.97 – 1.06
WIC enrollment at 3 months (yes vs. no)	1.08	0.68 – 1.72	0.70	0.35 – 1.37
Maternal smoking (yes vs. no)	0.90	0.52 – 1.56	1.49	0.55 – 4.06
Maternal age (continuous)	0.93	0.90 – 0.97	1.05	1.00 – 1.11
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	0.57	0.21 – 1.54	1.94	0.61 – 6.22
Maternal race: Hispanic	0.60	0.27 – 1.32	1.71	0.67 – 4.39
Maternal race: AAPI	1.81	0.65 – 5.02	1.25	0.27 – 5.89
Maternal race: other	1.81	0.34 – 9.62	--	--
Maternal marital status (yes vs. no)	0.81	0.49- 1.35	1.27	0.57 – 2.82
Gestational diabetes (yes vs. no)	0.54	0.27 – 1.08	6.29	0.83 – 47.84
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	0.77	0.41 – 1.48	1.82	0.62 – 5.36

* p < .05

** p < .01

*** p < .0001

Table 18c: Logistic regression results for average daily percentage of calories from carbohydrate and reasons for stopping breastfeeding (n = 587)

Variable	Social-ecological: individual		Social-ecological: family	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from carbohydrates, crude Low/moderate (< 45%) vs. high (45%+)	1.10	0.73 – 1.67	1.03	0.68 – 1.57
% of calories from carbohydrates, adjusted Low/moderate (< 45%) vs. high (45%+)	1.13	0.73 – 1.75	1.08	0.70 – 1.66
Breastfeeding intention (yes vs. no)	1.12	0.72 – 1.70	0.94	0.63 – 1.42
EPDS score (continuous)	1.04 *	1.00 – 1.08	1.02	0.99 – 1.06
Maternal BMI at 3 months (continuous)	0.97 *	0.94 – 1.00	0.99	0.96 – 1.01
WIC enrollment at 3 months (yes vs. no)	1.82 **	1.16 – 2.84	0.97	0.63 -1.51
Maternal smoking (yes vs. no)	1.77*	1.02 – 3.06	1.51	0.89 – 2.55
Maternal age (continuous)	0.99	0.95 – 1.02	1.00	0.96 – 1.03
Maternal race: white	1.00		1.00	
Maternal race: black	0.61	0.24 – 1.51	1.12	0.73 – 1.92
Maternal race: Hispanic	1.28	0.64 – 2.54	1.07	0.55 – 2.09
Maternal race: AAPI	0.70	0.26 – 1.89	1.03	0.38 – 2.82
Maternal race: other	1.92	0.36 – 10.35	0.96	0.18 – 5.03
Maternal marital status (yes vs. no)	1.28	0.78 – 2.10	1.19	0.73 – 1.92
Gestational diabetes (yes vs. no)	1.38	0.69 – 2.75	1.27	0.65 – 2.50
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	1.08	0.59 – 1.97	1.62	0.89 – 2.93

* p < .05

** p < .01

*** p < .0001

Table 18d: Logistic regression results for average daily percentage of calories from carbohydrate and reasons for stopping breastfeeding (n = 587)

Variable	Social-ecological: policy	
	Odds Ratio	95% Wald Confidence Limits
% of calories from carbohydrates, crude Low/moderate (< 45%) vs. high (45%+)	1.04	0.69 – 1.59
% of calories from carbohydrates, adjusted Low/moderate (< 45%) vs. high (45%+)	1.11	0.72 – 1.72
Breastfeeding intention (yes vs. no)	0.59 *	0.39 – 0.89
EPDS score (continuous)	1.05 *	1.01 – 1.09
Maternal BMI at 3 months (continuous)	0.99	0.96 – 1.02
WIC enrollment at 3 months (yes vs. no)	0.97	0.62 – 1.51
Maternal smoking (yes vs. no)	1.46	0.84 – 2.53
Maternal age (continuous)	1.01	0.97 – 1.04
Maternal race: white (reference)	1.00	
Maternal race: black	1.20	0.50 – 2.87
Maternal race: Hispanic	2.83 **	1.41 – 5.70
Maternal race: AAPI	0.76	0.27 – 2.15
Maternal race: other	1.12	0.19 – 6.48
Maternal marital status (yes vs. no)	1.13	0.69 – 1.85
Gestational diabetes (yes vs. no)	1.49	0.73 – 3.01
Type 2 diabetes (yes vs. no)	0.17	0.02 – 1.74
Maternal food allergy (yes vs. no)	0.88	0.48 – 1.62

* p < .05 ** p < .01

*** p < .0001

Table 19a: Logistic regression results for average daily percentage of calories from protein and reasons for stopping breastfeeding (n = 587)

Variable	Insufficient milk		Too much milk	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from protein, crude Moderate (10% - 35%) vs. low (<10%)	0.53	0.15 – 1.89	0.48	0.10 – 2.18
% of calories from protein, adjusted Moderate (10% - 35%) vs. low (<10%)	0.47	0.13 – 1.72	0.45	0.09 – 2.34
Breastfeeding intention (yes vs. no)	0.95	0.61 – 1.47	0.28 **	0.14 – 0.56
EPDS score (continuous)	1.02	0.98 – 1.06	1.05	0.98 – 1.12
Maternal BMI at 3 months (continuous)	1.05 *	1.01 – 1.08	1.02	0.97 – 1.08
WIC enrollment at 3 months (yes vs. no)	1.08	0.68 – 1.73	0.72	0.32 – 1.59
Maternal smoking (yes vs. no)	1.01	0.56 – 1.80	3.15	0.84 – 11.84
Maternal age (continuous)	0.98	0.95 – 1.02	0.93	0.86 – 1.00
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	1.73	0.62 – 4.86	0.54	0.07 – 4.41
Maternal race: Hispanic	2.04	0.91 – 4.59	1.29	0.36 – 4.65
Maternal race: AAPI	2.13	0.67 – 6.78	1.16	0.14 – 9.76
Maternal race: other	2.32	0.26 – 20.81	--	--
Maternal marital status (yes vs. no)	0.92	0.55 – 1.56	2.70	0.90 – 8.07
Gestational diabetes (yes vs. no)	0.68	0.31 – 1.46	1.42	0.31 – 6.58
Type 2 diabetes (yes vs. no)	3.84	0.48 – 30.45	--	--
Maternal food allergy (yes vs. no)	0.89	0.47 – 1.71	0.45	0.17 – 1.21

* p < .05

** p < .01

*** p < .0001

Table 19b: Logistic regression results for average daily percentage of calories from protein and reasons for stopping breastfeeding (n = 587)

Variable	Pain		Diet concern	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from protein, crude Moderate (10% - 35%) vs. low (<10%)	0.33 *	0.12 – 0.94	0.78	0.17 – 3.52
% of calories from protein, adjusted Moderate (10% - 35%) vs. low (<10%)	0.39	0.13 – 1.19	0.68	0.14 – 3.30
Breastfeeding intention (yes vs. no)	0.52 **	0.34 – 0.80	0.91	0.47 – 1.73
EPDS score (continuous)	1.03	0.99 – 1.07	1.03	0.98 – 1.09
Maternal BMI at 3 months (continuous)	1.02	0.99 – 1.05	1.02	0.97 – 1.06
WIC enrollment at 3 months (yes vs. no)	1.10	0.69 – 1.75	0.71	0.36 – 1.40
Maternal smoking (yes vs. no)	0.95	0.55 – 1.66	1.51	0.55 – 4.12
Maternal age (continuous)	0.94 **	0.90 – 0.97	1.06	1.00 – 1.12
Maternal race: white	1.00		1.00	
Maternal race: black	0.55	0.21 – 1.49	1.90	0.59 – 6.08
Maternal race: Hispanic	0.62	0.28 – 1.37	1.71	0.67 – 4.41
Maternal race: AAPI	1.79	0.64 – 4.96	1.23	0.26 – 5.76
Maternal race: other	1.93	0.37 – 10.18	--	--
Maternal marital status (yes vs. no)	0.79	0.48 – 1.32	1.24	0.56 – 2.76
Gestational diabetes (yes vs. no)	0.51	0.26- 1.03	6.01	0.79 – 45.49
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	0.76	0.40 – 1.45	1.82	0.62 – 5.35

* p < .05

** p < .01

*** p < .0001

Table 19c: Logistic regression results for average daily percentage of calories from protein and reasons for stopping breastfeeding (n = 587)

Variable	Social-ecological: individual		Social-ecological: family	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from protein, crude Moderate (10% - 35%) vs. low (<10%)	1.18	0.42 – 3.31	1.45	0.52 – 4.06
% of calories from protein, adjusted Moderate (10% - 35%) vs. low (<10%)	1.08	0.37 – 3.18	1.49	0.52 – 4.27
Breastfeeding intention (yes vs. no)	1.12	0.74 – 1.70	0.93	0.62 – 1.40
EPDS score (continuous)	1.04 *	1.00 – 1.08	1.02	0.99 – 1.06
Maternal BMI at 3 months (continuous)	0.97	0.94 – 1.00	0.99	0.96 – 1.01
WIC enrollment at 3 months (yes vs. no)	1.83 **	1.17 – 2.86	0.98	0.63 – 1.51
Maternal smoking (yes vs. no)	1.76 *	1.01 – 3.06	1.47	0.87 – 2.50
Maternal age (continuous)	0.99	0.95 – 1.02	1.00	0.96 – 1.03
Maternal race: white	1.00		1.00	
Maternal race: black	0.60	0.24 – 1.50	1.12	0.47 – 2.67
Maternal race: Hispanic	1.27	0.64 – 2.53	1.06	0.54 – 2.07
Maternal race: AAPI	0.68	0.25 – 1.85	1.01	0.37 – 2.75
Maternal race: other	1.95	0.36 – 10.50	0.96	0.18 – 5.01
Maternal marital status (yes vs. no)	1.28	0.78 – 2.10	1.19	0.74 – 1.93
Gestational diabetes (yes vs. no)	1.35	0.68 – 2.68	1.26	0.65 – 2.46
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	1.09	0.59 – 1.99	1.64	0.90 – 2.97

* p < .05

** p < .01

*** p < .0001

Table 19d: Logistic regression results for average daily percentage of calories from protein and reasons for stopping breastfeeding (n = 587)

Variable	Social-ecological: policy	
	Odds Ratio	95% Wald Confidence Limits
% of calories from protein, crude Moderate (10% - 35%) vs. low (<10%)	1.08	0.38 – 3.09
% of calories from protein, adjusted Moderate (10% - 35%) vs. low (<10%)	1.08	0.37 – 3.17
Breastfeeding intention (yes vs. no)	0.59 *	0.39 – 0.89
EPDS score (continuous)	1.05 *	1.01 – 1.09*
Maternal BMI at 3 months (continuous)	0.99	0.96 – 1.02
WIC enrollment at 3 months (yes vs. no)	0.97	0.62 – 1.51
Maternal smoking (yes vs. no)	1.45	0.84 – 2.53
Maternal age (continuous)	1.01	0.97 – 1.04
Maternal race: white (reference)	1.00	
Maternal race: black	1.19	0.50 – 2.86
Maternal race: Hispanic	2.82 **	1.40 – 5.68
Maternal race: AAPI	0.74	0.26 – 2.11
Maternal race: other	1.14	0.20 – 0.54
Maternal marital status (yes vs. no)	1.13	0.69 – 1.85
Gestational diabetes (yes vs. no)	1.46	0.72 – 2.95
Type 2 diabetes (yes vs. no)	0.17	0.02 – 1.74
Maternal food allergy (yes vs. no)	0.89	0.49 – 1.62

