SUPPORT FOR BREASTFEEDING MOTHERS AND DETERMINANTS OF LONG-TERM BREASTFEEDING IN THE UNITED STATES

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by

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Approval

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Dedication

To my family, and families everywhere, who give life meaning.

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To my mother, Eva, who has always inspired me to follow my dreams and convinced me that I could achieve anything I set my mind to. You were my inspiration for motherhood, my greatest dream. Thank you for everything you have sacrificed to make my life better; your sacrifices were not in vain. I would not be the person or mother I am without you.

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To my angel babies: though I would rather hold you in my arms, I will always hold you in my heart.

To my best friend, Els, who always sees the best in me. To my cousin, Kaylen, with whom I've shared childhood, adulthood, and motherhood. To my little sister, Amanda, who let me practice mothering on her sweet baby self. Thank you to the rest of my wonderful family, parents-in-law, siblings-in-law, and friends who have supported me over the years.

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To all of the wonderful, busy, tired mothers who took the time to begin or complete my survey - without you, this work could not exist. Your dedication to your children and your desire to do your best for them inspire me. Your stories of motherhood are uplifting, motivating, and heartbreaking. I hope this work will in some way validate all that you sacrifice as mothers and begin a conversation in American culture that recognizes this sacrifice. I am honored to join all mothers, past and present, in their undying devotion to their babies. This is for you, fellow mothers.

To my son, husband, mother, and all those I love:

I hope you feel like a welcomed spark to my life, not an inconvenience, annoyance, or bother to my day.

I hope you feel comfortable in your skin, not constantly wondering how many things you need to change before you're loved and celebrated.

I hope you feel heard, valued, and understood, not dismissed for being too young or too inexperienced to have an opinion or know what you need to thrive.

I hope you feel capable and confident, not incapable of doing something without constant supervision and correction.

I hope you feel brave to bare the colors of your soul, not pressured to hide your light or play small to gain acceptance.

I hope after spending an hour … a day … a lifetime in my presence,

I leave your heart fuller, your smile wider,

your spirit stronger, your future brighter

than you could have ever imagined by yourself.

- Rachel Macy Stafford, 2015

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ABSTRACT

Despite expert recommendations to breastfeed for at least 12 months, the average age of weaning in the U.S. is three months. Drawing on a sample of 594 American mothers, this mixed methods study aimed to: 1) determine who supports breastfeeding women and what effect support has on breastfeeding duration; and 2) assess what factors influence the duration of long-term breastfeeding including weaning strategies and social support. Quantitative analyses reveal that mothers receive significant social support. Cox regression results indicate that frequently discussing breastfeeding with La Leche League and maternal grandfathers positively impacts duration, while discussing breastfeeding with physicians has a negative effect. Qualitative methods indicate that mothers who breastfeed long-term feel pressured to wean after 12 months, and that these mothers tend to follow a child-led weaning strategy. In order to promote breastfeeding for any duration, education is essential for those who support breastfeeding mothers, including health care providers.

CHAPTER ONE: Introduction

Some of the most salient issues in recent breastfeeding and lactation studies regard the extreme variability of breastfeeding duration cross-culturally and the most important factors in determining breastfeeding structure and patterns. Human lactation is highly variable; cross-culturally, weaning occurs anywhere from hours after birth to five or more years of age (Sellen, 2007). Weaning age is early compared to other hominoids, both in terms of fraction of maternal body size and absolute time, around 2.5-3 years of age (Hinde & Milligan, 2011; Mace, 2000). Considerable variation exists even among foragers; weaning ages range from two (Ache, Baka, Nso, Fulani, Datoga, Hadza) to four years of age (Bofi, !Kung) (Fouts, Hewlett, & Lamb, 2012; Hill & Hurtado, 1996; Hirasawa, 2004; Konner, 1977; Sellen, 2001b; Yovsi & Keller, 2003). Many studies over the last 30 years have focused on the reproductive ecology, physiology, and energetics of lactation (Ellison, 1994; Wood, Lai, Johnson, Campbell, & Maslar, 1985).

Researchers have reached a consensus on many of the physiological factors impacting lactation, such as the hormones involved in lactogenesis and the let-down reflex. Of all primates, human milk has the highest lactose content, possibly due to the evolved pattern of close maternal proximity and on-demand breastfeeding (Hinde & Milligan, 2011; Konner, 1977; Trevathan, 1987; Wood, 1994). Human milk is low in fat and protein and highly dilute, which is common among "carrying" species, or those whose infants generally accompany the mothers and nurse frequently throughout the night and day (Hinde & Milligan, 2011; Wood, 1994). This contrasts with "cache" species that are characterized by highly dense milk, which is essential when the period of

lactation is short or mothers and infants are separated while mothers obtain food (Hinde & Milligan, 2011). Species with infants who nurse frequently need dilute milk to keep maternal reserves from depleting; human mothers are able to subsidize the high costs of lactation (up to 600 calories per day) by reducing productivity, increasing intake, increasing metabolic rate, and utilizing fat stores (Hinde & Milligan, 2011; Wood, 1994). Due to the multi-faceted approach to subsidizing lactation costs, human breast milk supply and quality are less affected by maternal nutritional status than other species (Ellison, 1994).

Since making major headway in our understanding of the physiology and energetics of lactation, anthropologists have turned their focus to the various cultural and ecological influences on breastfeeding structure, calling for a biocultural approach to human lactation studies (Stuart-Macadam, 1995). The realization that cultural and ecological factors impact breastfeeding structure (supply, exclusivity, duration, frequency, etc.) has resulted in a flurry of research devoted to elucidating which factors are most important cross-culturally and in individual societies. The goal of determining which factors matter in unique ecological settings contributes to an overall theory of breastfeeding behavior, one that can be used to derive predictions about breastfeeding structure given certain ecological and cultural characteristics. The following will describe some of the factors found to strongly influence breastfeeding structure and patterns, drawing on studies conducted in various cultural settings over the last 30 years. To conclude, this section will discuss some of the issues that have received less attention and propose research that could address these issues.

What we know about breastfeeding structure

Breastfeeding structure refers to duration of exclusive breastfeeding, frequency and intensity of infant suckling, and length of breastfeeding. Infant suckling frequency and intensity determine the amount of prolactin released in the mother's body, which directly influences milk volume (Konner & Worthman, 1980; Wood, 1994). The volume of a mother's milk (or her perception of milk volume) influences the introduction of supplemental foods and age at weaning. Due to the significant impacts of the duration of exclusive breastfeeding and total duration of breastfeeding on infant mortality and life-long morbidity, anthropologists, health professionals, and demographers are interested in the determinants of breastfeeding structure and patterns. Breastfeeding patterns are influenced by such cultural and ecological factors as maternal workload/employment; availability and perceived quality of supplemental foods; support of kin and non-kin; maternal characteristics such as confidence, intentions to breastfeed, education, age, and race; cultural norms such as those regarding motherhood, female sexuality, and postpartum sex taboos; and to some degree, nutritional status, though studies are mixed on how changes in the mother's diet impacts milk volume and density (Hinde & Milligan, 2011).

Many studies have found that maternal workload and/or outside employment, as well as the availability of supplemental foods, significantly impact breastfeeding patterns. Work that is incompatible with frequent breastfeeding results in longer intervals between breastfeeding bouts, resulting in lower prolactin levels, and ultimately lower milk supply and the early return of ovulation (Ellison, 1994). For example, foragers nurse more frequently and wean later than farmers (Fouts et al., 2012; Fouts & Lamb, 2004; Hrdy, 1999). Compatibility of maternal work with nursing influences when mothers introduce

supplementary foods among the Datoga (Sellen, 2001b). Maternal employment in the U.S. is one of the major factors resulting in early weaning (Dermer et al., 2008; Wambach et al., 2005). The introduction of supplementary foods causes less intense and less frequent infant suckling, also reducing milk supply and resulting in early weaning. Sellen (2001) found that weaning patterns among the Datoga are seasonal, reflecting the seasonal availability of supplemental foods. Breastfeeding rates in the U.S., Europe, and Australia dropped significantly after the discovery of pasteurization and the manufacture of infant formulas in the late 19th to mid-20th centuries (Fildes, 1995; Wolf, 2003).

The support of kin and non-kin impacts breastfeeding in two ways: first, the support of alloparents impacts when a mother can wean; second, kin and non-kin provide advice that may influence breastfeeding patterns. Alloparental care can either result in early supplementation and weaning age or delayed weaning. In some cultures, alloparental care allows the mother to wean earlier and reproduce earlier by providing care for children while the mother is engaged in other activities. This usually results in long intervals between nursing bouts and the use of supplemental foods (Hrdy, 1999). Alternatively, assistance from alloparents through caring for existing children or allowing the mother to nurse rather than engage in economic production can allow the mother to nurse more frequently and for a longer duration. In terms of social support, support from grandmothers and spouses have been shown to be important in the developing and developed worlds (Dermer et al., 2008; Clifford & McIntyre, 2008; Heinig et al., 2009; Kong & Lee, 2004; Osman, El Zein, & Wick, 2009). Maternal grandmothers are influential in determining breastfeeding patterns in Senegal and peri-urban Bolivia (Aubel, Touré, & Diagne, 2004; Bender & McCann, 2000). Non-kin support from

physicians and other healthcare providers has been shown to impact when a mother introduces supplementary foods and initiates weaning (Wambach et al., 2005). The media also has a significant influence on mothers' perceptions of appropriate feeding. For example, one study found that breastfeeding rates in the U.S. declined one year after infant formula ads were increased in *Parents* magazine (Foss & Southwell, 2006).

Maternal characteristics such as intention to breastfeed are associated with a longer duration of breastfeeding (Forster, McLachlan, & Lumley, 2006; Wambach et al., 2005). This is particularly true in societies where alternative foods are perceived as safe and widely available. In Missouri, white, college-educated, older, married women are more likely to breastfeed (Sable & Patton, 1998), while education is not correlated with breastfeeding among Mexican immigrants (Gill, Reifsnider, Mann, Villarreal, & Tinkle, 2004). One of the most common reasons cited for early weaning worldwide is perceived insufficient milk syndrome (IMS). Obermeyer and Castle (1996) argue that IMS accounts for the fact that 85% of the world's women do not follow optimal breastfeeding recommendations. IMS is associated with characteristics of modernization – urbanization, higher female education and employment – especially in Latin American countries (Obermeyer & Castle, 1996).

Anthropologists have called for more research into how cultural norms impact breastfeeding patterns. Norms about the value of breast milk and motherhood influence breastfeeding patterns, and notions about female sexuality and the sexualization of breasts are associated with women weaning early due to (Cadwell, 2002; Kong & Lee, 2004; Small, 1999). The value of modernity and its association with "scientific" commercial formulas is partially responsible for the decline in breastfeeding in the

industrial world more than 60 years ago, and the more recent decline in the developing world (Wolf, 2003). Cultural norms about the appropriateness of feeding infants colostrum impact the initiation and maintenance of breastfeeding in many countries, including Senegal (Aubel et al., 2004). Parenting norms, such as where to put the baby to bed, also impact milk production. Night feedings are associated with higher prolactin levels (up to 4-6 times higher than day feedings), resulting in greater milk production and longer lactational amenorrhea (Hrdy, 1999; Wooldridge, 1995). American notions about the dangers of co-sleeping results in putting babies in separate beds or separate rooms, resulting in longer nursing intervals and early weaning (Vitzthum, 1994). Finally, postpartum sex taboos can influence breastfeeding patterns. In pre-industrial Europe, women sent their babies to wet-nurses to avoid postpartum sex taboos and resume reproduction sooner (Fildes, 1986; Hrdy, 1999).

Unaddressed Issues

Many studies have addressed the importance of kin in supporting lactating mothers, and how this impacts breastfeeding structure (such as weaning age, feeding of colostrum, introduction of supplementary foods, etc.). However, few have attempted to assess how maternal decisions are made based on the information provided to them by various sources. Aubel et al. (2003) found that grandmothers in Senegal are important in providing information and influencing mothers' infant feeding choices. They found that in many cases, grandmothers' knowledge was directly correlated with mothers' behavior. Bender and McCann (2000) also found that grandmothers' education and support of mothers influenced breastfeeding in Bolivia. While these studies have contributed to our understanding of the effect of grandmothers' knowledge on mothers' behavior, no studies

to date have approached this issue theoretically. Most studies simply report that mothers' support of their breastfeeding daughters is influential.

Studies in anthropology and demography have significantly improved our understanding of the physiology and energetics of human lactation. However, the big question, what cultural and ecological factors influence breastfeeding patterns, has yet to be answered. This calls for research in various cultures in order to form theories that can predict breastfeeding behavior based on key ecological and cultural variables.

Breastfeeding in the United States

Research conducted over the last few decades has demonstrated the benefits of breastfeeding for both mother and child. Studies have found that breastfeeding is associated with lower risks for reproductive cancers, postpartum depression, and type II diabetes in mothers (Ip et al., 2007; Moss & Yeaton, 2014). In children, breastfeeding has been found to reduce the risk of childhood obesity and overweight, SIDS, necrotizing enterocolitis, non-specific gastroenteritis, asthma, acute otitis media, diabetes, and lower respiratory tract infections (Ip et al., 2007). Additionally, recent studies have identified a causal link between breastfeeding and later performance on cognitive tests (Horta, Loret de Mola, & Victora, 2015). Researchers continue to discover additional short and long-term benefits for breastfeeding.

Recommendations

Despite the clear documented benefits of breastfeeding and public health efforts, breastfeeding rates in the United States fail to meet national and international recommendations. The Centers for Disease Control (CDC), World Health Organization

(WHO), and American Academy of Pediatrics (AAP) recommend that all infants are breastfed exclusively for the first six months. However, only 15% of mothers in 2010 met this goal (CDC, 2015). In fact, 53% of mothers in the U.S. introduce formula before their infants are a week old (Wolf, 2003). National and international recommendations are to continue breastfeeding to one or two years and beyond (AAP, CDC, WHO). Just over a quarter of children born in 2011 were breastfed at 12 months, with only 10% continuing to 18 months (CDC, 2015). The breastfeeding rate at two years in the U.S. is unknown.

History

Recognized as a pressing public health concern, researchers in many disciplines have attempted to address this paradox: why are many American women weaning so long before expert recommendations? Breastfeeding has gone in and out of cultural and scientific favor for the past 130 years in the United States. Women began supplementing breast milk with cow's milk and weaning at three months as early as the 1880s, which was a major shift from the previous generations who breastfed up to age two (Wolf, 2003). At that time, doctors supported breastfeeding. This trend reversed by the 1930s when doctors proclaimed pasteurized milk to be at least equivalent to breast milk (Wolf, 2003). Around mid-century, infant formula was touted by physicians as scientifically superior, and breastfeeding rates fell dramatically (Dermer et al., 2008). Initiation rates reached an all-time-low in 1973, when only one in five infants was ever breastfed (Cadwell, 2002).

While breastfeeding rates have been on the rise since the 1970s, they fail to meet international and national health standards. For infants born in 2006, 74% were breastfed at least once; the target rate is 81.9% (Healthy People 2020, 2015). Less than half

(43.5%) of infants were breastfed at six months, and the target goal for the year 2020 is 60.6%. Even fewer infants born in 2006 were still breastfed at one year (22.7%), while the national goal is 34.1% (Healthy People 2020, 2015). These rates are in stark contrast to some other industrial nations, such as Sweden, in which 97% of infants in 2009 were ever breastfed, and 65% were still breastfed at 6 months (Centre for Epidemiology, 2009). In Norway, 98% of infants were ever breastfed, 80% were still receiving breast milk at 6 months, and 46% of 12-month-olds were still breastfed (Onsoien, 2008; Onsoien, 2009).

Influencing Factors

Given the scientific evidence, it may seem surprising that some women choose not to breastfeed or do so for short durations. However, more than 20 years of research has revealed that the issue is complex, and numerous factors impact a woman's infant feeding decisions. In general, women who initiate breastfeeding in the U.S. tend to be older and married, have more education, and higher socioeconomic status (SES) (Wambach et al., 2005). Women least likely to initiate breastfeeding are young women of minority status, with low SES, who tend to lack support for breastfeeding (Wambach et al., 2005).

Social, cultural, and environmental support for breastfeeding can influence maternal breastfeeding decisions. Employment policies, state and federal laws regarding breastfeeding in public, and access to healthcare professionals, lactation consultants, and Baby-Friendly hospitals all impact the ability of mothers to initiate and continue breastfeeding (Abrahams & Labbok, 2009; Clifford & McIntyre, 2008; Wambach et al., 2005). The popular media and marketing by infant formula companies directly impact

breastfeeding decisions (Foss & Southwell, 2006). Some researchers have found that support from new mothers' spouses, mothers, other kin, and friends are important (Clifford & McIntyre, 2008; Heinig et al., 2009; Lavender, Mcfadden, & Baker, 2006). Additional factors include whether the mother works outside the home, her childcare options, SES, education, and ethnic affiliation (Cadwell, 2002; Wambach et al., 2005).

Culture has been identified as an important factor that influences breastfeeding. Cultural norms regarding the appropriate duration of breastfeeding, female sexuality and beauty, and the appropriateness of breastfeeding in public impact infant feeding practices (Avery & Magnus, 2011; Clifford & McIntyre, 2008). Significantly, a few recent studies have mentioned traditions and the influence of elders on infant feeding practices (Aubel et al., 2004; Bender & McCann, 2000; Ingram, Johnson, & Hamid, 2002). Excluding these few studies, most research focuses on the mother as the locus of decision-making, and the support of the maternal grandmother is just one element of social support.

Long-term Breastfeeding in the U.S.

There are many terms in the academic literature for breastfeeding beyond infancy: these include long-term, prolonged, extended, and sustained breastfeeding. However, there is no agreement on what duration researchers consider "long-term." Early studies defined long-term breastfeeding as any continued breastfeeding after 6 months (Reamer & Sugarman, 1987). Others consider breastfeeding after one year long-term (Buckley, 2001), and still others define extended breastfeeding as beyond 3 years (Dettwyler, 2004). Given this discrepancy in definitions, studies on long-term breastfeeding are difficult to compare. Mothers who nurse older infants and toddlers also tend to do so in private, which is often referred to as "closet nursing" (Dettwyler, 2004; Reamer &

Sugarman, 1987). Mothers utilize various strategies to conceal breastfeeding due to widespread social disapproval for breastfeeding older children. These include nursing in private and creating signs or code words for nursing that they share with their children (Buckley, 1992; Dettwyler, 2004). Many mothers express concern about keeping breastfeeding a secret when their children get old enough to initiate or ask to breastfeed in public (Stearns, 2011). Given the secretive nature of long-term breastfeeding and the lack of formal data collection on breastfeeding after 18 months, long-term breastfeeding women form a hard-to-study population.

The few studies conducted among long-term breastfeeding mothers in the U.S. have found that these women tend to be older, white, have higher completed educations and socioeconomic statuses, and are less likely to be employed than mothers who breastfeed for shorter durations (Buckley, 1992; Kendall-Tackett & Sugarman, 1995; Reamer & Sugarman, 1987). Most of these studies have explored the experiences and motivations of long-term breastfeeding women. Mothers report that they find bonding, positive emotional effects on the child, better physical health and immunity, and the ability to comfort a child to be benefits of breastfeeding their children beyond infancy (Buckley, 1992; Kendall-Tackett & Sugarman, 1995; Reamer & Sugarman, 1987). Maternal perceptions of these benefits tend to decline as the child ages (Kendall-Tackett & Sugarman, 1995).

In a similar vein, mothers report many reasons for their decisions to continue breastfeeding beyond infancy. Mothers in one study reported that they continued nursing because breastfeeding provided a special time for mother and child (Hills-Bonczyk et al., 1994). Mothers also were motivated to delay weaning because they wanted to allow the

child to self-wean, they felt their child was not ready, and that long-term breastfeeding was natural (Hills-Bonczyk et al., 1994). Buckley (1992) also found that mothers' long-term breastfeeding decisions were embedded in a greater philosophy of motherhood that viewed breastfeeding older children as natural and as a way to allow young children a healthy dependence. Quantitatively, one researcher found that the mothers' perceived degree of control over breastfeeding was positively associated with the mothers' intended duration of breastfeeding beyond 9 and 12 months (Rempel, 2004).

Though mothers in all studies on long-term breastfeeding report numerous benefits and positive consequences, they also report that there are some negative aspects of breastfeeding beyond infancy. These include social stigma (42% of mothers in one sample), embarrassment, and restriction of maternal activities (Reamer & Sugarman, 1987). One study found that some negative aspects are reported more frequently as the child ages, such as social stigma (29% at 6 months, 44% at 12 months, 61% at 24 months) (Kendall-Tackett & Sugarman, 1995). Additionally, mothers report that nursing an older child comes with unique challenges that include maternal impatience (Buckley, 1992).