* p < .05 ** p < .01

*** p < .0001

Table 20a: Logistic regression results for average daily percentage of calories from fat and reasons for stopping breastfeeding (n = 587)

Variable	Insufficient milk		Too much milk	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from fat, crude Low/moderate (<36%) vs. high (36%+)	0.82	0.57 – 1.19	1.30	0.65 – 2.61
% of calories from fat, adjusted Low/moderate (<36%) vs. high (36%+)	0.84	0.57 – 1.22	1.16	0.56 – 2.40
Breastfeeding intention (yes vs. no)	0.92	0.59 – 1.44	0.28 **	0.14 – 0.56
EPDS score (continuous)	1.02	0.98 – 1.06	1.05	0.98 – 1.12
Maternal BMI at 3 months (continuous)	1.05 **	1.01 – 1.08	1.02	0.97 – 1.08
WIC enrollment at 3 months (yes vs. no)	1.07	0.67 – 1.71	0.70	0.32 – 1.56
Maternal smoking (yes vs. no)	0.95	0.53 – 1.70	2.89	0.79 – 10.51
Maternal age (continuous)	0.98	0.95 – 1.02	0.93	0.86 – 1.00
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	1.75	0.62 – 4.90	0.54	0.07 – 4.43
Maternal race: Hispanic	1.99	0.88 – 4.48	1.24	0.35 – 4.49
Maternal race: AAPI	2.11	0.66 – 6.69	1.11	0.13 – 9.33
Maternal race: other	2.14	0.24 – 19.34	--	--
Maternal marital status (yes vs. no)	0.92	0.54 – 1.55	2.75	0.92 – 8.21
Gestational diabetes (yes vs. no)	0.70	0.32 – 1.52	1.41	0.30 – 6.62
Type 2 diabetes (yes vs. no)	3.59	0.45 – 28.59	--	--
Maternal food allergy (yes vs. no)	0.90	0.47 – 1.72	0.47	0.18 – 1.25

* p < .05

** p < .01

*** p < .0001

Table 20b: Logistic regression results for average daily percentage of calories from fat and reasons for stopping breastfeeding (n = 587)

Variable	Pain		Diet concern	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from fat, crude Low/moderate (<36%) vs. high (36%+)	0.98	0.69 – 1.41	1.63	0.90 – 2.96
% of calories from fat, adjusted Low/moderate (<36%) vs. high (36%+)	0.96	0.66 – 1.40	1.57	0.85 – 2.88
Breastfeeding intention (yes vs. no)	0.51 **	0.34 – 0.78	0.92	0.48 – 1.76
EPDS score (continuous)	1.03	0.99 – 1.07	1.03	0.98 – 1.10
Maternal BMI at 3 months (continuous)	1.02	0.99 – 1.05	1.02	0.97 – 1.06
WIC enrollment at 3 months (yes vs. no)	1.09	0.69 – 1.74	0.73	0.37 – 1.44
Maternal smoking (yes vs. no)	0.90	0.52 – 1.56	1.50	0.55 – 4.07
Maternal age (continuous)	0.94 **	0.90 – 0.97	1.06	1.00 – 1.12
Maternal race: white (reference)	1.00		1.00	
Maternal race: black	0.56	0.21 – 1.52	1.96	0.61 – 6.31
Maternal race: Hispanic	0.60	0.27 – 1.32	1.71	0.66 – 4.40
Maternal race: AAPI	1.73	0.62 – 4.81	1.19	0.26 – 5.58
Maternal race: other	1.85	0.35 – 9.81	--	--
Maternal marital status (yes vs. no)	0.81	0.48 – 1.34	1.27	0.57 – 2.80
Gestational diabetes (yes vs. no)	0.52	0.26 – 1.05	5.53	0.73 – 41.96
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	0.78	0.41 – 1.49	1.91	0.65 – 5.63

* p < .05

** p < .01

*** p < .0001

Table 20c: Logistic regression results for average daily percentage of calories from fat and reasons for stopping breastfeeding (n = 587)

Variable	Social-ecological: individual		Social-ecological: family	
	Odds Ratio	95% Wald Confidence Limits	Odds Ratio	95% Wald Confidence Limits
% of calories from fat, crude Low/moderate (<36%) vs. high (36%+)	1.17	0.83 – 1.64	1.24	0.88 – 1.75
% of calories from fat, adjusted Low/moderate (<36%) vs. high (36%+)	1.28	0.90 – 1.83	1.30	0.92 – 1.85
Breastfeeding intention (yes vs. no)	1.14	0.75 – 1.73	0.95	0.63 – 1.44
EPDS score (continuous)	1.04 *	1.00 – 1.08	1.02	0.99 – 1.06
Maternal BMI at 3 months (continuous)	0.97	0.94 – 1.00	0.99	0.96 – 1.02
WIC enrollment at 3 months (yes vs. no)	1.86 **	1.19 – 2.90	0.99	0.64 – 1.54
Maternal smoking (yes vs. no)	1.81 *	1.04 – 3.15	1.54	0.91 – 2.61
Maternal age (continuous)	0.99	0.95 – 1.02	1.00	0.96 – 1.03
Maternal race: white (reference)				
Maternal race: black	0.61	0.24 – 1.52	1.13	0.47 – 2.70
Maternal race: Hispanic	1.29	0.65 – 2.56	1.08	0.55 – 2.12
Maternal race: AAPI	0.67	0.25 – 1.82	1.00	0.37 – 2.74
Maternal race: other	2.14	0.40 – 11.47	1.07	0.21 – 5.57
Maternal marital status (yes vs. no)	1.31	0.80 – 2.14	1.21	0.75 – 1.96
Gestational diabetes (yes vs. no)	1.28	0.64 – 2.56	1.19	0.61 – 2.33
Type 2 diabetes (yes vs. no)	--	--	--	--
Maternal food allergy (yes vs. no)	1.10	0.60 – 2.02	1.66	0.91 – 3.01

* p < .05

** p < .01

*** p < .0001

Table 20d: Logistic regression results for average daily percentage of calories from fat and reasons for stopping breastfeeding (n = 587)

Variable	Social-ecological: policy	
	Odds Ratio	95% Wald Confidence Limits
% of calories from fat, crude Low/moderate (<36%) vs. high (36%+)	1.03	0.73 – 1.46
% of calories from fat, adjusted Low/moderate (<36%) vs. high (36%+)	0.98	0.68 – 1.40
Breastfeeding intention (yes vs. no)	0.59 *	0.39 – 0.89
EPDS score (continuous)	1.05 *	1.01 – 1.09
Maternal BMI at 3 months (continuous)	0.99	0.96 – 1.02
WIC enrollment at 3 months (yes vs. no)	0.97	0.62 – 1.51
Maternal smoking (yes vs. no)	1.46	0.84 – 2.52
Maternal age (continuous)	1.01	0.97 – 1.04
Maternal race: white (reference)	1.00	
Maternal race: black	1.19	0.50 – 2.85
Maternal race: Hispanic	2.83 **	1.41 – 5.68
Maternal race: AAPI	0.75	0.26 – 2.12
Maternal race: other	1.13	0.20 – 6.54
Maternal marital status (yes vs. no)	1.13	0.69 – 1.85
Gestational diabetes (yes vs. no)	1.47	0.73 – 2.98
Type 2 diabetes (yes vs. no)	0.17	0.02 – 1.73
Maternal food allergy (yes vs. no)	0.89	0.48 – 1.62

* p < .05

** p < .01

*** p < .0001

Tables: Results for Aim 3

Table 21a. Descriptive statistics and bivariate associations for infant weights (girls) at birth and at 6 months, among those who are providing at least 80% of milk feeds as breastmilk (n = 96)

Variable	Total sample (n = 96)	Weight at birth in kg Mean (SE)	p-value	Weight at 6m in kg Mean (SE)	p-value
Total sample		3.53		7.64	
Dietary factors					
Magnesium, mg					
Quartiles, % (N)					
Q1 117.67 – 243.80 mg	24.0% (23)	3.39 (3.22 – 3.58)	.652	7.10 (6.72 – 7.49)	.565
Q2 243.81 – 317.34 mg	28.1% (27)	3.43 (3.26 – 3.59)		7.33 (6.98 – 7.68)	
Q3 317.35 – 379.63 mg	24.0% (23)	3.54 (3.36 – 3.72)		7.36 (6.98 – 7.74)	
Q4 379.64 – 803.12 mg	24.0% (23)	3.50 (3.33 – 3.68)		7.49 (7.10 – 7.87)	
Added sugar, tsp					
Quartiles, % (N)					
Q1 1.67 – 8.62 tsp	27.1% (26)	3.48 (3.32 – 3.65)	.951	7.31 (6.95 – 7.68)	.993
Q2 8.63 – 13.00 tsp	18.8% (18)	3.48 (3.27 – 3.68)		7.37 (6.94 – 7.81)	
Q3 13.01 – 18.84 tsp	26.0% (25)	3.48 (3.31 – 3.65)		7.29 (6.92 – 7.66)	
Q4 18.85 – 75.77 tsp	28.1% (27)	3.42 (3.26 – 3.59)		7.32 (6.96 – 7.68)	
Dairy, # of daily servings:					
Quartiles, % (N)					
Q1 0.06 – 1.22 servings	26.0% (25)	3.38 (3.21 – 3.55)	.648	7.11 (6.74 – 7.47)	.377
Q2 1.23 – 2.01 servings	28.1% (27)	3.46 (3.29 – 3.62)		7.48 (7.13 – 7.83)	
Q3 2.02 – 3.12 servings	26.0% (25)	3.50 (3.33 – 3.67)		7.22 (6.86 – 7.59)	
Q4 3.13 – 8.03 servings	19.8% (19)	3.54 (3.35 – 3.74)		7.50 (7.08 – 7.92)	
Energy, # of kcal/day:					
Quartiles, % (N)					
Q1 855.47 – 1565.46 kcal	25.0%	3.50	.937	7.32	.872

Q2 1565.47 – 1934.48 kcal	(24) 25.0%	(3.33 – 3.68) 3.43		(6.95 – 7.70) 7.41	
Q3 1934.49 – 2262.12 kcal	(24) 26.0%	(3.25 – 3.60) 3.47		(7.03 – 7.79) 7.20	
Q4 2262.13 – 4257.42 kcal	(25) 24.0%	(3.30 – 3.64) 3.46		(6.83 – 7.57) 7.36	
	(23)	(3.28 – 3.64)		(6.97 – 7.74)	
Glycemic load, average daily					
Quartiles, % (N)					
Q1 39.80 – 91.56	27.1% (26)	3.54 (3.37 – 3.70)	.379	7.34 (6.97 – 7.70)	.855
Q2 91.57 – 111.54	16.7% (16)	3.31 (3.10 – 3.52)		7.16 (6.70 – 7.62)	
Q3 111.55 – 153.19	30.2% (29)	3.50 (3.34 – 3.66)		7.41 (7.07 – 7.76)	
Q4 153.20 – 316.83	26.0% (25)	3.46 (3.29 – 3.63)		7.30 (6.93 – 7.67)	
Percentage of calories from carbohydrate					
% of calories from carbohydrate, % (N)					
Low/moderate (<45%)	25.0% (24)	3.47 (3.29 – 3.64)	.969	7.19 (6.82 – 7.56)	.424
High (>= 45%)	75.0% (72)	3.46 (3.36 – 3.56)		7.36 (7.15 – 7.58)	
Percentage of calories from protein					
% kcal from prot, % (N)					
Low (<10%)	0% (0)	-----	-----	-----	-----
Moderate (10% - 35%)	100% (96)	3.47 (3.37 – 3.55)		7.32 (7.13 – 7.51)	
Percentage of calories from fat					
% kcal from fat, % (N)					
Low/moderate (<36%)	66.7% (64)	3.44 (3.33 – 3.55)	.418	7.30 (7.07- 7.53)	.788
High (>= 36%)	33.3% (32)	3.52 (3.37 – 3.66)		7.36 (7.03 – 7.68)	
Demographic variables					
EPDS score					
>= 13	4.2% (4)	3.39 (2.97 – 3.82)	.724	6.83 (5.91 – 7.74)	.281
< 13	95.8% (92)	3.47 (3.38 – 3.56)		7.34 (7.15 – 7.53)	