Social support has been documented as an important element influencing breastfeeding duration among all mothers (Thulier & Mercer, 2009). Given the prevalent negative view of long-term breastfeeding in the U.S., some studies have explored the social support for mothers who breastfeed beyond infancy (Hills-Bonczyk et al., 1994; Kendall-Tackett & Sugarman, 1995; Rempel, 2004). Some of these studies draw on La Leche League (LLL) to obtain samples of long-term breastfeeding women, and they find that most mothers cite LLL as an important source of support (Kendall-Tackett &

Sugarman, 1995). These mothers reported that most LLL leaders (93%) and members (88%) had positive reactions to their decision to breastfeed long-term (Kendall-Tackett & Sugarman, 1995). Spouses, maternal grandmothers, sisters and other relatives, friends, and some co-workers are also important sources of support for some mothers, while some relatives, employers and strangers tend to respond negatively to long-term breastfeeding (Hills-Bonczyk et al., 1994; Kendall-Tackett & Sugarman, 1995). One study found that social support for breastfeeding dropped at 9 months among friends and maternal and paternal grandmothers (Rempel, 2004). Mothers reported less support from all individuals in their social networks at 12 months as compared to 9 months. Moreover, social support at 9 months was positively correlated with maternal breastfeeding intentions and behavior, which may indicate that social support influences breastfeeding duration beyond infancy (Rempel, 2004).

Limitations of the Existing Literature

The few existing studies on long-term breastfeeding in the U.S. are limited in that they are dated and tend to have small sample sizes. Additionally, the studies exploring social support relied on La Leche League (LLL) to recruit, which could limit the generalizability to mothers who are not involved in the organization (Kendall-Tackett & Sugarman, 1995; Reamer & Sugarman, 1987). Many women seek out LLL if they do not have support around them in the form of friends and family. As such, these women may have little support outside of LLL, which may not reflect the wider population of long-term breastfeeding women. For example, one study that does not rely on LLL for recruitment found that only 21% of women reported LLL as a source of support, as compared to over 90% in the other studies (Hills-Bonczyk et al., 1994).

While the existing literature has done well to explore the qualitative experiences of long-term breastfeeding mothers in the U.S., very few have utilized quantitative data to determine what factors affect breastfeeding duration beyond 12 months. In fact, Rempel (2004) was the only one to do so, but this study did not include any mothers who breastfed after 12 months. No research to date has examined how support changes after breastfeeding for 12 months. No studies have examined whether there is a significant difference between maternal and paternal kin or between kin and non-kin in who supports American mothers breastfeeding long-term. Finally, there have been no studies on how birth order or gender might affect long-term breastfeeding.

In addition to the limitations above, existing research recommends that studies be conducted to include mothers who breastfeed longer than 24 months, especially older children who are weaned in the pre-school years (Kendall-Tackett & Sugarman, 1995). Hills-Bonczyk and colleagues (1994) recommend that future research explore the impact of mothers having been breastfed as infants on breastfeeding duration among long-term breastfeeders. The current study was designed to fill these gaps in the literature, as well as attempt to overcome some of the limitations of previous studies with this population.

Human Behavioral Ecology: The Role of Theory in the Study of Breastfeeding Duration

This study will draw on the human behavioral ecology literature to explore how social support from kin and non-kin influences breastfeeding duration up to and beyond the first year. Given the necessary brevity of the theoretical background in the papers that make up the study, maternal and parental investment, life history theory, cooperative breeding, and parent-offspring conflict will be discussed in the following section.

Maternal Investment

Anthropologists interested in the variation of parental investment often take for granted that maternal investment is variable. Mothers have many opportunities to decide how much they will invest in a given child. Such decisions often have many important constraints, such as age, health, availability of alloparental care, resources, and education. Women face two major decisions concerning reproduction: when to begin investment in reproduction, and how much to invest in each offspring. Human females have a number of options that allow them to adjust the amount of investment in offspring, and all can be viewed as part of a series of tradeoffs.

First, women must determine when to begin reproduction, represented by age at first birth. The tradeoff involved in this decision is between continued investment in somatic growth and/or resources, and investment in reproduction. Many ecological and biological factors constrain a woman's possible options regarding her age at first birth. Second, women must decide how much to invest in each offspring. There are a number of ways to terminate investment in an offspring. Abortion, infanticide, abandonment, adoption, fostering, wet-nursing, early weaning, and complementary feeding reduce the amount of investment in a given child. Whether or not these possibilities are realistic options for the mother depends on ecological circumstances. Women may also choose to invest in one offspring over another. One way to do this is to manipulate inter-birth intervals, diverting resources away from existing offspring and toward future or gestating offspring.

In order to present the current state of research on the topic, it is essential to briefly introduce the four theories widely used in human behavioral ecology to address

maternal investment: life history, cooperative breeding, parental investment, and parent-offspring conflict. Understanding these theories helps clarify the different reasons mothers choose to wean at a given time.

Maternal Investment and Theory

Life history theory "attempts to explain why, despite initially puzzling variations, certain patterns or sets of traits can be seen as evolving in systematic and predictable ways within and between species" (Hill, 1993, p. 79). This variation in life stages is explained based on the principle of allocation. Allocation refers to the fact that energy is a limited resource. Organisms are challenged with a series of tradeoffs throughout the life cycle, which require energy to be diverted from one life stage to another. Mace (2000) argues that life history theory is uniquely capable of predicting how tradeoffs are resolved by natural selection. Such a paradigm is essential to understand human life history because of the many unique stages that characterize our species. For example, human infants are born altricial, with large brains and a short gestation length given maternal body size. Humans are also characterized by prolonged juvenile dependency, late age at maturity and first birth, short inter-birth intervals, and a long post-reproductive lifespan (Mace, 2000). Perhaps the most integral tradeoffs that characterize our species are the tradeoffs between the quantity and quality of offspring, and between current and future reproduction (Hill, 1993). Humans paradoxically have the largest, slowest developing, and most costly babies; yet, we breed faster than any of the great apes. Hrdy argues that this "hyperfertility" was made possible by the widespread assistance of alloparents, or cooperative breeding (Hrdy, 2009, p.102).

A cooperative breeding species, as defined by Hrdy, is characterized by

"alloparental assistance in both the care and provisioning of young" (Hrdy, 2009, p. 30). Cooperative breeding in humans is directly related to unique life history traits such as shorter inter-birth intervals and longer juvenile dependency. Human mothers need help from allocaregivers because they give birth again prior to the self-sufficiency of older offspring (Hrdy, 2009). The availability of alternative caregivers allows mothers to give birth more often, despite the fact that their larger and more dependent offspring are more expensive to raise. This ultimately "alters basic quantity-versus-quality life-history trade-offs underlying maternal decision-making," by making it possible for mothers to "invest less per offspring and give birth again sooner, without sacrificing child survival" (Hrdy, 2004, p. 71). Human behavioral ecologists have produced a vast amount of research providing evidence that post-reproductive females support their daughters' reproduction (Hawkes, O'Connell, & Blurton Jones, 1997; Hawkes, O'Connell, Blurton Jones, Alvarez, & Charnov, 2000; Hawkes, O'Connell, Blurton Jones, Alvarez, & Charnov, 1998; Hrdy, 2004; Hrdy, 1999; Leonetti, Nath, & Hemam, 2007b; Sear, Mace, & McGregor, 2000). Males have also been shown to support their mates and juveniles (Hewlett, 1991; Hill & Hurtado, 1996; Ivey, 2000; Kaplan, Hill, Lancaster, & Hurtado, 2000; Marlowe, 1999; Winterhalder, 1996). Moreover, numerous studies have shown that alloparental caregivers, when close kin, benefit by providing care in terms of increasing their inclusive fitness (Flinn, 1989; Hawkes et al., 2000). Access to alloparental care in some contexts can influence how long a mother is able to breastfeed.

While cooperative breeding diverts some of the responsibility for intensive care and resources away from the parents, they (especially mothers) still invest by far the most in their offspring. Parental investment theory addresses the ways in which parents allocate

resources "between existing offspring, current versus future offspring, and quantity versus quality of offspring" (Sugiyama & Chacon, 2004, p. 241). Parental investment comes in many forms: providing resources and basic care, developing a relationship with the child (MacDonald, 1997), arranging and paying for marriages, and investing in children's offspring. The high cost of raising human offspring is impacted by life history traits such as long juvenile dependency. In most cases, "parents rarely expect [juveniles] to be nutritionally independent," which significantly increases the amount of parental investment ((Worthman, 1993, p. 340). When determining how much to invest in each offspring, parents weigh the costs of investing in a specific offspring against investing in other existing or future offspring.

Finally, Trivers (1974) introduced the concept that parents and offspring may have conflicting strategies regarding parental investment. Parents may benefit by curtailing investment in each offspring to allow for investment in other offspring, while each offspring benefits from manipulating their parents to gain as much investment as possible. A classic example of early parent-offspring conflict is weaning. Strategies offspring may use to prolong investment in the form of weaning include crying and temper tantrums (Fouts & Lamb, 2004). Parents and offspring may also have conflict regarding investment in marriages (in the form of dowry, brideprice, or inheritance) and selection of the marriage partner (Trivers, 1974).

Life history theory, cooperative breeding, parental investment, and parent-offspring conflict are essential when investigating the strategies mothers adopt when investing in offspring. Some of the factors that mothers take into account are the effect of a birth on existing offspring, the response of her mate, the infant's likelihood for survival, and the

prospect that her efforts will result in reproductive success (Hrdy, 1999). Additionally, mothers face multiple tradeoffs, in which they must decide how much to invest given the potential benefits, costs, and ecological constraints.

Reproductive Tradeoffs

All organisms face four major reproductive tradeoffs (Roff, 1992; Stearns, 1992). Mothers must decide at each major tradeoff how much they will invest in reproduction and offspring. While these tradeoffs are not all directly related to breastfeeding, the timing of reproduction can influence breastfeeding duration. The first tradeoff is between continued somatic effort and reproductive effort (Voland, 1998). This tradeoff for women involves the age at maturity, marriage, and birth. Reproduction may be delayed to continue physical growth, accumulate resources, or social standing. The second tradeoff is between direct and indirect reproduction. Women must choose (or have the choice made for them in some cases) whether they will reproduce or assist their kin in reproducing. The decision to continue mating effort versus initiating reproduction is the third reproductive tradeoff. A woman's age at first birth, and usually marriage, represents the end of invested time in mating effort and the initiation of reproduction. Finally, mothers must determine how much they will invest in each offspring, current and future. This is the tradeoff between offspring quantity and quality (Voland, 1998). Parents modify investment in offspring according to the benefits and costs of raising an individual offspring, the effect continued investment will have on existing or future offspring, and what options are available to them to reduce investment in a particular child. How much a parent invests in a child, including time, care, and resources, is impacted by factors such as extrinsic mortality (Voland, 1998), subsistence (Blurton

Jones, 1993; Panter-Brick, 1995), the availability of allocaregivers (Panter-Brick, 1995), and cultural norms that may influence a parent to value one gender over another.

A variety of ways exist for mothers to reduce or terminate investment in a specific offspring. These include abortion, infanticide, abandonment, adoption, fostering, wet-nursing, weaning, and complementary feeding. Hrdy points out that "maternal subsistence and especially the survival of her offspring are so heavily influenced by other group members that it is impossible to consider the mother in isolation from the web of fitness tradeoffs by other individuals in the social network she is part of" (1992, p. 411). The following sections will examine the ecological factors that impact age at first birth, infanticide, abandonment, adoption, fostering, wet-nursing, weaning, and complementary feeding.

Age at First Birth

The first reproductive tradeoff a female (or any organism) faces is when to initiate reproductive investment over continued somatic or resource investment. It may seem counter-intuitive that natural selection would ever favor delayed reproduction. However, Hill (1993) points out that delaying reproduction at a certain age may actually increase an individual's potential for future reproduction by investing in growth, which increases the possibility of survival for later reproduction. A woman's decision to initiate reproduction is impacted by several ecological factors, such as her age at maturity, age at marriage, need to pursue education or career opportunities, extrinsic mortality, and perceived access to alloparental care.

Age at Sexual Maturity. This section focuses on the factors that impact how much and in what contexts mothers invest in their offspring. Age at sexual maturity impacts when

she can conceivably initiate reproductive investment. It may also influence whether or not she would want to delay reproduction in favor of somatic or resource investment. According to life history theory, "age at maturity represents the optimal solution to a tradeoff between increasing reproductive value and decreasing survival" (Hill 1993, p. 83). Several factors impact age at maturity, such as stress, family size, availability of resources, household composition, and competition (Voland, 1998; Worthman, 1993).

Age at sexual maturity in humans is highly variable worldwide. The mean age at menarche ranges from 12.3 to 18.6 years (Voland, 1998). Worthman (1993) points out that this variation has been subject to selection pressures from the environment and life experience. Not only is there variation across populations, the lowest observed in urban areas and some of the highest in Highland New Guinea, there is also a great deal of variation within populations (Worthman, 1993). There is evidence that better nutrition leads to an earlier age at menarche, which may explain why the mean age at menarche is so low in industrial societies (Hill, 1993) and is undergoing a secular trend. The impact of improved nutrition on lowered age at menarche is supported by research on the Bundi of New Guinea. Their average age at menarche dropped from 18 to 15.2 for girls living in urban areas in a span of only 17 years (Worthman, 1993).

A later age at maturity may be adaptive for a number of reasons. First, investment in reproduction at the expense of growth can lead to reduced fertility. Second, very young pregnant women suffer more from impeded growth, spontaneous abortions, and preterm births. Finally, women who reproduce early have more underweight children when they experience growth spurts during their pregnancies (Voland, 1998). Among the Kikuyu of central Kenya, girls reach menarche at a significantly greater age than girls in London

(Worthman, 1987). The mean age for Kikuyu girls is 15.9 years; indeed, age at menarche is often higher in small-scale societies than industrialized societies (Walker et al., 2006). The factors that impact this delayed age at menarche are large family size, periodic food shortages, low cash income, small plot size, and high population density (Worthman, 1993). Overall, delayed menarche can be a fitness maximizing strategy in some ecological contexts (Voland, 1998).

Age at Marriage. While age at maturity can certainly impact how soon a woman can reproduce, she can also be constrained by marriage practices. Age at marriage is one representation of the tradeoff between mating and parental effort. Voland (1998) discusses several factors that impact how soon a woman can get married. First, prevailing marriage patterns in a culture may dictate when a woman can get married. For example, polygyny increases the competition over women, thus lowering their average age at marriage (Marlowe & Berbesque, 2012). A high value for virginity and paternity certainty can also lower the average age at marriage.

Second, economic factors play a major role in determining age at marriage, and hence, age at first birth. Age at marriage may be later for "helper-at-the-nest" girls who participate in the household economy and childcare (Flinn, 1989). Age at marriage is a major factor in determining how early most women can reproduce, but it is also possible for women in many societies to reproduce prior to or outside of marriage. For example, girls who grow up in contra-normative father-absent households (households that lack a father in a culture in which two-parent households are the norm) tend to engage in sexual behavior earlier, reproduce earlier, and have unstable pair-bonds (Draper & Harpending, 1982).

Extrinsic Mortality. A number of studies have demonstrated that mortality and life expectancy have a significant impact on women's age at first birth. For example, high homicide mortality, low male life expectancy, and early age at reproduction in some urban Chicago neighborhoods in the late 1980s and early 1990s (Wilson & Daly, 1997). Up to the age of 30, lowered life expectancy across neighborhoods leads to early female reproduction. They argue that this trend supports the idea that life expectancy "may be a psychologically salient determinant of risk taking and the timing of life transitions" (Wilson & Daly 1997, p. 1271). Quinlan (2010) also found that extrinsic mortality had a significant effect on age at first birth in rural Dominica. Women who lived in environments with high risks of mortality in early life tended to reproduce late, perhaps due to the stress associated with high infant mortality conditions. Likewise, women who were born during periods of low infant mortality delayed reproduction. Women who lived in an environment with a moderate level of infant mortality when they were young, however, reproduced much earlier. Quinlan (2010) argues that these trends can be accounted for by developmental responses to the environment and psychological traits such as impulsivity, present orientation, and an external locus of control.

Perceived Availability of Alloparental Care. A woman's perception of the availability of alloparental caregivers impacts the timing of her strategy to initiate reproduction. Support from kin reduces a mother's opportunity costs of caring for children. In fact, the perception of limited available childcare in modern countries like the United States and Germany leads many women to either abstain from having children or significantly delay reproduction (Hrdy, 2009). Non-reproductive allocaregivers can have a profound effect on maternal reproductive success. Flinn (1989) found that women with such helpers have

greater reproductive success than those without. Many studies have indicated that alloparents increase child survival, allowing mothers to have more, and more surviving, children (Hawkes et al., 1998; Hrdy, 2009; Ivey, 2000; Ivey Henry, Morelli, & Tronick, 2004). Whether alloparents take the form of spouses, older children, grandmothers, mothers, or other kin, research shows that women who have greater social support are more responsive to their children's needs and have more children (Hrdy, 2009).

Terminating or Reducing Investment

Once a woman has children, she is faced with the quantity versus quality tradeoff. The children she decides to invest in and how much depends on the costs she will pay for investing, as well as the benefits she will reap for investing in a specific child (Voland, 1998). Costs include biologically and ecologically determined factors such as: the time and energy devoted to gestation, feeding, and care; economic costs of sustenance, childcare, and education; and impact on future remarriage. Benefits are also impacted by factors such as the impact a specific offspring may have on reproductive success (including vitality and gender), number of already existing offspring, the child's potential to contribute to household income or subsistence, and the child's potential to care for younger siblings (Voland, 1998). The costs of raising children are often not considered because maternal investment is not as highly variable as paternal investment. However, mothers have many ways to reduce or terminate investment in a given child, including infanticide, abandonment, fostering, adoption, wet-nursing, weaning, and complementary feeding. The following section will address these strategies and the factors that impact how and when mothers use them to reduce investment.

Infanticide and Abandonment. According to Sarah Hrdy, human parents differ from

non-human primates in that they are "responsible for the largest portion of infanticides, and marriage and inheritance systems, religious beliefs, and social norms concerning individual and family honor play central roles in parental decisions to terminate investment" in children (1992, p. 412). Parental decisions are influenced by many factors, including the desire to manipulate family size, composition, and configuration. Gender is an important quality of composition and configuration that parents commonly attempt to control through infanticide or abandonment. For example, archaeological evidence for sex-biased infanticide has been found in Israel from the Late Roman to Early Byzantine period, where several two-day old baby boy skeletons were found in a sewer outside a brothel (Smith & Kahila, 1992). Prostitutes may have preferred girls because it was less problematic to raise them without legitimate fathers. Parents have also been motivated to manipulate the order of their children's genders for practical reasons. Turke and Betzig (1985) suggest that the ideal configuration of a daughter first and then a son in the Ifaluk Atoll may be adaptive. They found that mothers who had daughters early in the birth order had greater reproductive success than women who had sons first (Turke & Betzig, 1985).

Mothers may also be motivated to commit infanticide or abandon a child if the child or the current economic conditions are perceived as undesirable. Daly and Wilson (1984) found several cross-cultural reasons for infanticide. A child may be viewed as undesirable if it was sired by a man other than the mother's spouse, if it was somehow defective or "low quality," or if it was one of a multiple birth (Daly & Wilson, 1984). While lactational amenorrhea tends to delay ovulation and subsequent pregnancies in natural fertility populations, mothers may become pregnant too soon after a previous

birth. Terminating investment in the older sibling may reduce that child's survival, and infanticide is a common solution to dispose of a child that is born too soon (Daly & Wilson, 1984). Economic conditions are also a major factor in determining whether a mother can or wants to keep a child. Lack of male support is one important consideration, particularly in cultures like the Ache where father contribution is key to child survival (Hill & Hurtado, 1996). Lack of resources, poor economic conditions, and lack of alternate caregivers may also influence a mother to commit infanticide or abandon an infant (Daly & Wilson, 1984; Hrdy, 1992).

Finally, the availability of alternative options for reducing or terminating investment influences a mother's decision to commit infanticide. Possible alternatives include wet-nursing, adoption, fostering, selling the child, reducing overall investment, and reducing investment in specific children (Hrdy, 1992). Destroying a child is usually a last resort, one that parents adopt when other options are not available. The lowered rate of infanticide in Europe after the opening of charity orphanages illustrates this point (Hrdy, 1992). Without such institutions however, abandonment is often not a viable alternative to infanticide. Adoption is also not possible for many mothers who lack supportive kin or institutions that care for children waiting for adoption. The cross-cultural patterns of infanticide demonstrate the impact of available alternatives on mothers' decisions to commit infanticide. Female infanticide is highest in patrilocal societies in South America and New Guinea, where father support is essential and abandonment is impractical (Hrdy, 1992). Sex-selective infanticide is practiced in about 9% of the world's cultures, and is most commonly biased against females. In contrast, the lowest rates of infanticide occur in Africa, where it is "largely confined to the destruction

of defective offspring or twins" (Hrdy, 1992, p. 433). Hrdy (1992) argues that the low rates in Africa are due to ecological factors such as the low cost of children; the widespread availability of caretakers, especially 'grannies', older siblings, and matrilineal kin; female-centered horticulture in matrilineal societies; value of daughters for labor and bridewealth; and the value of all children in a system of ancestor worship. Among the !Kung for example, only approximately 1% of births end in infanticide (Konner, 2004).

Adoption and Fostering. According to Silk, "adoption transactions involve reduction or termination of investment in offspring by natural parents, and initiation of investment by other adults" (1980, p. 801). If adoption and/or fostering are available options, a mother could increase her reproductive fitness by ensuring that the child is raised rather than destroyed, particularly if this can happen with minimal cost to herself. Adoption is common in many areas of the world, including Oceania. Adoption in Oceania almost always occurs between close kin. On average, up to 31% of the population in some societies of Oceania are adopted, and the extremes range from 12% in Tonga to 83% in the Ellice Islands (Silk, 1980). Kin adoption benefits parents by decreasing their family size to an optimal level, and benefits both natural and adoptive parents by redistributing property among close kin (Silk, 1980). While adopted children usually do very well when adopted by kin, they can also experience less investment by their adoptive parents than the natal children in their households. Adoptive parents usually divide land in favor of their biological children (Silk, 1980).