Maternal BMI at 3 months					
BMI $\geq$ 25	52.1% (50)	3.54 (3.42 – 3.65)	.092	7.47 (7.21 – 7.72)	.101
BMI < 25	47.9% (46)	3.39 (3.27 – 3.51)		7.16 (6.89 – 7.43)	
Race/Ethnicity					
White	88.5% (85)	3.47 (3.38 – 3.56)	.776	7.31 (7.11 – 7.51)	.680
Other	11.5% (11)	3.43 (3.17 – 3.69)		7.43 (6.88 – 7.98)	
Enrolled in WIC, month 3					
Yes	15.6% (15)	3.32 (3.11 – 3.54)	.161	7.33 (6.86 – 7.81)	.958
No	84.4% (81)	3.49 (3.40 – 3.58)		7.32 (7.11 – 7.52)	
Age					
21 – 26.99	21.9% (21)	3.41 (3.23 – 3.60)	.853	7.19 (6.79 – 7.60)	.832
27 – 29.99	22.9% (22)	3.46 (3.28 – 3.64)		7.43 (7.03 – 7.82)	
30 – 32.99	20.8% (20)	3.45 (3.26 – 3.64)		7.25 (6.84 – 7.67)	
33 – 42	34.4% (33)	3.51 (3.37 – 3.66)		7.37 (7.05 – 7.69)	
Smoking					
Yes	2.1% (2)	3.22 (2.62 – 3.82)	.415	6.84 (5.54 – 8.13)	.455
No	97.9% (94)	3.47 (3.38 – 3.56)		7.33 (7.14 – 7.52)	
Marital status					
Yes	93.8% (90)	3.46 (3.38 – 3.55)	.951	7.32 (7.12 – 7.51)	.929
No	6.3% (6)	3.48 (3.13 – 3.82)		7.35 (6.60 – 8.10)	
Gestational diabetes					
Yes	8.3% (8)	3.27 (2.97 – 3.57)	.178	7.26 (6.61 – 7.91)	.848
No	91.7% (88)	3.48 (3.39 – 3.57)		7.33 (7.13 – 7.52)	
Type 2 diabetes					
Yes	1.0% (1)	3.35 (2.50 – 4.20)	.787	7.94 (6.11 – 9.78)	.499
No	99.0% (95)	3.47 (3.38 – 3.55)		7.31 (7.13 – 7.50)	

Introduced formula					
Yes	40.6% (39)	3.44 (3.31 – 3.58)	.665	7.24 (6.95 – 7.53)	.479
No	59.4% (57)	3.48 (3.37 – 3.59)		7.38 (7.13 – 7.62)	
Introduced solid food					
Yes	57.3% (55)	3.51 (3.40 – 3.63)	.213	7.43 (7.18 – 7.67)	.186
No	42.7% (41)	3.40 (3.27 – 3.53)		7.18 (6.89 – 7.46)	

Table 21b. Descriptive statistics and bivariate associations for infant weights (boys) at birth and at 6 months, among those who are providing at least 80% of milk feeds as breastmilk (n = 90)

Variable	Total sample (n = 90)	Weight at birth in kg Mean (SE)	p-value	Weight at 6m in kg Mean (SE)	p-value
Total sample		3.53		7.64	
Dietary factors					
Magnesium, mg					
Quartiles, % (N)					
Q1 117.67 – 243.80 mg	25.6% (23)	3.61 (3.41 – 3.80)	.215	8.12 (7.76 – 8.48)	.072
Q2 243.81 – 317.34 mg	22.2% (20)	3.48 (3.27 – 3.68)		7.53 (7.14 – 7.92)	
Q3 317.35 – 379.63 mg	25.6% (23)	3.51 (3.32 – 3.71)		8.00 (7.64 – 8.36)	
Q4 379.64 – 803.12 mg	26.7% (24)	3.75 (3.56 – 3.94)		8.18 (7.83 – 8.53)	
Added sugar, tsp					
Quartiles, % (N)					
Q1 1.67 – 8.62 tsp	22.2% (20)	3.55 (3.33 – 3.76)	.453	8.24 (7.84 – 8.63)	.318
Q2 8.63 – 13.00 tsp	32.2% (29)	3.50 (3.33 – 3.68)		7.78 (7.45 – 8.10)	
Q3 13.01 – 18.84 tsp	23.3% (21)	3.71 (3.50 – 3.91)		8.07 (7.68 – 8.46)	
Q4 18.85 – 75.77 tsp	22.2% (20)	3.64 (3.43 – 3.86)		7.90 (7.50 – 8.30)	
Dairy, # of daily servings:					
Quartiles, % (N)					
Q1 0.06 – 1.22 servings	23.3% (21)	3.57 (3.36 – 3.78)	.671	7.95 (7.56 – 8.34)	.968
Q2 1.23 – 2.01 servings	22.2% (20)	3.55 (3.34 – 3.77)		7.98 (7.58 – 8.39)	
Q3 2.02 – 3.12 servings	23.3% (21)	3.53 (3.32 – 3.74)		7.91 (7.51 – 8.30)	
Q4 3.13 – 8.03 servings	31.1% (28)	3.68 (3.50 – 3.86)		8.04 (7.69 – 8.38)	
Energy, # of kcal/day:					
Quartiles, % (N)					
Q1 855.47 – 1565.46 kcal	24.4% (22)	3.61 (3.41 – 3.81)	.281	8.11 (7.73 – 8.49)	.575
Q2 1565.47 – 1934.48 kcal	25.6% (23)	3.48 (3.29 – 3.68)		7.85 (7.48 – 8.22)	
Q3 1934.49 – 2262.12 kcal	23.3%	3.53		7.82	

Q4 2262.13 – 4257.42 kcal	(21) 26.7% (24)	(3.32 – 3.73) 3.74 (3.54 – 3.93)		(7.43 – 8.21) 8.10 (7.73 – 8.46)	
Glycemic load, average daily					
Quartiles, % (N)					
Q1 39.80 – 91.56	22.2% (20)	3.56 (3.35 – 3.77)	.721	8.21 (7.81 – 8.61)	.465
Q2 91.57 – 111.54	23.3% (21)	3.54 (3.33 – 3.75)		7.98 (7.59 – 8.36)	
Q3 111.55 – 153.19	30.0% (27)	3.57 (3.39 – 3.76)		7.79 (7.45 – 8.13)	
Q4 153.20 – 316.83	24.4% (22)	3.69 (3.49 – 3.90)		7.98 (7.60 – 8.36)	
Percentage of calories from carbohydrate					
% of calories from carbohydrate, % (N)					
Low/moderate (<45%)	20.0% (18)	3.44 (3.22 – 3.66)	.122	7.86 (7.44 – 8.28)	.557
High (>= 45%)	80.0% (72)	3.63 (3.52 – 3.74)		8.00 (7.79 – 8.21)	
Percentage of calories from protein					
% kcal from prot, % (N)					
Low (<10%)	1.1% (1)	3.38 (2.43 – 4.33)	.653	7.71 (5.93 – 9.50)	.774
Moderate (10% - 35%)	98.9% (89)	3.59 (3.49 – 3.70)		7.97 (7.79 – 8.17)	
Percentage of calories from fat					
% kcal from fat, % (N)					
Low/moderate (<36%)	53.3% (48)	3.63 (3.50 – 3.77)	.379	7.92 (7.66 – 8.17)	.513
High (>= 36%)	46.7% (42)	3.54 (3.40 – 3.69)		8.04 (7.77 – 8.32)	
Demographic variables					
EPDS score					
>= 13	4.4% (4)	3.43 (2.95 – 3.90)	.479	7.21 (6.34 – 8.09)	.082
< 13	95.6% (86)	3.60 (3.50 – 3.70)		8.01 (7.82 – 8.20)	

Maternal BMI at 3 months					
BMI $\geq$ 25	52.2% (47)	3.63 (3.49 – 3.77)	.464	7.90 (7.64 – 8.15)	.384
BMI < 25	47.8% (43)	3.55 (3.41 – 3.70)		8.06 (7.79 – 8.33)	
Race/Ethnicity					
White	90.0% (81)	3.61 (3.50 – 3.71)	.316	8.01 (7.81 – 8.21)	.290
Other	10.0% (9)	3.44 (3.13 – 3.76)		7.67 (7.08 – 8.27)	
Enrolled in WIC, month 3					
Yes	12.2% (11)	3.59 (3.30 – 3.87)	.975	7.90 (7.36 – 8.44)	.774
No	87.8% (79)	3.59 (3.49 – 3.70)		7.65 (7.78 – 8.19)	
Age					
21 – 26.99	17.8% (16)	3.65 (3.41 – 3.89)	.444	7.95 (7.50 – 8.40)	.673
27 – 29.99	23.3% (21)	3.54 (3.33 – 3.75)		8.00 (7.61 – 8.39)	
30 – 32.99	25.6% (23)	3.48 (3.29 – 3.68)		7.80 (7.43 – 8.17)	
33 – 42	33.3% (30)	3.68 (3.51 – 3.85)		8.11 (7.78 – 8.43)	
Smoking					
Yes	2.2% (2)	3.60 (2.93 – 4.28)	.971	8.26 (6.99 – 9.52)	.653
No	97.8% (88)	3.59 (3.49 – 3.69)		7.97 (7.78 – 8.16)	
Marital status					
Yes	91.1% (82)	3.57 (3.47 – 3.67)	.138	7.93 (7.74 – 8.13)	.137
No	8.9% (8)	3.83 (3.50 – 4.16)		8.42 (7.80 – 9.05)	
Gestational diabetes					
Yes	7.8% (7)	3.95 (3.60 – 4.30)	.036	8.64 (7.98 – 9.30)	.040
No	92.2% (83)	3.56 (3.46 – 3.66)		7.92 (7.73 – 8.11)	
Type 2 diabetes					
Yes	2.2% (2)	3.49 (2.82 – 4.16)	.758	7.93 (6.67 – 9.19)	.945
No	97.8% (88)	3.59 (3.49 – 3.70)		7.98 (7.78 – 8.17)	

Introduced formula					
Yes	31.1% (28)	3.52 (3.34 – 3.70)	.335	7.90 (7.57 – 8.24)	.620
No	68.9% (62)	3.62 (3.50 – 3.74)		8.01 (7.78 – 8.23)	
Introduced solid food					
Yes	62.2% (56)	3.57 (3.45 – 3.70)	.623	8.02 (7.78 – 8.25)	.576
No	37.8% (34)	3.62 (3.46 – 3.79)		7.91 (7.60 – 8.21)	

Table 21c. Descriptive statistics and bivariate associations for infant weight-for-age z-scores (girls) at birth and at 6 months, among those who are providing at least 80% of milk feeds as breastmilk (n = 96)

Variable	Total Sample (n = 96)	Weight-for age z-score at birth	p-value	Weight-for age z-score at 6m	p-value
Total sample		0.46		-0.04	
Dietary factors					
Magnesium, mg					
Quartiles, % (N)					
Q1 117.67 – 243.80 mg	24.0% (23)	0.33 (-0.05 – 0.71)	.638	-0.28 (-0.68 – 0.13)	.551
Q2 243.81 – 317.34 mg	28.1% (27)	0.38 (-0.01 – 0.77)		-0.05 (-0.50 – 0.41)	
Q3 317.35 – 379.63 mg	24.0% (23)	0.62 (0.24 – 0.99)		0.01 (-0.41 – 0.44)	
Q4 379.64 – 803.12 mg	24.0% (23)	0.55 (0.19 – 0.91)		0.15 (-0.26 – 0.56)	
Added sugar, tsp					
Quartiles, % (N)					
Q1 1.67 – 8.62 tsp	27.1% (26)	0.51 (0.19 – 0.83)	.947	-0.05 (-0.49 – 0.38)	.978
Q2 8.63 – 13.00 tsp	18.8% (18)	0.50 (0.13 – 0.87)		0.04 (-0.37 – 0.45)	
Q3 13.01 – 18.84 tsp	26.0% (25)	0.49 (0.04 – 0.93)		-0.10 (-0.58 – 0.38)	
Q4 18.85 – 75.77 tsp	28.1% (27)	0.38 (0.01- 0.74)		-0.03 (-0.41 – 0.35)	
Dairy, # of daily servings:					
Quartiles, % (N)					
Q1 0.06 – 1.22 servings	26.0% (25)	0.30 (-0.05 – 0.64)	.652	-0.27 (-0.67 – 0.13)	.356
Q2 1.23 – 2.01 servings	28.1% (27)	0.44 (0.06 – 0.83)		0.12 (-0.31 – 0.56)	
Q3 2.02 – 3.12 servings	26.0% (25)	0.53 (0.15 – 0.90)		-0.15 (-0.59 – 0.29)	
Q4 3.13 – 8.03 servings	19.8% (19)	0.63 (0.22 – 1.04)		0.18 (-0.22 – 0.59)	
Energy, # of kcal/day:					
Quartiles, % (N)					
Q1 855.47 – 1565.46 kcal	25.0% (24)	0.54 (0.12 – 0.96)	.945	-0.04 (-0.49 – 0.41)	.825
Q2 1565.47 – 1934.48 kcal	25.0% (24)	0.38 (0.02 – 0.75)		0.08 (-0.28 – 0.44)	
Q3 1934.49 – 2262.12 kcal	26.0%	0.49		-0.19	

Q4 2262.13 – 4257.42 kcal	(25) 24.0% (23)	(0.15 – 0.82) 0.44 (0.03 – 0.85)		(-0.64 – 0.27) 0.00 (-0.45 – 0.44)	
Glycemic load, average daily					
Quartiles, % (N)					
Q1 39.80 – 91.56	27.0% (26)	0.61 (0.26 – 0.96)	0.389	-0.03 (-0.45 – 0.40)	.830
Q2 91.57 – 111.54	16.7% (16)	0.14 (-0.28 – 0.55)		-0.23 (-0.84 – 0.38)	
Q3 111.55 – 153.19	30.2% (29)	0.53 (0.18 – 0.88)		0.06 (-0.32 – 0.45)	
Q4 153.20 – 316.83	26.0% (25)	0.44 (0.05 – 0.84)		-0.05 (-0.44 – 0.33)	
Percentage of calories from carbohydrate					
% of calories from carbohydrate, % (N)					
Low/moderate (<45%)	25.0% (24)	0.49 (0.20 – 0.77)	.892	-0.20 (-0.67 – 0.27)	.378
High (>= 45%)	75.0% (72)	0.46 (0.23 – 0.68)		0.01 (-0.22 – 0.24)	
Percentage of calories from protein					
% kcal from prot, % (N)					
Low (<10%)	-----	-----	-----	-----	-----
Moderate (10% - 35%)	100% (96)	0.46 (0.28 – 0.65)		-0.04 (-0.25 – 0.16)	
Percentage of calories from fat					
% kcal from fat, % (N)					
Low/moderate (<36%)	66.7% (64)	0.41 (0.18 – 0.64)	.405	-0.05 (-0.29 – 0.18)	.860
High (>= 36%)	33.3% (32)	0.57 (0.27 – 0.88)		-0.01 (-0.43 – 0.40)	
Demographic variables					
EPDS score					
>= 13	4.2% (4)	0.33 (-0.65 – 1.31)	.759	-0.60 (-2.44 – 1.23)	.255
< 13	95.8% (92)	0.47 (0.28 – 0.66)		-0.02 (-0.22 – 0.19)	

Maternal BMI at 3m					
BMI $\geq$ 25	52.0% (50)	0.61 (0.34 – 0.87)	.102	0.13 (-0.13 – 0.40)	.079
BMI < 25	47.9% (46)	0.31 (0.07 – 0.55)		-0.23 (-0.54 – 0.09)	
Race/Ethnicity					
White	88.5% (85)	0.47 (0.28 -0.67)	.789	-0.06 (-0.28 – 0.16)	.572
Other	11.5% (11)	0.40 (-0.14- 0.93)		0.12 (-0.48 – 0.73)	
Enrolled in WIC, month 3 (girls, boys)					
Yes	15.6% (15)	0.16 (-0.35 – 0.67)	.156	-0.05 (-0.73 – 0.62)	.954
No	84.4% (81)	0.52 (0.32 – 0.72)		-0.04 (-0.25 – 0.18)	
Age					
21 – 26.99	21.9% (21)	0.37 (0.02 – 0.71)	.864	-0.18 (-0.62 – 0.27)	.825
27 – 29.99	22.9% (22)	0.44 (-0.03 – 0.91)		0.06 (-0.45 – 0.06)	
30 – 32.99	20.8% (20)	0.43 (0.02 – 0.84)		-0.13 (-0.66 – 0.40)	
33 - 42	34.4% (33)	0.57 (0.25 – 0.89)		0.03 (-0.28 – 0.34)	
Smoking					
Yes	2.1% (2)	-0.06 (-11.51 – 11.39)	.404	-0.54 (-4.02 – 2.93)	.483
No	98.9% (94)	0.48 (0.29 – 0.66)		-0.03 (-0.24 – 0.18)	
Marital status					
Yes	93.8% (90)	0.46 (0.28 – 0.65)	.969	-0.05 (-0.26 – 0.17)	.862
No	6.3% (6)	0.49 (-0.66 – 1.61)		0.03 (-0.80 – 0.86)	
Gestational diabetes					
Yes	8.3% (8)	0.05 (-0.72 – 0.82)	.173	-0.11 (-1.03 – 0.81)	.835
No	91.7% (88)	0.50 (0.31 – 0.69)		-0.03 (-0.24 – 0.18)	
Type 2 diabetes					
Yes	1.0% (1)	0.25	.815	0.69	.468
No	99.0% (95)	0.47 (0.28 – 0.65)		-0.05 (-0.25 – 0.16)	

Introduced formula					
Yes	40.6% (39)	0.42 (0.13 – 0.71)	.668	-0.18 (-0.54 – 0.18)	.315
No	59.4% (57)	0.50 (0.26 – 0.74)		0.04 (-0.21 – 0.29)	
Introduced solid food					
Yes	57.3% (55)	0.56 (0.30 – 0.82)	.238	-0.11 (-0.40 – 0.17)	.560
No	42.7% (41)	0.34 (0.09 – 0.59)		0.01 (-0.28 – 0.30)	

Table 21d. Descriptive statistics and bivariate associations for infant weight-for-age z-scores (boys) at birth and at 6 months, among those who are providing at least 80% of milk feeds as breastmilk (n = 90)

Variable	Total Sample (n = 90)	Weight-for-age z-score at birth Mean (SE)	p-value	Weight-for-age z-score at 6m Mean (SE)	p-value
Total sample		0.45		-0.01	
Dietary factors					
Magnesium, mg					
Quartiles, % (N)					
Q1 117.67 – 243.80 mg	25.6% (23)	0.49 (0.10 – 0.87)	.299	0.13 (-0.40 – 0.65)	.080
Q2 243.81 – 317.34 mg	22.2% (20)	0.22 (-0.23 – 0.67)		-0.50 (-0.85 – -0.16)	
Q3 317.35 – 379.63 mg	25.6% (23)	0.31 (-0.04 – 0.66)		0.05 (-0.29 – 0.39)	
Q4 379.64 – 803.12 mg	26.7% (24)	0.75 (0.34 – 1.16)		0.23 (-0.22 – 0.69)	
Added sugar, tsp					
Quartiles, % (N)					
Q1 1.67 – 8.62 tsp	22.2% (20)	0.36 (-0.07 – 0.79)	.249	0.25 (-0.34 – 0.84)	.386
Q2 8.63 – 13.00 tsp	32.2% (29)	0.28 (-0.06 – 0.62)		-0.21 (-0.55 – 0.11)	
Q3 13.01 – 18.84 tsp	23.3% (21)	0.67 (0.20 – 1.14)		0.12 (-0.31 – 0.54)	
Q4 18.85 – 75.77 tsp	22.2% (20)	0.56 (0.18 – 0.94)		-0.08 (-0.53 – 0.37)	
Dairy, # of daily servings:					
Quartiles, % (N)					
Q1 0.06 – 1.22 servings	23.3% (21)	0.40 (-0.07 – 0.86)	.398	-0.07 (-0.66 – 0.51)	.949
Q2 1.23 – 2.01 servings	22.2% (20)	0.38 (-0.02 – 0.79)		0.00 (-0.51 – 0.51)	
Q3 2.02 – 3.12 servings	23.3% (21)	0.34 (-0.02 – 0.70)		-0.06 (-0.42 – 0.30)	
Q4 3.13 – 8.03 servings	31.1% (28)	0.63 (0.24 – 1.01)		0.08 (-0.26 – 0.42)	
Energy, # of kcal/day:					
Quartiles, % (N)					
Q1 855.47 – 1565.46 kcal	24.4% (22)	0.49 (-0.07 – 0.91)	.319	0.13 (-0.34 – 0.60)	.537
Q2 1565.47 – 1934.48 kcal	25.6% (23)	0.24 (-0.15 – 0.63)		-0.16 (-0.71 – 0.38)	

Q3 1934.49 – 2262.12 kcal	23.3% (21)	0.33 (-0.05 – 0.71)		-0.17 (-0.59 – 0.25)	
Q4 2262.13 – 4257.42 kcal	26.7% (24)	0.73 (0.33 – 1.13)		0.16 (-0.14 – 0.47)	
Glycemic load, average daily					
Quartiles, % (N)					
Q1 39.80 – 91.56	22.2% (20)	0.38 (-0.10 – 0.86)	.325	0.22 (-0.40 – 0.84)	.549
Q2 91.57 – 111.54	23.3% (21)	0.36 (-0.04 – 0.76)		0.01 (-0.41 – 0.43)	
Q3 111.55 – 153.19	30.0% (27)	0.41 (0.29 – 0.79)		-0.21 (-0.58 – 0.16)	
Q4 153.20 – 316.83	24.4% (22)	0.66 (0.29 – 1.02)		0.03 (-0.33 – 0.39)	
Percentage of calories from carbohydrate					
% of calories from carbohydrate, % (N)					
Low/moderate (<45%)	20.0% (18)	0.15 (-0.30 – 0.60)	.114	-0.12 (-0.62 – 0.38)	.588
High (>= 45%)	80.0% (72)	0.53 (0.31 – 0.74)		0.02 (-0.21 – 0.26)	
Percentage of calories from protein					
% kcal from prot, % (N)					
Low (<10%)	1.1% (1)	0.06	.672	-0.25	.806
Moderate (10% - 35%)	98.9% (89)	0.46 (0.26 – 0.65)		0.00 (-0.22 – 0.21)	
Percentage of calories from fat					
% kcal from fat, % (N)					
Low/moderate (<36%)	53.3% (48)	0.54 (0.29 – 0.79)	.337	-0.07 (-0.39 – 0.24)	.491
High (>= 36%)	46.7% (42)	0.35 (0.04 – 0.66)		0.07 (-0.21 – 0.35)	
Demographic variables					
EPDS score					
>= 13	4.4% (4)	0.15 (-0.87 – 1.17)	.500	-0.88 (-2.12 – 0.35)	.073
< 13	95.6% (86)	0.47 (0.27 – 0.67)		0.04 (-0.17 – 0.25)	