Fostering, like adoption, is another possible way for parents to reduce their investment in a child, yet ensure child survival. This practice is widespread throughout East, West and South Africa, where as many as 40% of mothers send weaned or weaning

infants to grannies or better-endowed relatives (Hrdy, 1999). Such relatives may be able to provide better educational opportunities and nutrition. Parents benefit not only from reducing their own costs of raising the child but from increasing the survival and success of the child while remaining in contact. Mothers who are very young, unmarried, lack support, are remarried, or who have "malicious co-wives" may send their children to grannies to avoid infanticide (Hrdy, 1999, p. 375).

Wet-nursing. Wet-nursing allows mothers to reduce initial investment of time and energy in lactation without entirely eliminating investment. Hrdy argues that "wet-nursing represent[s] an alternative to worse outcomes (death of infant and maternal destitution) rather than a covert means of destruction" (1992, p. 416). Wet-nursing may have begun early in human history when mothers were freed to forage while female kin suckled their infants. Such wet-nursing, or "communal suckling," could have been done by already nursing kin, or induced in pre-reproductive girls (as young as age 8) or post-reproductive girls women (as old as age 80). The advantages to having post-reproductive women as wet-nurses were that such women who were not constrained by their own reproduction had more time and were able to induce lactation more easily than pre-reproductive women (Hrdy, 1999). As societies became more stratified, higher status women were able to pay (or demand) wet-nursing services of lower status women. There is evidence that this occurred as early as 3000 BC in ancient Egypt (Hrdy, 1992).

Wet-nursing was extremely widespread in 18th century France, where 95% of 21,000 babies born in Paris were wet-nursed (Hrdy, 1999). There were three primary motives for wet-nursing (Hrdy, 1992; Hrdy, 1999). First, wet-nursing was valuable for elites because it allowed for shorter birth intervals, with births as often as every year, and

greater completed family sizes. Elite parents were able to pay high quality wet-nurses, which resulted in much lower mortality for wet-nursed infants. This was more often the case for heirs and earlier born infants than non-heirs and later born children. Second, wet-nursing allowed peasant women whose labor was essential to the household economy to work shortly after giving birth. Unfortunately, households that relied on women's labor also had fewer means with which to pay wet-nurses, resulting in high mortality of peasant infants. Compounding this problem, the shorter birth intervals caused by cessation of breastfeeding resulted in more offspring for peasant families who could not afford to provision them. Finally, peasants and elites may have been motivated to wet-nurse to get around postpartum sex taboos imposed by the Catholic Church. Hrdy (1999) notes that mothers were likely pressured by husbands to send their children out to wet-nurses because they were "eager to resume conjugal relations" (1999, p. 356).

Weaning and Complementary Feeding. As alternatives to wet-nursing, mothers can reduce their investment in a given child by weaning early and/or introducing complementary foods. As previously mentioned, weaning is often viewed as a classic parent-offspring conflict because of the differing strategies of mother and child (Trivers, 1974), as has been documented among the Ache (Hill & Hurtado, 1996). The mother benefits from reducing her investment in lactation, while the child benefits from extracting as much investment as possible from the mother. Sellen argues that complementary feeding may have "evolved as a facultative strategy that provided a unique adaptation for resolving tradeoffs between maternal costs of lactation and risk of poor infant outcomes" (2007, p. 123). The introduction of complementary foods prior to weaning is uniquely human, and contributes to the short birth intervals (an average of

four years) that characterizes the human species (Sellen, 2007). Complementary foods are introduced at around 6 months of age worldwide.

The length of breastfeeding is variable within and across populations. The average age at weaning for small-scale societies is approximately 30 months, and 75-83% of these societies breastfeed beyond two years (Sellen, 2007). Duration of breastfeeding is even highly variable across traditional hunter-gatherer societies. The Ache (Hill & Hurtado, 1996), Hadza (Marlowe, 2004), and Datoga (Sellen, 2001b) have among the lowest average lengths of breastfeeding, 24-25 months and 24 months. The Agta also have a shorter average length of breastfeeding, between 23 and 29 months (Konner, 2004). Bofi and Aka infants wean a bit later, around 36-48 months (Fouts & Lamb, 2004; Konner, 2004). Finally, the longest average duration of breastfeeding recorded in a hunter-gatherer society is among the !Kung San of Tanzania, at 48 months (Konner, 1977). Sellen (2007) argues that human flexibility in weaning age "reflects an evolved maternal capacity" to respond to ecological factors (2007, p. 133). Such factors include desired inter-birth intervals, gender, subsistence and mothers' involvement in household economy, the child's ability to survive, and availability of allocaregivers and alternate foods.

Breastfeeding practices, such as duration and intensity, significantly impact the duration of postpartum amenorrhea, which directly impacts the inter-birth interval. According to Ellison (1994), the length of lactational amenorrhea is the most important variable in determining the length of inter-birth intervals in natural fertility populations. However, this is not a perfect predictor of inter-birth intervals. Many mothers in natural fertility populations initiate weaning when they become pregnant again (Ache: Hill &

Hurtado, 1996; Aka and !Kung: Konner, 2004). In other cases, the inter-birth interval extends beyond the termination of breastfeeding. For example, the average inter-birth interval among the Datoga is 11 months later than the average duration of breastfeeding, and pregnancy rarely occurs prior to weaning (Sellen, 2001b). Bofi foragers have inter-birth intervals that coincide or are slightly longer than the average age of weaning. Contrary to previous findings, Fouts and Lamb (2004) found that Bofi forager children initiate weaning, and they did not observe signs of parent-offspring conflict as part of this process.

Several factors in addition to desired inter-birth interval impact when mothers decide to wean and introduce complementary foods. First, the child's ability to survive on complementary foods influences a mother's decision, because longer durations of breastfeeding increase child survival (Hrdy, 1999). The child's ability to survive on complementary foods depends greatly on what foods are available. Sellen (2001) found that Datoga mothers based their decision to end breastfeeding early on the availability of seasonal foods like animal milk and maize. Baka mothers were found to wean much earlier after becoming sedentary, due to the availability of plantains as an alternative food source (Hirasawa, 2004). The availability of clean water and palatable and nutritious foods impact a mother's decision to terminate weaning early (Hrdy, 1999).

Subsistence patterns and the mother's involvement in the household economy play a major role in how long she can exclusively breastfeed. Closely tied to this is the availability of allocaregivers. To illustrate this, Hadza infants are cared for mostly by their mothers until they are weaned, after which their fathers, grandmothers, and older sisters provide a great deal of care (Marlowe, 2004). Additionally, the length of

breastfeeding in contemporary societies is greatly influenced by the mother's workload and childcare options (Sellen, 2007). Datoga women are responsible for collecting water and firewood but continue to breastfeed if they have older children or co-wives who can assist in these tasks (Sellen, 2001b). While Datoga mothers agree that breast milk is better for infants than animal milk or other foods, they introduce such foods when their involvement in subsistence results in time constraints. Ivey Henry and colleagues (2004) found that Efe mothers are also stressed for time due to heavy involvement in subsistence. This cost is offset by having older children who can help with subsistence or childcare (Ivey, 2000). Overall, a mother may be forced to wean earlier if she is heavily constrained by economic activities and/or lacks supportive caregivers. This is evidenced by the fact that weaning age is much earlier among herders and farmers than foragers (Sellen, 2007).

Cooperative Breeding

There has been considerable debate about whether humans are cooperative breeders. Part of this debate revolves around the difficulty of defining what it means to be a cooperative breeder. Kramer (2010a) defines cooperative breeding as a social system in which non-parental members of a group provide care for the offspring of others. More specifically, she argues that cooperative breeding in humans should be defined as care provided by non-mothers. Those who support the classification of humans as cooperative breeders argue that long juvenile dependence, high child survival, and short inter-birth intervals are possible in humans due to cooperative breeding (Hrdy, 2004; Hrdy, 1999; Hrdy, 2009; Kramer, 2010a; Mace, 2000; Sear & Mace, 2008).

In contrast to this argument, some anthropologists and evolutionary biologists

argue that humans should not be classified species-wide as cooperative breeders. This is partly due to the difficulty of assessing whether humans are cooperative breeders based on the criteria set for other species. Avian species are classified as cooperative breeders if more than 10% of nests in one or more populations are attended by more than two birds. By this definition, humans would be considered cooperative breeders if more than 10% of families in one or more populations were assisted by alloparents; this is clearly the case in humans (Strassmann & Kurapati, 2010). However, Strassman and Kurapati (2010) argue that cooperative breeding should be defined as a breeding system in which direct provisioning is prevalent, and reproduction of alloparents is delayed or forfeited. They argue that this definition does not apply to humans as a species; rather it should be applied to individual societies or social systems that meet the criteria. According to Strassman & Kurapati (2010), the breakdown of extended families in the modern world is evidence for the facultative nature of human cooperative breeding.

Aspects of the Debate

One aspect of the debate about whether humans are cooperative breeders is whether or not cooperative breeding improves maternal fitness. Kramer (2010a) argues that alloparental care decreases child mortality rates and shortens inter-birth intervals, thus increasing maternal fitness. Additionally, the main debate centers on whether the forfeiting or delaying of alloparents' own reproduction is required to be considered a cooperative breeding species; according to the narrow definition, all human societies are not cooperative breeders, thus humans cannot be classified as cooperative breeders as a species. Those who argue that alloparenting must be reproductively costly characterize humans as communal breeders, rather than cooperative breeders. However, the

proponents of the broader definition argue that alloparenting in humans can exact low costs in alloparents while providing significant benefits (Ivey, 2000; Kramer, 2010a); this is partially due to the care of pre- and post-reproductives, and partially due to widespread food sharing in humans.

Evidence to support the broad and narrow definitions of cooperative breeding

Hrdy (1999, 2004, 2009), Kramer (2010a), and Mace (2000) argue that unique human life history traits including high survival, short interbirth intervals, and long juvenile dependence are possible due to cooperative breeding. Sellen (2007) argues that cooperative breeding allows mothers to mitigate the tradeoff between maternal investment and poor child outcomes through the use of complementary foods, a trait that is unique to humans.

Studies have attempted to determine the effect of alloparental care on child survival. Among the Efe hunter-gatherers, pre- and post-reproductive individuals are three times more likely to provide allocare than other individuals (Ivey, 2000). Kin are more likely to care than non-kin, and grandmothers, sisters, and aunts are more likely to provide care for offspring. Non-lactating mothers are twice as likely to provide care than lactating mothers. Foster children are more likely to assist with care of siblings than related siblings and are shown to increase child survival. Overall, Ivey (2000) found that the number of alloparents at one year of age is directly correlated with Efe child survival at age three. Sear and Mace (2008) argue that allocare is a human universal. They found that grandmothers are the most reliable form of support, though there is variation in the effect on survival based on whether the grandmother is maternal or paternal (with maternal grandmothers showing more consistently positive effects on survival). The

impact of fathers on survival is mixed; about one third of studies show a significant impact on child survival. Reproductive kin show mixed effects on child survival, possibly due to variation in inheritance patterns and resulting competition for resources. Older siblings tend to increase child survival cross-culturally (Sear, 2008). Finally, Hill and Hurtado (1996) found that Ache fathers impact child survival; children are more likely to die if their parents are divorced or if their father is dead. Grandmothers and other kin also provide alloparental care among the Ache. However, Strassman and Kurapati (2010) found that grandmothers are not as essential to child survival as Sear and Mace (2008) suggest.

Some evidence supports defining humans as cooperative breeders, even according to the restricted definition that requires alloparents to forfeit their own reproduction. For example, Flinn (1989) found that only one female reproduces per household in Trinidad, and that overlapping reproductive spans of mother and daughter result in conflict. Hrdy (1999) also argues that coerced wet-nursing, found throughout the world in more stratified cultures such as Ancient Egypt and pre-industrial Europe, is a form of alloparenting that requires the alloparent to forfeit their own reproduction.

Similarities

According to Flinn (1989), there are three characteristics of cooperative breeding species: 1) The lives of reproducers and helpers overlap; 2) Helpers are able to assist close kin with reproduction; and 3) Alternatives to helping are not likely to result in alloparents' own reproduction. Based on these characteristics, humans join other species such as wolves, elephants, tamarins, foxes, meerkats, and some primates as cooperative breeders (Kramer, 2010a). Shared suckling, or nursing provided by non-mothers, is

common in several species classified as cooperative breeders, such as cebus monkeys (Hrdy, 2009). Shared suckling is found in 87% of foraging societies; this is common, for example, among the Aka and Efe (Hrdy, 2009).

Differences

If cooperative breeding requires the forfeiting or delaying of alloparents' own reproduction, as is common in many other cooperative breeding species like wolves, not all human societies can be characterized as cooperative breeders (Strassmann & Kurapati, 2010). Anthropologists who argue that humans are cooperative breeders counter that this is not required in humans due to the ability of pre- and post-reproductives to provide allocare (Ivey, 2000; Kramer, 2010a). Human alloparenting does not require the dispersal of some members at sexual maturity, as is common in many other cooperative breeding species (Kramer, 2010a). Finally, food sharing is more widespread in humans than other cooperative breeding species (Kramer, 2010a). Kramer (2010a) argues that the unique characteristics of humans (delayed dispersal unnecessary, reproduction of helpers not forfeited, and food sharing) does not preclude them from being classified as cooperative breeders.

Ultimately, the difficulty of determining whether or not humans are cooperative or merely "communal" breeders depends on definitions. The difficulty lies in comparing humans to other species, as evolutionary biologists set different criteria for classification according to unique aspects of the species (as in birds). It is still heavily debated whether the unique characteristics of humans prohibit them from being defined as cooperative breeders. Those who argue that we should be defined as cooperative breeders species-wide demonstrate the significant effects of alloparents on female reproduction and life

history in most known cultures (Hrdy, 2004; Hrdy, 1999; Hrdy, 2009; Ivey, 2000; Mace, 2000; Sear & Mace, 2008). Those who argue for a more restricted definition of cooperative breeding state that the amount of variation in human alloparenting should require us to focus on explaining the variation rather than broadly proclaiming the benefits of cooperative breeding for all humans (Strassmann & Kurapati, 2010). If the goal of human behavioral ecology is to explain human variation based on cultural and ecological conditions, then pinning down whether humans are cooperative breeders should be a primary area of investigation.

Male Provisioning and the Grandmother Hypothesis

As previously discussed, human life history has several unique derived characteristics that are not shared with other primates: altriciality, early weaning in terms of maternal body size and absolute time, short interbirth intervals, long juvenile dependence, late age at sexual maturity, long lifespans, long post-reproductive lifespans in females, and the use of complementary/transitional foods (Hill, 1993; Hinde & Milligan, 2011; Mace, 2000; Sellen, 2007). Life history theory purports that each life history event involves tradeoffs, such that energy is allocated for one purpose at the expense of another (Worthman & Kuzara, 2005). Major life history events requiring tradeoffs in energy allocation include maturation vs. initiation of reproduction (age at sexual maturity), mating vs. reproductive effort (age at first birth), quality vs. quantity in parental investment (investment in existing vs. future offspring), and maintenance vs. continued reproduction (senescence/menopause in females). Various models have been proposed to address how humans evolved such unique life history characteristics. Two such models are the Grandmother Hypothesis (Hawkes et al., 1998) and Male

Provisioning (Kaplan et al., 2000).

The Grandmother Hypothesis

The grandmother hypothesis emphasizes the dense social networks in which human mothers raise their offspring, rather than the importance of human pair-bonding (Hawkes et al., 1998). The grandmother hypothesis argues that long juvenile dependence and high child survival are possible due to provisioning by grandmothers; grandmothers' provisioning allows their daughters to raise more costly offspring, born at shorter intervals, while investing less without compromising child survival. Hawkes and colleagues (1998) argue that grandmothers increase maternal fitness by: 1) provisioning their daughters and grandchildren in such a way that increases child body size and maturity, resulting in an earlier possible age at weaning; and/or 2) provisioning daughters' offspring during and after weaning to allow daughters to begin reproducing earlier. This mitigates the quantity-quality tradeoff mothers face, in that they are able to invest less per child without compromising child survival. Mothers are able to raise more costly children while investing less. Finally, Hawkes and colleagues (1998) argue that menopause evolved because the fitness benefits of provisioning daughters and grandchildren became greater to grandmothers at advanced age than continuing to reproduce themselves.

The Male Provisioning Model

According to Kaplan and colleagues (2000), male provisioning resulted in several unique human life history characteristics. They argue that pair-bonding and men's provisioning allows females to reduce economic productivity and increase intake to subsidize the costs of pregnancy and lactation. Male provisioning of juveniles also allows

women to reproduce faster, resulting in shorter inter-birth intervals, without compromising child survival. They argue that the transition to hunting, a high and long-term investment form of food acquisition, allowed humans to transition from a frugivore to omnivore diet. This transition was dependent on the use of weapons, hunting, and food sharing, and allowed for longer juvenile dependence and higher child survival. Finally, they argue that large brains and social intelligence, needed for acquiring difficult-to-gain food packages, resulted in slower maturity, longer juvenile dependence, and greater productivity later in life, potentially explaining the evolution of the long post-reproductive lifespan in humans.

Critiques and Cross-cultural Evidence

Hawkes and colleagues (1998) argue that the male provisioning model does not account for the evolution of menopause and other unique life history characteristics because male provisioning cannot account for short inter-birth intervals and high child survival. They argue that this is because hunting luck makes fathers' economic contributions unreliable, and fathers provide as a form of mating effort rather than parental investment. Some studies have found some support for aspects of the grandmother hypothesis. Ivey (2000) found that pre- and post-reproductive individuals (including grandmothers) increase child survival among the Efe. Sear and Mace (2008) found that grandmothers' impact on child survival is more reliable than fathers' cross-culturally. This supports the assertion of the grandmother hypothesis that grandmothers' assistance may have resulted in shorter inter-birth intervals, higher child survival, longer juvenile dependence, and higher maternal fertility; however, it does not necessarily demonstrate that menopause evolved due to grandmother provisioning. Sear and Mace

(2008) argue that menopause may have evolved independently, and that grandmothers provision because it results in greater fitness than not helping. In other words, once post-reproductive, grandmothers have no competing reproductive interests and benefit from increasing the fitness of their daughters. Additionally, Sear and Mace (2008) found that fathers' effect on child survival is highly variable; only one third of studies have shown a benefit. This may be because fathers' contributions to children can easily be substituted by other kin in many societies. One interesting caveat to the benefit of grandmothers is that maternal grandmothers are more reliably helpful than paternal grandmothers, possibly due to age or the effect of paternity certainty. A potential implication of this is that early human family systems were at least partially matrilocal, such that women reproduced near their mothers.

To counter the grandmother hypothesis, Kaplan and colleagues (2000) argue that grandmothers are not the main breadwinners in any society, nor are they shown to contribute more to reproducing females and juveniles than men in any society. Father care and provisioning is highly linked to child survival among the Ache and Hiwi; divorce or father death results in higher child mortality. Kaplan and colleagues (2000) also argue that the grandmother hypothesis cannot account for the post-reproductive life spans of men. They argue that the complementarity of males and females, resulting in pair-bonding, accounts for long juvenile dependence and high child survival. Women's ability to decrease economic production rather than increasing it during reproductive years demonstrates women's dependence on provisioning. To support Kaplan et al.'s assertions, Strassman and Kurapati (2010) found that grandmothers are not as reliable or essential cross-culturally as Sear and Mace (2008) (and Hawkes and colleagues) argue.

Human Characteristics associated with each model

According to Hawkes and colleagues (1998), if the grandmother hypothesis were correct, we would see mating effort rather than parental investment by males. For example, we would see wide distribution of meat, rather than the meat going directly to spouses and children. There is some support for this among the Hadza, but others have debated about the potential effect of reciprocity. Men may still be provisioning their households by ensuring the reciprocity of other hunters, even when meat is distributed equally in the group. This debate centers on the reliability and distribution of meat in big-game hunting societies. Hawkes et al. (1998) argue that male provisioning is a form of costly-signaling and mating effort, rather than parental investment. If men were provisioning females other than their spouses, this would support the mating effort argument. However, it is a bit unclear, if men do provision their wives, whether they are investing in mating opportunities or current/future offspring. Either way, we would see increased fitness for both spouses, in which case the motivations may not matter. Such a pattern would still result in higher maternal fitness.

If the grandmother hypothesis is correct, we should see more investment by grandmothers in offspring than fathers cross-culturally. As previously mentioned, there is mixed evidence for this. Some argue that fathers are incredibly important for child survival; this is true for the Ache and Hiwi (Hill, 1993; Kaplan et al., 2000). Others argue that fathers are not as reliable or essential to child survival as grandmothers, which is the case among the Hadza (Hawkes et al., 1998; Sear & Mace, 2008). Strassman and Kurapati (2010) argue that grandmothers are not consistently important, and Ivey (2000) argues that both grandmothers and fathers increase child survival among the Efe.

Therefore, it seems clear that the importance of investment by grandmothers or fathers depends on ecological conditions, in which case, the evidence cannot support one model over the other (Sear & Mace, 2008).