Maternal BMI at 3 months					
BMI $\geq$ 25	52.2% (47)	0.53 (0.26 – 0.80)	.446	-0.02 (-0.34 – 0.29)	.658
BMI < 25	47.8% (43)	0.38 (0.11 – 0.66)		0.07 (-0.23 – 0.38)	
Race/Ethnicity					
White	90.0% (81)	0.48 (0.28 – 0.69)	.347	0.04 (-0.18 – 0.26)	.234
Other	10.0% (9)	0.18 (-0.43 – 0.79)		-0.38 (-1.05 – 0.28)	
Enrolled in WIC, month 3					
Yes	12.2% (11)	0.44 (-0.23 – 1.11)	.947	-0.13 (-1.14 – 0.89)	.622
No	87.8% (79)	0.46 (0.26 – 0.66)		0.04 (-0.17 – 0.26)	
Age					
21 – 26.99	17.8% (16)	0.57 (0.05 – 1.08)	.384	-0.04 (-0.60 – 0.53)	.539
27 – 29.99	23.3% (21)	0.34 (-0.13 – 0.81)		-0.03 (-0.63 – 0.57)	
30 – 32.99	25.6% (23)	0.24 (-0.14 – 0.63)		-0.18 (-0.49 – 0.13)	
33 - 42	33.3% (30)	0.63 (0.34 – 0.93)		0.23 (-0.15 – 0.61)	
Smoking					
Yes	2.2% (2)	0.51 (-2.30 – 3.33)	.932	0.36 (-4.83 – 5.55)	.648
No	97.8% (88)	0.46 (0.26 – 0.65)		0.01 (-0.21 – 0.23)	
Marital status					
Yes	91.1% (82)	0.41 (0.22 – 0.61)	.129	-0.06 (-0.29 – 0.16)	.016
No	8.9% (8)	0.89 (0.12 – 1.67)		0.81 (0.05 – 1.57)	
Gestational diabetes					
Yes	7.8% (7)	1.15 (0.43 – 1.87)	.036	0.76 (0.15 – 1.38)	.034
No	92.2% (83)	0.39 (0.20 – 0.59)		-0.07 (-0.29 – 0.15)	
Type 2 diabetes					
Yes	2.2% (2)	0.27 (-6.92 – 7.46)	.781	-0.05 (-12.77 – 12.67)	.948
No	97.8% (88)	0.46 (0.26 – 0.65)		0.00 (-0.22 – 0.21)	

Introduced formula					
Yes	31.1% (28)	0.41 (0.17 – 0.66)	.620	-0.08 (-0.49 – 0.32)	.624
No	68.9% (62)	0.51 (0.19 – 0.84)		0.03 (-0.22 – 0.28)	
Introduced solid food					
Yes	62.2% (56)	0.44 (-0.23 – 1.11)	.947	0.06 (-0.19 – 0.30)	.460
No	37.8% (34)	0.46 (0.26 – 0.66)		-0.11 (-0.50 – 0.29)	

Table 22: Maternal average daily intake of magnesium and infant weight (kg) at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
Magnesium, g:				
Q1	7.10 (6.72 – 7.49)	7.22 (6.87 – 7.58)	8.12 (7.76 – 8.48)	8.20 ^a (7.86 – 8.54)
Q2	7.33 (6.98 – 7.68)	7.36 (7.04 – 7.69)	7.53 (7.14 – 7.92)	7.60 (7.24 – 7.95)
Q3	7.36 (6.98 – 7.74)	7.28 (6.93 – 7.64)	8.00 (7.64 – 8.36)	8.07 (7.75 – 8.40)
Q4	7.49 (7.10 – 7.87)	7.40 (7.04 – 7.77)	8.18 (7.83 – 8.53)	7.98 (7.64 – 8.32)
	Parameter estimates		Parameter estimates	
Magnesium				
Q1	-0.38 (-0.92 – 0.16)	-0.18 (-0.70 – 0.34)	-0.06 (-0.56 – 0.45)	0.22 (-0.28 – 0.72)
Q2	-0.16 (-0.68 – 0.36)	-0.04 (-0.54 – 0.47)	-0.65 (-1.18 – -0.13)	-0.38 (-0.89 – 0.13)
Q3	-0.12 (-0.67 – 0.42)	-0.12 (-0.64 – 0.39)	-0.18 (-0.69 – 0.33)	0.10 (-0.38 – 0.57)
Q4	REF	REF	REF	REF
Infant weight at birth		1.13 (0.71 – 1.55)		0.87 (0.50 – 1.25)
EPDS score		-0.01 (-0.05 – 0.03)		-0.01 (-0.05 – 0.04)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.04 – 0.01)
Mother's age		0.00 (-0.05 – 0.04)		0.00 (-0.04 – 0.04)
Race/ethnicity (white vs. other)		-0.22 (-0.78 – 0.35)		0.20 (-0.37 – 0.77)
Enrolled in WIC at 3m (yes vs. no)		0.17 (-0.35 – 0.69)		-0.13 (-0.70 – 0.44)
Smoking (yes vs. no)		0.32 (-0.98 – 1.62)		-0.27 (-1.47 – 0.93)
Marital status (yes vs. no)		0.06 (-0.77 – 0.90)		-0.32 (-0.91 – 0.26)
Gestational diabetes (yes vs. no)		0.03 (-0.70 – 0.76)		0.57 (-0.10 – 1.24)
Type 2 diabetes (yes vs. no)		0.71 (-1.39 – 2.81)		-0.24 (-1.47 – 0.99)
Introduced formula (yes vs. no)		-0.22 (-0.62 – 0.18)		-0.01 (-0.40 – 0.38)
Introduced complementary foods (yes vs. no)		0.23 (-0.19 – 0.65)		0.25 (-0.11 – 0.61)

^a Difference between Q1 and Q2 is significant ($\alpha \leq 0.05$)

Table 23: Maternal average daily intake of added sugar and infant weight (kg) at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
Added sugar, tsp:				
Q1	7.31 (6.95– 7.68)	7.30 (6.95 – 7.65)	8.24 (7.84 – 8.63)	8.34 ^{a,c} (7.99 – 8.70)
Q2	7.37 (6.94 – 7.81)	7.33 (6.93 – 7.74)	7.78 (7.45 – 8.10)	7.87 (7.57 – 8.16)
Q3	7.29 (6.92 – 7.66)	7.30 (6.95 – 7.64)	8.07 (7.68 – 8.46)	7.94 (7.58 – 8.29)
Q4	7.32 (6.96 – 7.68)	7.35 (7.02 – 7.68)	7.90 (7.50 – 8.30)	7.80 (7.44 – 8.16)
	Parameter estimates		Parameter estimates	
Added sugar				
Q1	-0.01 (-0.52 – 0.50)	-0.05 (-0.54 – 0.44)	0.34 (-0.22 – 0.90)	0.54 (0.03 – 1.06)
Q2	-0.05 (-0.51 – 0.62)	-0.01 (-0.54 – 0.51)	-0.12 (-0.64 – 0.39)	0.06 (-0.41 – 0.54)
Q3	-0.03 (-0.55 – 0.48)	-0.05 (-0.53 – 0.43)	0.17 (-0.38 – 0.72)	0.14 (-0.37 – 0.64)
Q4	REF	REF	REF	REF
Infant weight at birth		1.14 (-0.72 – 1.56)		0.94 (0.57 – 1.31)
EPDS score		0.00 (-0.05 – 0.04)		-0.02 (-0.06 – 0.03)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.04 – 0.02)
Mother's age		0.00 (-0.05 – 0.04)		0.00 (-0.03 – 0.04)
Race/ethnicity (white vs. other)		-0.24 (-0.81 – 0.33)		0.30 (-0.27 – 0.87)
Enrolled in WIC at 3m (yes vs. no)		0.18 (-0.34 – 0.71)		-0.11 (-0.69 – 0.47)
Smoking (yes vs. no)		0.31 (-1.00 – 1.62)		-0.32 (-1.51 – 0.87)
Marital status (yes vs. no)		0.12 (-0.72 – 0.95)		-0.27 (-0.87 – 0.33)
Gestational diabetes (yes vs. no)		0.04 (-0.68 – 0.77)		0.42 (-0.26 – 1.10)
Type 2 diabetes (yes vs. no)		0.83 (-1.29 – 2.95)		-0.13 (-1.35 – 1.09)
Introduced formula (yes vs. no)		-0.23 (-0.63 – 0.17)		0.05 (-0.35 – 0.45)
Introduced complementary foods (yes vs. no)		0.24 (-0.19 – 0.67)		0.23 (-0.13 – 0.59)

^a Difference between Q1 and Q2 is significant ($\alpha \leq 0.05$)^c Difference between Q1 and Q4 is significant ($\alpha \leq 0.05$)

Table 24: Maternal average daily intake of dairy and infant weight (kg) at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
Dairy, # servings:				
Q1	7.11 (6.74 – 7.47)	7.17 (6.81 – 7.54)	7.95 (7.56 – 8.34)	8.02 (7.63 – 8.40)
Q2	7.48 (7.13 – 7.83)	7.54 (7.22 – 7.87)	7.98 (7.58 – 8.39)	8.07 (7.70 – 8.44)
Q3	7.22 (6.86 – 7.59)	7.20 (6.86 – 7.53)	7.91 (7.51 – 8.30)	7.94 (7.57 – 8.31)
Q4	7.50 (7.08 – 7.92)	7.36 (6.96 – 7.76)	8.04 (7.69 – 8.38)	7.90 (7.58 – 8.22)
	Parameter estimates		Parameter estimates	
Dairy				
Q1	-0.39 (-0.95 – 0.16)	-0.19 (-0.75 – 0.37)	-0.09 (-0.60 – 0.44)	0.11 (-0.41 – 0.63)
Q2	-0.02 (-0.57 – 0.52)	0.18 (-0.33 – 0.70)	-0.05 (-0.58 – 0.48)	0.17 (-0.32 – 0.66)
Q3	-0.28 (-0.83 – 0.28)	-0.16 (-0.68 – 0.36)	-0.13 (0.65 – 0.39)	0.03 (-0.47 – 0.53)
Q4	REF	REF	REF	REF
Infant weight at birth		1.13 (0.72 – 1.55)		0.93 (0.55 – 1.32)
EPDS score		-0.01 (-0.05 – 0.04)		-0.01 (-0.06 – 0.04)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.04 – 0.02)
Mother's age		0.00 (-0.05 – 0.04)		0.00 (-0.04 – 0.05)
Race/ethnicity (white vs. other)		-0.37 (-0.96 – 0.22)		0.21 (-0.39 – 0.80)
Enrolled in WIC at 3m (yes vs. no)		0.17 (-0.35 – 0.69)		-0.09 (-0.68 – 0.50)
Smoking (yes vs. no)		0.30 (-0.99 – 1.59)		-0.28 (-1.54 – 0.98)
Marital status (yes vs. no)		0.13 (-0.67 – 0.94)		-0.26 (-0.87 – 0.35)
Gestational diabetes (yes vs. no)		0.01 (-0.71 – 0.73)		0.51 (-0.21 – 1.23)
Type 2 diabetes (yes vs. no)		0.89 (-1.18 – 2.96)		0.00 (-1.29 – 1.28)
Introduced formula (yes vs. no)		-0.21 (-0.61 – 0.18)		0.00 (-0.40 – 0.41)
Introduced complementary foods (yes vs. no)		0.24 (-0.17 – 0.64)		0.23 (-0.15 – 0.60)