If the grandmother hypothesis is correct, we should see more significant returns from foraging by grandmothers being distributed to reproducing women and their offspring. The evidence for this is again mixed. Hawkes et al. (1998) argue that grandmothers have significant foraging returns that are given to daughters and grandchildren among the Hadza. Hewlitt (1991) argues that food provided by female foraging is equal to men's in many societies, and in a few exceeds the amount provided by men. Kaplan et al. (2000) counter that there are no societies in which grandmothers provide more food than men. They also argue that hunting requires the longest amount of time and skill to master, and that the shift from being frugivores to omnivores is responsible for several unique human life history traits. Additionally, decreased foraging productivity in reproducing females should correlate with increased productivity by important alloparents. Kaplan et al. (2000) found that Ache and Hiwi women produce less food when married to high producing men. Among the Hadza, post-reproductive women produce more than reproducing women (Hawkes et al., 1998). However, Kaplan and colleagues point out that post-reproductive Hadza women do not produce more than Hadza men, supporting the importance of male provisioning based on foraging patterns.

Regarding the morphology/physiology of reproduction, Kaplan et al. (2000) argue that human females increase intake and decrease economic output in order to subsidize the costs of reproduction, instead of relying on fat stores or increased metabolic efficiency. They argue that this supports the argument that women are able to reproduce

faster without compromising reproductive success due to provisioning from other age and sex classes (especially men). However, research into lactation has demonstrated that human females do rely on fat stores and increase metabolic efficiency while lactating, in addition to increasing intake and decreasing productivity (Hinde & Milligan, 2011). In this case, the physiology of reproduction certainly supports the fact that women's reproductive costs are offset by other members of the group, but it does not require that the provisioners be grandmothers or spouses. The two models also address the evolution of large brains and high social intelligence among humans. Hawkes and colleagues (1998) argue that learning is a result of long juvenile dependence, whereas the model by Kaplan and colleagues asserts that investment in learning and large brains resulted in delayed maturity, slow growth, and greater productivity later in life. Both argue for the development of the same life history characteristics, but debate the selective pressures that resulted in their evolution.

Finally, if either model were correct, we would see longer juvenile dependence, shorter inter-birth intervals, and higher child survival. Hrdy (2004) argues that provisioning by non-mothers (including fathers and grandmothers) allows for such life history traits in humans. The key to these variables is the mitigation of the quantity-quality tradeoff for human mothers. Provisioning allows women to reduce their economic production, while increasing their own consumption (due to the high costs of pregnancy and lactation) as well as increasing the demand for food required by her costly offspring. In this case, it seems less important *who* is provisioning reproducing females and their offspring, as long as provisioning allows her to decrease her investment in each offspring. Sear and Mace (2008) found that alloparents in general increase child survival and

fertility, but who helps is dependent on ecological and social conditions.

In conclusion, it seems that provisioning by either grandmothers or men (or both) can account for long juvenile dependence and high child survival. However, based on the mixed evidence for the importance of grandmothers versus fathers, it seems that neither can satisfactorily account for the evolution of menopause. If the evolution of menopause occurred because of the essential nature of grandmother provisioning for grandchildren, grandmothers would have had to provision enough and gain enough fitness benefits from ceasing their own reproduction to make menopause worthwhile. Hawkes et al. (1998) provide a persuasive argument for this occurrence using the Hadza as an analog for early human societies. However, as the cross-cultural evidence for grandmother provisioning is variable, even among foraging societies, one must assume that all early humans resembled the Hadza and not other foraging societies like the Ache in order to accept the grandmother hypothesis. This is problematic because it is difficult to assume that any existing foraging society accurately represents early modern humans, which society this would be, and in what ways they might differ due to their own unique cultural evolution.

Aims of the Present Study

Life history, parental investment, cooperative breeding, and parent-offspring conflict help explain why certain trends in weaning behavior are observed cross-culturally. If we accept the idea that humans are cooperative breeders in a broad sense of the term, it makes sense that a mother's access to alloparents would influence how long she can breastfeed. Based on ecological contexts, we may expect the father or maternal grandmother, or both, to be essential caregivers who influence the duration mothers are able to breastfeed. Mothers face tradeoffs at each stage of reproduction: weaning is not

only a potential source of parent-offspring conflict, but a time at which the mother must decide whether to continue investing in the current offspring or divert maternal resources to a future child. Drawing on the evolutionary and empirical literatures on breastfeeding, the following papers explore who invests in breastfeeding mothers and what factors influence breastfeeding duration beyond one year.

Paper One: "Who Supports Breastfeeding? A Look at Kin Investment in the U.S."

Research has suggested that humans can be defined as cooperative breeders, in that kin provide support for mothers and their children. While kin in industrial countries provide varying amounts and types of support to reproducing women, few studies have investigated the mechanisms through which kin invest and what effects this investment has on children and fertility. In industrial societies, evaluating the effect of kin support on fertility is complicated by neolocal residence and wide geographic dispersion of kin networks. Drawing on data collected with U.S. mothers in 2015, this paper seeks to investigate the types of contributions various kin provide to breastfeeding mothers and their children and how this investment impacts breastfeeding duration.

This paper will be submitted to *Human Nature* as part of the special issue on Parenting Strategies in Modern and Emerging Economies, which will come out in Winter 2016 (volume 27, issue 4). This journal is interdisciplinary in its focus on the social, environmental, and biological issues that influence human behavior. The paper takes an evolutionary perspective on the problem of social support for breastfeeding and how this influences duration.

Paper Two: "Determinants of Weaning Among Long-term Breastfeeding Mothers in the U.S."

Despite national and international recommendations, most American women do not breastfeed to one year or beyond. As such, research on long-term breastfeeding is sparse. This paper aims to determine what factors influence weaning age after one year, including maternal, familial, and child characteristics. The latter will include whether the mother was breastfed, which has not previously been examined in the long-term breastfeeding literature. It will also examine mothers' explanations of how and when they decided to wean their toddlers or older children. Finally, it will synthesize the results of both analytical approaches to describe the factors that influence weaning age for children who are breastfed to 12 months and beyond. Cox regression, a form of event history analysis, is used to predict factors that influence weaning age after 12 months. Qualitative analysis is used to derive weaning strategies from mothers' own weaning accounts.

This paper will be submitted to *The Journal of Human Lactation*. The journal publishes original research, case studies, insights, and commentaries that are relevant to issues in breastfeeding and lactation policy and practice. An interdisciplinary approach is utilized to make the journal relevant to a wide variety of professionals including lactation consultants, policy makers, researchers, and practitioners. Qualitative and quantitative methods are welcome. Other studies on long-term breastfeeding have been published in this journal.

Paper Three: "The Effect of Social Support on Breastfeeding Duration Among Long-term Breastfeeding Mothers in the U.S."

Research has found that social support is important to breastfeeding mothers and may influence breastfeeding duration (see (Thulier & Mercer, 2009), and some studies have explored social support among long-term breastfeeding mothers (Hills-Bonczyk et

al., 1994; Rempel, 2004). However, it is not clear how social support or disapproval impacts actual breastfeeding decisions among mothers who breastfeed for at least 12 months. This study aims to determine who encourages or discourages long-term breastfeeding and how others influence a mother's breastfeeding decisions. Utilizing qualitative analyses, it will explore who reportedly pressured mothers to wean their children after 12 months. Quantitative analyses will be used to determine what factors, including social support, influence breastfeeding duration beyond one year.

This paper will be submitted to the journal *Breastfeeding Medicine*. This journal was created by physicians with a goal to advance breastfeeding knowledge globally. Also an inter-disciplinary journal, it covers issues such as cultural, social, and economic issues; lactation physiology and composition; breastfeeding management and the treatment of problems in mothers and infants; and breastfeeding benefits. Mixed methodologies are welcome and the focus is largely empirical.

CHAPTER TWO: Study Methods

Recruitment

Data for this study were derived from a survey that was distributed online through social media in January and February of 2015. Participants were recruited using purposive/judgment sampling, a form of non-probability sampling (Bernard, 2011). Recruitment involved the researcher posting a survey link and description of the study on her Facebook profile, with the request that contacts share the survey with their friends on their Facebook pages. Additionally, the researcher contacted the operator of a popular blog that promotes breastfeeding, Paala Secor, to request that she advertise the study on her site (http://paa.la/). Among other natural parenting topics, Paala writes about "full-term" breastfeeding to normalize the practice and advocate for public breastfeeding through writing and images.

Women were invited to participate if they were at least 18 years of age and had at least one child whom they had breastfed or were currently breastfeeding. In the ad, participants were directed to an online survey on the University's Qualtrics site. This recruitment method allowed for a wide dispersal of the survey, which would not have been possible if recruitment was restricted to face-to-face or other local recruitment methods. Respondent-driven sampling also made it possible to reach participants who do not breastfeed in public; in most cases, only close friends and family members are usually aware of the mother's breastfeeding behaviors (Reamer & Sugarman, 1987). Due to this constraint, other studies on breastfeeding in industrial countries have used the Internet and social media to recruit participants (Dowling & Brown, 2013). While this sampling

method has the disadvantage of not being nationally representative, it benefits from having a larger proportion of mothers who breastfed for longer than the national average. Given the usually private nature of long-term breastfeeding, this recruitment method is likely the only way to obtain a large sample of long-term breastfeeding mothers. The goal for this study was to collect data with a bias toward mothers who successfully breastfeed for long durations in order to examine what factors are characteristic of those who are able to breastfeed longer than average. Ultimately, understanding the factors that help women meet public health recommendations might help us understand what to improve among those who are unable to do so.

The survey was open to any American mother who had breastfed for any length of time. The purpose of not restricting the recruitment to long-term breastfeeding mothers was two-fold: 1) given the low rates of long-term breastfeeding in the U.S., all breastfeeding mothers were included to obtain a sizeable sample and; 2) all mothers were included to allow for analyses that could examine differences between long-term breastfeeding women and those who breastfeed for shorter durations. Ultimately, more than half of the final sample was composed of long-term breastfeeding women (n=390). This was surprising given that most women in the U.S. do not breastfeed to 12 months (less than 25%). However, there may be a few reasons for the high proportion of long-term breastfeeding mothers in the sample. First, recruitment was primarily conducted through Facebook, and the researcher is a long-term breastfeeder with some friends who are as well. These friends likely took the survey and passed it on to other like-minded women. Also, the researcher is married, white, and of a middle-class background; many of her friends, and likely her friends' friends, are of the same background. These

characteristics are typical of long-term breastfeeding mothers. Second, the number of mothers who initiated the survey was 1,140, while only 607 completed it. Given that it included over 100 closed- and open-ended questions, the survey took a relatively significant time investment – around 45 minutes for most participants. There was no compensation for taking the survey. It may be that mothers who breastfeed long-term tend to be more passionate and dedicated to breastfeeding than those who do not, and as such, were more likely to complete a long survey about breastfeeding without compensation.