Table 25: Maternal average daily intake of energy and infant weight (kg) at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
Energy, kcal:				
Q1	7.32 (6.95 – 7.70)	7.33 (6.98 – 7.69)	8.11 (7.73 – 8.49)	8.12 (7.75 – 8.49)
Q2	7.41 (7.03 – 7.79)	7.44 (7.10 – 7.79)	7.85 (7.48 – 8.22)	7.98 (7.63 – 8.34)
Q3	7.20 (6.83 – 7.57)	7.16 (6.81 – 7.52)	7.82 (7.43 – 8.21)	7.91 (7.55 – 8.26)
Q4	7.36 (6.97 – 7.74)	7.35 (6.99 – 7.70)	8.10 (7.73 – 8.46)	7.89 (7.54 – 8.23)
	Parameter estimates		Parameter estimates	
Energy				
Q1	-0.03 (-0.57 – 0.51)	-0.01 (-0.51 – 0.49)	0.01 (-0.52 – 0.54)	0.23 (-0.29 – 0.75)
Q2	0.06 (-0.48 – 0.60)	0.10 (-0.40 – 0.60)	-0.25 (-0.77 – 0.27)	0.10 (-0.41 – 0.60)
Q3	-0.16 (-0.69 – 0.37)	-0.18 (-0.70 – 0.34)	-0.28 (-0.81 – 0.26)	0.02 (-0.48 – 0.52)
Q4	REF	REF	REF	REF
Infant weight at birth		1.15 (0.73 – 1.57)		0.92 (0.53 – 1.31)
EPDS score		0.00 (-0.05 – 0.04)		-0.02 (-0.06 – 0.03)
Maternal BMI at 3m		-0.01 (-0.04 – 0.04)		-0.01 (-0.04 – 0.02)
Mother's age		0.00 (-0.04 – 0.05)		0.01 (-0.03 – 0.05)
Race/ethnicity (white vs. other)		-0.23 (-0.78 – 0.32)		0.22 (-0.37 – 0.80)
Enrolled in WIC at 3m (yes vs. no)		0.18 (-0.34 – 0.70)		-0.06 (-0.66 – 0.54)
Smoking (yes vs. no)		0.13 (-1.21 – 1.46)		-0.26 (-1.50 – 0.98)
Marital status (yes vs. no)		0.11 (-0.71 – 0.94)		-0.26 (-0.87 – 0.35)
Gestational diabetes (yes vs. no)		0.04 (-0.68 – 0.75)		0.47 (-0.87 – 0.35)
Type 2 diabetes (yes vs. no)		1.04 (-1.07 – 3.15)		-0.18 (-1.49 – 1.14)
Introduced formula (yes vs. no)		-0.24 (-0.66 – 0.17)		-0.01 (-0.42 – 0.41)
Introduced complementary foods (yes vs. no)		0.23 (-0.18 – 0.65)		0.21 (-0.16 – 0.59)

Table 26: Maternal average daily glycemic load and infant weight (kg) at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
Glycemic load:				
Q1	7.34 (6.97 – 7.70)	7.26 (6.92 – 7.60)	8.21 (7.81 – 8.61)	8.35 ^b (7.98 – 8.72)
Q2	7.16 (6.70 – 7.62)	7.32 (6.88 – 7.77)	7.98 (7.59 – 8.36)	7.99 (7.64 – 8.33)
Q3	7.41 (7.07 – 7.76)	7.41 (7.08 – 7.75)	7.79 (7.45 – 8.13)	7.80 (7.49 – 8.11)
Q4	7.30 (6.93 – 7.67)	7.27 (6.93 – 7.62)	7.98 (7.60 – 8.36)	7.84 (7.50 – 8.18)
	Parameter estimates		Parameter estimates	
Glycemic load				
Q1	0.04 (-0.48 – 0.55)	-0.02 (-0.50 – 0.47)	0.23 (-0.32 – 0.78)	0.51 (0.00 – 1.03)
Q2	-0.14 (-0.73 – 0.45)	0.05 (-0.52 – 0.62)	-0.01 (-0.55 – 0.53)	0.15 (-0.33 – 0.63)
Q3	0.11 (-0.39 – 0.62)	0.14 (-0.36 – 0.64)	-0.20 (-0.71 – 0.32)	-0.04 (-0.51 – 0.43)
Q4	REF	REF	REF	REF
Infant weight at birth		1.15 (0.72 – 1.57)		0.93 (0.56 – 1.30)
EPDS score		-0.01 (-0.05 – 0.04)		-0.02 (-0.07 – 0.03)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.04 – 0.02)
Mother's age		0.00 (-0.05 – 0.04)		0.00 (-0.04 – 0.04)
Race/ethnicity (white vs. other)		-0.26 (-0.82 – 0.30)		0.28 (-0.30 – 0.86)
Enrolled in WIC at 3m (yes vs. no)		0.21 (-0.32 – 0.73)		-0.10 (-0.67 – 0.46)
Smoking (yes vs. no)		0.34 (-0.97 – 1.65)		-0.28 (-1.46 – 0.91)
Marital status (yes vs. no)		0.19 (-0.66 – 1.04)		-0.24 (-0.82 – 0.35)
Gestational diabetes (yes vs. no)		0.06 (-0.66 – 0.78)		0.54 (-0.14 – 1.22)
Type 2 diabetes (yes vs. no)		0.88 (-1.30 – 3.06)		-0.45 (-1.71 – 0.81)
Introduced formula (yes vs. no)		-0.20 (-0.61 – 0.21)		0.03 (-0.36 – 0.42)
Introduced complementary foods (yes vs. no)		0.25 (-0.16 – 0.67)		0.23 (-0.13 – 0.58)

^b Difference between Q1 and Q3 is significant ($\alpha \leq 0.05$)

Table 27: Maternal average daily percentage of calories from carbohydrate and infant weight (kg) at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
% of calories from carbohydrate:				
Low/moderate (< 45%)	7.19 (6.82 – 7.56)	7.18 (6.83 – 7.52)	7.86 (7.44 – 8.28)	8.01 (7.60 – 8.41)
High (> 45%)	7.36 (7.15 – 7.58)	7.37 (7.17 – 7.56)	8.00 (7.79 – 8.21)	7.97 (7.78 – 8.16)
	Parameter estimates		Parameter estimates	
% of calories from carbohydrate				
Low/moderate (<45%)	-0.17 (-0.61 – 0.26)	-0.19 (-0.60 – 0.21)	-0.14 (-0.61 – 0.33)	0.04 (-0.42 – 0.50)
High (>= 45%)	REF	REF	REF	REF
Infant weight at birth		1.15 (0.74 – 1.56)		0.93 (0.54 – 1.32)
EPDS score		-0.01 (-0.05 – 0.04)		-0.01 (-0.06 – 0.04)
Maternal BMI at 3m		-0.01 (-0.04 – 0.02)		-0.01 (-0.04 – 0.02)
Mother's age		0.00 (-0.05 – 0.04)		0.00 (-0.03 – 0.04)
Race/ethnicity (white vs. other)		-0.23 (-0.78 – 0.31)		0.18 (-0.40 – 0.76)
Enrolled in WIC at 3m (yes vs. no)		0.16 (-0.35 – 0.67)		-0.08 (-0.66 – 0.50)
Smoking (yes vs. no)		0.26 (-1.02 – 1.54)		-0.25 (-1.47 – 0.97)
Marital status (yes vs. no)		0.18 (-0.64 – 0.99)		-0.28 (-0.88 – 0.32)
Gestational diabetes (yes vs. no)		0.12 (-0.61 – 0.84)		0.46 (-0.23 – 1.15)
Type 2 diabetes (yes vs. no)		0.79 (-1.25 – 2.82)		-0.01 (-1.24 – 1.22)
Introduced formula (yes vs. no)		-0.23 (-0.62 – 0.15)		-0.01 (-0.42 – 0.39)
Introduced complementary foods (yes vs. no)		0.25 (-0.16 – 0.65)		0.20 (-0.16 – 0.56)

Table 28: Maternal average daily percentage of calories from protein and infant weight (kg) at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
% of calories from protein:				
Low (< 10%)	-----	-----	7.72 (5.93 – 9.50)	7.93 (6.27 – 9.59)
Moderate (10% - 35%)	7.32 (7.13 – 7.51)	7.32 (7.16 – 7.49)	7.98 (7.79 – 8.17)	7.97 (7.81 – 8.14)
	Parameter estimates		Parameter estimates	
% of calories from protein				
Low (< 10%)		-----	-0.26 (-2.06 – 1.54)	-0.04 (-1.71 – 1.63)
Moderate (10% - 35%)			REF	REF
Infant weight at birth		1.14 (0.73 – 1.55)		0.92 (0.55 – 1.30)
EPDS score		0.00 (-0.05 – 0.04)		-0.01 (-0.06 – 0.04)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.04 – 0.02)
Mother's age		0.00 (-0.04 – 0.04)		0.01 (-0.03 – 0.04)
Race/ethnicity (white vs. other)		-0.24 (-0.79 – 0.30)		0.19 (-0.38 – 0.76)
Enrolled in WIC at 3m (yes vs. no)		0.19 (-0.31 – 0.70)		-0.08 (-0.68 – 0.52)
Smoking (yes vs. no)		0.31 (-0.96 – 1.58)		-0.26 (-1.47 – 0.95)
Marital status (yes vs. no)		0.11 (-0.69 – 0.91)		-0.27 (-0.87 – 0.32)
Gestational diabetes (yes vs. no)		0.04 (-0.67 – 0.74)		0.46 (-0.22 – 1.15)
Type 2 diabetes (yes vs. no)		0.81 (-1.23 – 2.84)		-0.01 (-1.24 – 1.23)
Introduced formula (yes vs. no)		-0.23 (-0.62 – 0.15)		-0.01 (-0.41 – 0.39)
Introduced complementary foods (yes vs. no)		0.25 (-0.15 – 0.66)		0.20 (-0.16 – 0.56)

Table 29: Maternal average daily percentage of calories from fat and infant weight (kg) at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
% of calories from fat:				
Low/moderate (< 36%)	7.30 (7.07- 7.53)	7.34 (7.13 – 7.55)	7.92 (7.66 – 8.17)	7.88 (7.65 – 8.11)
High (>= 36%)	7.36 (7.03 – 7.68)	7.28 (6.99 – 7.58)	8.04 (7.77 – 8.32)	8.08 (7.64 – 8.33)
	Parameter estimates		Parameter estimates	
% of calories from fat				
Low/moderate (< 36%)	-0.05 (-0.45 – 0.34)	0.05 (-0.32 – 0.43)	-0.12 (-0.50 – 0.25)	-0.20 (-0.55 – 0.14)
High (>= 36%)	REF	REF	REF	REF
Infant weight at birth		1.14 (0.73 – 1.56)		0.96 (0.58 -1.34)
EPDS score		0.00 (-0.05 – 0.04)		-0.01 (-0.06 – 0.04)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.04 – 0.02)
Mother's age		0.00 (-0.04 – 0.04)		0.00 (-0.04 – 0.04)
Race/ethnicity (white vs. other)		-0.24 (-0.79 – 0.31)		0.19 (-0.38 – 0.75)
Enrolled in WIC at 3m (yes vs. no)		0.19 (-0.32 – 0.70)		-0.13 (-0.70 – 0.45)
Smoking (yes vs. no)		0.32 (-0.96 – 1.60)		-0.25 (-1.45 – 0.95)
Marital status (yes vs. no)		0.11 (-0.70 – 0.92)		-0.26 (-0.85 – 0.33)
Gestational diabetes (yes vs. no)		0.06 (-0.67 – 0.79)		0.42 (-0.26 – 1.10)
Type 2 diabetes (yes vs. no)		0.76 (-1.31 – 2.83)		0.01 (-1.22 – 1.23)
Introduced formula (yes vs. no)		-0.24 (-0.62 – 0.15)		0.01 (-0.39 – 0.42)
Introduced complementary foods (yes vs. no)		0.26 (-0.15 – 0.67)		0.18 (-0.18 – 0.54)

Table 30: Maternal average daily intake of magnesium and weight-for-age z-score at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
Magnesium, g:				
Q1	-0.28 (-0.70 – 0.14)	-0.15 (-0.54 – 0.25)	0.13 (-0.28 – 0.53)	0.22 ^a (-0.15 – 0.60)
Q2	-0.05 (-0.44 – 0.34)	-0.01 (-0.37 – 0.35)	-0.50 (-0.94 – -0.07)	-0.43 ^d (-0.82 – -0.03)
Q3	0.01 (-0.41 – 0.43)	-0.08 (-0.47 – 0.32)	0.05 (-0.36 – 0.45)	0.12 (-0.24 – 0.49)
Q4	0.15 (-0.27 – 0.57)	0.06 (-0.34 – 0.47)	0.23 (-0.17 – 0.63)	0.00 (-0.38 – 0.38)
	Parameter estimates		Parameter estimates	
Magnesium				
Q1	-0.43 (-1.02 – 0.17)	-0.21 (-0.78 – 0.37)	-0.10 (-0.67 – 0.47)	0.22 (-0.33 – 0.78)
Q2	-0.20 (-0.77 – 0.37)	-0.07 (-0.63 – 0.49)	-0.73 (-1.33 – -0.14)	-0.43 (-0.99 – 0.14)
Q3	-0.14 (-0.73 – 0.46)	-0.14 (-0.71 – 0.44)	-0.18 (-0.75 – 0.39)	0.12 (-0.41 – 0.65)
Q4	REF	REF	REF	REF
Infant weight-for-age z-score at birth		0.58 (0.36 – 0.80)		0.50 (0.29 – 0.72)
EPDS score		-0.01 (-0.06 – 0.04)		-0.01 (-0.06 – 0.04)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.02 (-0.05 – 0.02)
Mother's age		0.00 (-0.05 – 0.04)		0.00 (-0.04 – 0.02)
Race/ethnicity (white vs. other)		-0.29 (-0.91 – 0.33)		-0.28 (-0.36 – 0.91)
Enrolled in WIC at 3m (yes vs. no)		0.15 (-0.43 – 0.72)		-0.20 (-0.83 – 0.44)
Smoking (yes vs. no)		0.31 (-1.13 – 1.75)		-0.29 (-1.63 – 1.05)
Marital status (yes vs. no)		0.02 (-0.90 – 0.94)		-0.40 (-1.06 – 0.25)
Gestational diabetes (yes vs. no)		0.00 (-0.80 – 0.81)		0.67 (-0.08 – 1.41)
Type 2 diabetes (yes vs. no)		0.81 (-1.50 – 3.13)		-0.24 (-1.61 – 1.13)
Introduced formula (yes vs. no)		-0.23 (-0.67 – 0.22)		0.00 (-0.44 – 0.43)
Introduced complementary foods (yes vs. no)		0.27 (-0.19 – 0.73)		0.33 (-0.08 – 0.73)

^a Difference between Q1 and Q2 is significant ($\alpha \leq 0.05$)

^d Difference between Q2 and Q3 is significant ($\alpha \leq 0.05$)

Table 31: Maternal average daily intake of added sugar and weight-for-age z-score at 6m

Variable	Girls		Boys	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Added Sugar, tsp:				
Q1	-0.05 (-0.45 – 0.35)	-0.08 (-0.47 – 0.30)	0.25 (-0.19 – 0.70)	0.38 ^c (-0.02 – 0.77)
Q2	0.04 (-0.44 – 0.52)	-0.01 (-0.45 – 0.44)	-0.22 (-0.59 – 0.15)	-0.12 (-0.45 – 0.21)
Q3	-0.10 (-0.50 – 0.31)	-0.06 (-0.45 – 0.32)	0.12 (-0.32 – 0.55)	-0.02 (-0.42 – 0.37)
Q4	-0.03 (-0.42 – 0.36)	0.00 (-0.37 – 0.36)	-0.08 (-0.53 – 0.36)	-0.20 (-0.60 – 0.20)
	Parameter estimates		Parameter estimates	
Added sugar				
Q1	-0.02 (-0.58 – 0.54)	-0.08 (-0.62 – 0.47)	0.34 (-0.30 – 0.97)	0.58 (0.00 – 1.15)
Q2	0.07 (-0.55 – 0.69)	0.00 (-0.58 – 0.58)	-0.14 (-0.72 – 0.44)	0.08 (-0.45 – 0.62)
Q3	-0.06 (-0.63 – 0.50)	-0.06 (-0.59 – 0.47)	0.20 (-0.43 – 0.82)	0.18 (-0.39 – 0.75)
Q4	REF	REF	REF	REF
Infant weight-for-age z-score at birth		0.59 (0.37 – 0.81)		0.54 (0.32 – 0.76)
EPDS score		-0.01 (-0.06 – 0.05)		-0.02 (-0.07 – 0.03)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.04 – 0.02)
Mother's age		0.00 (-0.05 – 0.05)		0.01 (-0.04 – 0.05)
Race/ethnicity (white vs. other)		-0.31 (-0.94 – 0.32)		0.38 (-0.25 – 1.02)
Enrolled in WIC at 3m (yes vs. no)		0.15 (-0.43 – 0.74)		-0.17 (-0.82 – 0.48)
Smoking (yes vs. no)		0.28 (-1.17 – 1.73)		-0.35 (-1.68 – 0.98)
Marital status (yes vs. no)		0.09 (-0.83 – 1.01)		-0.36 (-1.02 – 0.31)
Gestational diabetes (yes vs. no)		0.03 (-0.77 – 0.83)		0.50 (-0.25 – 1.26)
Type 2 diabetes (yes vs. no)		0.98 (-1.35 – 3.32)		-0.12 (-1.48 – 1.24)
Introduced formula (yes vs. no)		-0.23 (-0.68 – 0.21)		0.06 (-0.39 – 0.50)
Introduced complementary foods (yes vs. no)		0.27 (-0.20 – 0.74)		0.31 (-0.09 – 0.71)

^c Difference between Q1 and Q4 is significant ($\alpha \leq 0.05$)

Table 32: Maternal average daily intake of dairy and weight-for-age z-score at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Dairy, # servings:				
Q1	-0.27 (-0.68 – 0.13)	-0.23 (-0.64 – 0.17)	-0.07 (-0.52 – 0.37)	-0.01 (-0.44 – 0.42)
Q2	0.12 (-0.26 – 0.51)	0.20 (-0.15 – 0.56)	0.00 (-0.45 – 0.45)	0.11 (-0.30 – 0.53)
Q3	-0.15 (-0.55 – 0.25)	-0.17 (-0.54 – 0.19)	-0.06 (-0.50 – 0.38)	-0.04 (-0.45 – 0.37)
Q4	0.18 (-0.28 – 0.64)	0.04 (-0.40 – 0.48)	0.08 (-0.30 – 0.46)	-0.06 (-0.42 – 0.29)
	Parameter estimates		Parameter estimates	
Dairy				
Q1	-0.46 (-1.06 – 0.15)	-0.27 (-0.89 – 0.34)	-0.16 (-0.74 – 0.43)	0.05 (-0.53 – 0.64)
Q2	-0.06 (-0.66 – 0.54)	0.16 (-0.41 – 0.74)	-0.08 (-0.67 – 0.51)	0.18 (-0.37 – 0.72)
Q3	-0.33 (0.94 – 0.28)	-0.21 (-0.79 – 0.36)	-0.14 (-0.72 – 0.45)	0.02 (-0.54 – 0.58)
Q4	REF	REF	REF	REF
Infant weight-for-age z-score at birth		0.58 (0.36 – 0.80)		0.54 (0.32 – 0.76)
EPDS score		-0.01 (-0.06 – 0.04)		-0.01 (-0.06 – 0.04)
Maternal BMI at 3m		0.00 (-0.04 – 0.03)		-0.01 (-0.04 – 0.02)
Mother's age		0.00 (-0.05 – 0.04)		0.01 (-0.04 – 0.05)
Race/ethnicity (white vs. other)		-0.48 (-1.13 – 0.17)		0.28 (-0.38 – 0.94)
Enrolled in WIC at 3m (yes vs. no)		0.14 (-0.43 – 0.71)		-0.17 (-0.82 – 0.49)
Smoking (yes vs. no)		0.26 (-1.15 – 1.68)		-0.28 (-1.69 – 1.12)
Marital status (yes vs. no)		0.09 (-0.79 – 0.98)		-0.34 (-1.02 – 0.34)
Gestational diabetes (yes vs. no)		-0.02 (-0.82 – 0.77)		0.58 (-0.23 – 1.38)
Type 2 diabetes (yes vs. no)		1.00 (-1.29 – 3.28)		0.05 (-1.38 – 1.48)
Introduced formula (yes vs. no)		-0.21 (-0.64 – 0.23)		0.01 (-0.45 – 0.46)
Introduced complementary foods (yes vs. no)		0.27 (-0.17 – 0.72)		0.31 (-0.11 – 0.73)

Table 33: Maternal average daily intake of energy and weight-for-age z-score at 6m

	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
Energy, kcal:				
Q1	-0.04 (-0.46 – 0.37)	-0.02 (-0.41 – 0.37)	0.13 (-0.30 – 0.56)	0.13 (-0.28 – 0.54)
Q2	0.08 (-0.33 – 0.49)	0.12 (-0.26 – 0.49)	-0.16 (-0.58 – 0.25)	0.00 (-0.40 – 0.40)
Q3	-0.19 (-0.60 – 0.22)	-0.24 (-0.63 – 0.15)	-0.17 (-0.61 – 0.27)	-0.07 (-0.46 – 0.33)
Q4	0.00 (-0.42 – 0.42)	0.00 (-0.40 – 0.39)	0.16 (-0.24 – 0.57)	-0.08 (-0.47 – 0.30)
	Parameter estimates		Parameter estimates	
Energy				
Q1	-0.04 (-0.63 – 0.55)	-0.02 (-0.57 – 0.53)	-0.03 (-0.63 – 0.56)	0.21 (-0.37 – 0.79)
Q2	0.08 (-0.51 – 0.67)	0.12 (-0.43 – 0.67)	-0.33 (-0.91 – 0.26)	0.08 (-0.48 – 0.65)
Q3	-0.19 (-0.78 – 0.40)	-0.24 (-0.81 – 0.33)	-0.33 (-0.93 – 0.27)	0.01 (-0.54 – 0.57)
Q4	REF	REF	REF	REF
Infant weight-for-age z-score at birth		0.59 (0.37 – 0.81)		0.53 (0.31 – 0.76)
EPDS score		0.00 (-0.05 – 0.05)		-0.02 (-0.07 – 0.04)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.04 – 0.02)
Mother's age		0.01 (-0.04 – 0.05)		0.01 (-0.04 – 0.05)
Race/ethnicity (white vs. other)		-0.30 (-0.91 – 0.31)		0.30 (-0.36 – 0.95)
Enrolled in WIC at 3m (yes vs. no)		0.15 (-0.42 – 0.72)		-0.13 (-0.79 – 0.54)
Smoking (yes vs. no)		0.06 (-1.41 – 1.52)		-0.28 (-1.67 – 1.10)
Marital status (yes vs. no)		0.08 (-0.83 – 0.98)		-0.34 (-1.02 – 0.35)
Gestational diabetes (yes vs. no)		0.02 (-0.77 – 0.81)		0.56 (-0.21 – 1.34)
Type 2 diabetes (yes vs. no)		1.24 (-1.08 – 3.55)		-0.16 (-1.62 – 1.31)
Introduced formula (yes vs. no)		-0.25 (-0.71 – 0.20)		0.00 (-0.47 – 0.46)
Introduced complementary foods (yes vs. no)		0.27 (-0.19 – 0.73)		0.29 (-0.13 – 0.71)

Table 34: Maternal average daily glycemic load and weight-for-age z-score at 6m

	Girls (n = 96)		Boys (n = 90)	
Variable	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
Glycemic load:				
Q1	-0.03 (-0.42 – 0.37)	-0.11 (-0.49 – 0.27)	0.22 (-0.23 – 0.67)	0.38 ^b (-0.03 – 0.79)
Q2	-0.23 (-0.74 – 0.27)	-0.07 (-0.56 – 0.43)	0.01 (-0.43 – 0.45)	-0.01 (-0.37 – 0.40)
Q3	0.06 (-0.31 – 0.44)	0.07 (-0.30 – 0.44)	-0.21 (-0.60 – 0.18)	-0.20 (-0.54 – 0.15)
Q4	-0.05 (-0.46 – 0.35)	-0.08 (-0.46 – 0.30)	0.03 (-0.40 – 0.46)	-0.14 (-0.53 – 0.24)
	Parameter estimates		Parameter estimates	
Glycemic load				
Q1	0.03 (-0.54 – 0.60)	-0.03 (-0.57 – 0.51)	0.19 (-0.43 – 0.81)	0.53 (-0.53 – 1.11)
Q2	-0.18 (0.83 – 0.47)	0.01 (-0.62 – 0.63)	-0.02 (-0.63 – 0.59)	0.16 (-0.38 – 0.69)
Q3	0.12 (-0.44 – 0.67)	0.15 (-0.40 – 0.70)	-0.24 (-0.81 – 0.34)	-0.05 (-0.58 – 0.48)
Q4	REF	REF	REF	REF
Infant weight-for-age z-score at birth		0.59 (0.36 – 0.81)		0.54 (0.32 – 0.75)
EPDS score		-0.01 (-0.06 – 0.04)		-0.02 (-0.07 – 0.03)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.04 – 0.02)
Mother's age		0.00 (-0.05 – 0.05)		0.00 (-0.04 – 0.05)
Race/ethnicity (white vs. other)		-0.33 (-0.95 – 0.28)		0.36 (-0.29 – 1.01)
Enrolled in WIC at 3m (yes vs. no)		0.18 (-0.40 – 0.76)		-0.17 (-0.80 – 0.46)
Smoking (yes vs. no)		0.31 (-1.13 – 1.76)		-0.29 (-1.62 – 1.04)
Marital status (yes vs. no)		0.17 (-0.77 – 1.11)		-0.31 (-0.97 – 0.34)
Gestational diabetes (yes vs. no)		-0.05 (-0.75 – 0.85)		0.63 (-0.13 – 1.40)
Type 2 diabetes (yes vs. no)		1.07 (-1.34 – 3.48)		-0.45 (-1.87 – 0.96)
Introduced formula (yes vs. no)		-0.20 (-0.65 – 0.25)		0.04 (-0.40 – 0.48)
Introduced complementary foods (yes vs. no)		0.29 (-0.17 – 0.74)		0.30 (-0.10 – 0.70)

^b Difference between Q1 and Q3 is significant ($\alpha \leq 0.05$)

Table 35: Maternal average daily percentage of calories from carbohydrate and weight-for-age z-score at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
% of calories from carbohydrate:				
Low/moderate (< 45%)	-0.20 (-0.61 – 0.21)	-0.22 (-0.60 – 0.16)	-0.12 (-0.59 – 0.35)	0.04 (-0.41 – 0.49)
High (>= 45%)	0.01 (-0.22 – 0.25)	0.02 (-0.19 – 0.23)	0.02 (-0.21 – 0.26)	-0.02 (-0.23 – 0.19)
	Parameter estimates		Parameter estimates	
% of calories from carbohydrate				
Low/moderate (< 45%)	-0.21 (-0.68 – 0.26)	-0.23 (-0.69 – 0.21)	-0.14 (-0.67 – 0.38)	0.06 (-0.45 – 0.57)
High (>= 45%)	REF	REF	REF	REF
Infant weight-for-age z-score at birth		0.59 (0.38 – 0.81)		0.54 (0.31 – 0.76)
EPDS score		-0.01 (-0.06 – 0.04)		-0.01 (-0.06 – 0.04)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.05 – 0.02)
Mother's age		0.00 (-0.05 – 0.04)		0.01 (-0.04 – 0.05)
Race/ethnicity (white vs. other)		-0.30 (-0.91 – 0.30)		0.26 (-0.38 – 0.90)
Enrolled in WIC at 3m (yes vs. no)		0.13 (-0.43 – 0.69)		-0.15 (-0.79 – 0.50)
Smoking (yes vs. no)		0.23 (-1.17 – 1.64)		-0.27 (-1.62 – 1.09)
Marital status (yes vs. no)		0.16 (-0.74 – 1.06)		-0.36 (-1.02 – 0.31)
Gestational diabetes (yes vs. no)		0.13 (-0.68 – 0.93)		0.55 (-0.22 – 1.31)
Type 2 diabetes (yes vs. no)		0.91 (-1.33 – 3.16)		0.00 (-1.37 – 1.37)
Introduced formula (yes vs. no)		-0.24 (-0.67 – 0.18)		0.00 (-0.45 – 0.45)
Introduced complementary foods (yes vs. no)		0.28 (-0.16 – 0.73)		0.28 (-0.13 – 0.68)

Table 36: Maternal average daily percentage of calories from protein and weight-for-age z-score at 6m

Variable	Girls (n = 96)		Boys (n = 90)	
	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
% of calories from protein:				
Low (< 10%)	-----	-----	-0.25 (-2.26 – 1.75)	0.01 (-1.84 – 1.86)
Moderate (10% - 35%)	-0.04 (-0.25 – 0.16)	-0.04 (-0.22 – 0.14)	0.00 (-0.22 – 0.21)	-0.01 (-0.19 – 0.18)
	Parameter estimates		Parameter estimates	
% of calories from protein				
Low (< 10%)			-0.24 (-2.27 – 1.77)	0.01 (-1.85 – 1.87)
Moderate (10% - 35%)			REF	REF
Infant weight-for-age z-score at birth		0.58 (0.37 – 0.80)		0.53 (0.31 – 0.75)
EPDS score		-0.01 (-0.06 – 0.04)		-0.01 (-0.06 – 0.04)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.04 – 0.02)
Mother's age		0.00 (-0.04 – 0.05)		0.01 (-0.04 – 0.05)
Race/ethnicity (white vs. other)		-0.32 (-0.92 – 0.29)		0.27 (-0.37 – 0.91)
Enrolled in WIC at 3m (yes vs. no)		0.17 (-0.38 – 0.73)		-0.15 (-0.81 – 0.52)
Smoking (yes vs. no)		0.30 (-1.10 – 1.70)		-0.28 (-1.63 – 1.07)
Marital status (yes vs. no)		0.07 (-0.81 – 0.96)		-0.35 (-1.02 – 0.31)
Gestational diabetes (yes vs. no)		0.02 (-0.75 – 0.80)		0.56 (-0.21 – 1.32)
Type 2 diabetes (yes vs. no)		0.94 (-1.31 – 3.18)		0.00 (-1.37 – 1.37)
Introduced formula (yes vs. no)		-0.24 (-0.67 – 0.18)		-0.01 (-0.46 – 0.44)
Introduced complementary foods (yes vs. no)		0.29 (-0.16 – 0.74)		0.27 (-0.13 – 0.68)

Table 37: Maternal average daily percentage of calories from fat and weight-for-age z-score at 6m

	Girls (n = 96)		Boys (n = 90)	
Variable	Means: Unadjusted	Means: Adjusted	Means: Unadjusted	Means: Adjusted
% of calories from fat:				
Low/moderate (< 36%)	-0.05 (-0.31 – 0.20)	-0.02 (-0.24 – 0.21)	-0.07 (-0.36 – 0.21)	-0.12 (-0.37 – 0.14)
High (>= 36%)	-0.01 (0.37 – 0.34)	-0.09 (-0.42 – 0.23)	0.07 (-0.24 – 0.38)	0.13 (-0.15 – 0.40)
	Parameter estimates		Parameter estimates	
% of calories from fat				
Low/moderate (< 36%)	-0.04 (-0.48 – 0.40)	0.08 (-0.33 – 0.49)	-0.15 (-0.57 – 0.28)	-0.24 (-2.11 – 2.78)
High (>= 36%)	REF	REF	REF	REF
Infant weight-for-age z-score at birth		0.59 (0.37 – 0.81)		0.55 (-0.34 – 0.77)
EPDS score		-0.01 (-0.06 – 0.04)		-0.01 (-0.06 – 0.04)
Maternal BMI at 3m		-0.01 (-0.04 – 0.03)		-0.01 (-0.05 – 0.02)
Mother's age		0.00 (-0.05 – 0.05)		0.00 (-0.04 – 0.05)
Race/ethnicity (white vs. other)		-0.31 (-0.92 – 0.29)		0.27 (-0.36 – 0.90)
Enrolled in WIC at 3m (yes vs. no)		0.17 (-0.39 – 0.73)		-0.20 (-0.84 – 0.44)
Smoking (yes vs. no)		0.31 (-1.10 – 1.72)		-0.27 (-1.60 – 1.07)
Marital status (yes vs. no)		0.07 (-0.81 – 0.96)		-0.33 (-0.99 – 0.33)
Gestational diabetes (yes vs. no)		0.06 (-0.74 – 0.86)		0.50 (-0.26 – 1.26)
Type 2 diabetes (yes vs. no)		0.87 (-1.42 – 3.15)		0.02 (-1.34 – 1.38)
Introduced formula (yes vs. no)		-0.24 (-0.67 – 0.19)		0.03 (-0.42 – 0.47)
Introduced complementary foods (yes vs. no)		0.30 (-0.15 – 0.75)		0.26 (-0.14 – 0.66)

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