Instruments

A self-administered survey was conducted through the University's Qualtrics site. The survey contained a total of one hundred (100) questions, including open-ended and closed-ended items (see Appendix A for the full survey). The survey was pre-tested and reviewed by a lactation consultant prior to recruitment. The survey included demographic questions such as current age and completed education; age of spouse; completed educations of spouse, mother, and father; employment status of self and spouse; ethnic affiliation of self and spouse; annual household income; and religious affiliation. Women were also asked breastfeeding questions including whether they were currently breastfeeding, how long they plan to continue, the longest they breastfed any of their children, and how many children they have. For each child, mothers were asked if the child was breastfed. If not, they were asked the child's age, gender, age at introducing complementary foods, age the child slept through the night, age the child was night-weaned from a bottle, child's age at which mother's menstrual cycle returned, and reasons for not breastfeeding. For breastfed children, mothers were asked the child's age,

gender, age at introducing complementary foods, age the child slept through the night, age the child was night-weaned, child's age at which mother's menstrual cycle returned, if the mother experienced any problems with breastfeeding (and if yes, what these problems were and if they contacted anyone for help), and style of breastfeeding at specific ages (on-demand, scheduled, don't ask-don't refuse, and weaned).

Respondents were asked about their experiences with breastfeeding prior to becoming mothers, including whether they were breastfed and for how long, if they ever saw their mothers breastfeed siblings, and if they ever saw anyone other than their mothers breastfeed.

All mothers were asked questions regarding their support networks, including whom they spoke with regarding breastfeeding during pregnancy and their first child's infancy. Respondents indicated who provided support and what type (emotional, financial, informational, and childcare). A list of fifteen relatives, friends, and other individuals was provided, with an option for "other." Based on the length of time mothers breastfed, they were asked to indicate how encouraging members of their networks were in their decision to breastfeed at key ages (0-6 months, 7-12, 13-18, 19-24, 25-30, 31-36, and beyond 36 months). Respondents were asked to indicate which of eleven (including "other") positive aspects of breastfeeding they felt were relevant at key ages (0-3 months, 4-6, 7-12, 13-24, 25-36, and beyond 36 months). These included nutritional benefits for the child, maternal health benefits, delaying the return of menarche, postpartum weight loss, mother-child bonding, benefits for the child's emotional well-being, positive effects on the child's behavior, immune system benefits, aiding in the child's sleep, and cognitive/IQ benefits. Mothers also indicated which of nine (including "other") negative

aspects of breastfeeding they felt were relevant at key ages (same as those in the positive aspects list). These included pain or problems with breastfeeding, restricting maternal activities, dependence of the child, maternal embarrassment, and disapproval from family, friends, society, and healthcare providers.

All mothers were asked open-ended questions about their experiences with breastfeeding, including whether they ever felt compelled to breastfeed in private (and at what age of their children they began feeling that way) and if they perceived disapproval from certain individuals or in specific places, what these were, and how they dealt with this disapproval. Mothers also wrote about what they felt would improve society's acceptance of breastfeeding.

Mothers who breastfed longer than 12 months were asked additional open-ended questions. Questions included for what reasons they decided to breastfeed longer than 12 months, whether they would encourage other mothers to breastfeed beyond 12 months, what their 12 month or older children would say about what they like about breastfeeding, how frequently their older children breastfeed, if their older breastfeeding children have any difficult nursing habits due to their age, and how they decide to wean after 12 months. Mothers were also asked if they perceived any pressure to wean their children after 12 months of age, who pressured them, and whether they perceived that their child's gender had anything to do with this weaning pressure. These mothers were also asked what they thought would improve society's acceptance of long-term breastfeeding.

All mothers were also asked if there was anything they would like to add about their experiences with breastfeeding (in general, or breastfeeding 12 month or older

children for long-term breastfeeders). This generated a wealth of qualitative data about mothers' experiences with breastfeeding.

Study Population

Full Sample

A total of 1,140 participants began the survey; 607 mothers completed it. The drop-out rate for the survey was 46%, and given the nature of recruitment, there was no possibility for reminders to complete the survey. Twelve surveys were removed because the participants' nationalities and lifetime residences were outside the U.S., and the final sample included 594 respondents. All mothers were over the age of 18 and had breastfed at least one child at least once. Mothers indicated where they lived at the time of their first births, which included 47 U.S. states. Table 1 indicates participants' state of residence.

Table 1. Number of participants residing in each state at the time of their first birth

State of Residence	Number of Participants	State of Residence	Number of Participants
Alabama	2	Montana	1
Alaska	12	Nebraska	12
Arizona	25	Nevada	2
Arkansas	12	New Hampshire	2
California	30	New Jersey	2
Colorado	8	New Mexico	5
Connecticut	34	New York	12
Delaware	1	North Carolina	3
Florida	9	North Dakota	5
Georgia	7	Ohio	13
Hawaii	2	Oklahoma	2
Idaho	8	Oregon	12
Illinois	12	Pennsylvania	10
Indiana	6	Rhode Island	1
Iowa	17	South Carolina	18
Kansas	12	South Dakota	0
Kentucky	2	Tennessee	7

Louisiana	2	Texas	25
Maine	1	Utah	7
Maryland	2	Vermont	0
Massachusetts	8	Virginia	7
Michigan	15	Washington	13
Minnesota	3	West Virginia	5
Mississippi	3	Wisconsin	10
Missouri	166	Wyoming	0

Fifty-four percent (n=317) of mothers were breastfeeding at least one child at the time of the survey. Mothers were asked to indicate the longest length of time they had breastfed (including children still nursing): the average in months was 18 (range: 3 weeks to 66 months; mode: 12 months). At the time of the survey, 67% (n=203) of mothers who were still breastfeeding were nursing children at least 12 months of age, while 33% (n=102) of still nursing mothers had children under one year. For those whose children were weaned at the time of the survey, 69% (n=187) had weaned their children at or after 12 months. Thirty-one percent (n=85) of mothers who were not currently nursing had children who were weaned before one year of age. Table 2 displays demographic information for the full sample.

Table 2. Demographic and maternal characteristics for the full sample of breastfeeding women

Characteristic	**Mean**
Mother's Current Age	33.7
Mother's Age at First Birth	27.4
Spouse's Age at First Birth	29.7
Number of Children	1.9
Mother's number of siblings	2.0
	Percent of sample
Mothers Currently Employed	66%
Annual Household Income	
Less than $20,000	5%
$20-39,000	15%

$40-59,000	19%
$60-79,000	19%
$80-99,000	15%
Over $100,000	28%
Mother's Completed Education	
High School	15%
Associate's Degree	14%
Bachelor's Degree	34%
Master's Degree	24%
PhD/JD/MD	13%
Mother's Current Marital Status	
Single	8%
Married	87%
Divorced/separated	3%
Mother's Ethnicity	
Caucasian	92%
African American	>1%
Hispanic	4%
Native American	1%
Pacific Islander	>1%
"Other"	3%
Mothers who were Breastfed	60%

The average age of mothers at the time of the study was 34 (range: 19-74; mode: 31). The average age at the time of the mothers' first births was 27 (range: 16-44; mode: 27). The average age of respondents' spouses at first birth was 30 (range: 17-53; mode: 28). Eighty-four percent of mothers were married at the time of their first child's birth (n=493). Forty-one percent of women were primiparous (n=240), 38% had two children (n=221), and 22% had three or more children (n=127). Most mothers breastfed their children: 96% of first children were breastfed (n=563), 97% of second children were breastfed (n=328), 98% of third children were breastfed (n=119), 93% of fourth children were breastfed (n=37), 94% of fifth children were breastfed (n=15), and all of sixth and seventh children were breastfed (n=4 and n=2 respectively). The total number of children in the sample was 1,132.

Thirty-one percent (n=182) of respondents' highest completed education level was a Bachelor's degree, while an additional 33% had completed postgraduate degrees (n=190). Nine percent of respondents were pursuing a degree at the time of the survey (n=51). Eighty-seven percent of respondents were married at the time of the survey (n=511). Two-thirds of the respondents were employed at the time of the survey (n=389). Mothers worked on average 30 hours per week outside the home (range: 0-75 hours; mode: 40). Ninety-four percent of spouses were employed (n=480) and worked on average 44 hours per week outside the home (range: 0-100 hours; mode: 40). The most commonly reported annual household income was greater than $100,000 (28%, n=161). Annual incomes of $40-59,000 and $60-79,000 were reported by an additional nineteen percent each. Only 5% of the sample reported an annual household income below $20,000. The majority of respondents were white/Caucasian (92%, n=537), with an additional seven percent reporting Hispanic or "other." Spouses were also mostly white/Caucasian (90%; n=456). The largest proportion of participants reported no religious affiliation (45%; n=271), while 38% (n=222) reported affiliation with a Protestant denomination. An additional 11% reported Roman Catholic or Catholic affiliation.

The majority of respondents found out about the survey through Facebook (78%, n=457), while an additional 18% heard about it through a friend or relative (n=106). Two hundred and twenty three mothers elected to be contacted for follow-up interviews (39% of the sample).

Long-term Breastfeeding Sample

The final sample of long-term breastfeeding mothers included 390 respondents.

This included mothers who had breastfed any child over 12 months. Fifty-two percent (n=203) of mothers were breastfeeding at least one child at the time of the survey. Of these mothers, the longest length of time they had breastfed (including children still nursing) averaged 23 months (range: 12 to 66 months; mode: 12 months). For those whose children were weaned at the time of the survey, 60% (n=111) had weaned their children between 12 and 24 months. For those still breastfeeding at the time of the survey, 63% (n=127) reported that the longest they had nursed was between 12 and 24 months, while an additional 25% (n=50) were nursing children between 24 and 36 months of age. Table 3 displays demographic and maternal characteristics for the long-term breastfeeding mothers in the sample.

Table 3. Demographic and maternal characteristics for long-term breastfeeding women

Characteristic	**Mean**
Mother's Current Age	35
Mother's Age at First Birth	28
Spouse's Age at First Birth	30
Number of Children	1.9
	Percent of sample
Mothers Currently Employed	68%
Annual Household Income	
Less than $20,000	3%
$20-39,000	16%
$40-59,000	19%
$60-79,000	19%
$80-99,000	17%
Over $100,000	27%
Mother's Completed Education	
High School	13%
Associate's Degree	11%
Bachelor's Degree	36%
Master's Degree	26%
PhD/JD/MD	14%
Mothers Currently Married	91%
Mother's Ethnicity	
Caucasian	90%
African American	1%

Hispanic	3%
Native American	1%
Pacific Islander	1%
"Other"	4%
Mothers who were Breastfed	66%
Mothers who had problems breastfeeding	68%

The average age of mothers at the time of the study was 34 (range: 20-64; mode: 31). The average age at the time of the mothers' first births was 27 (range: 16-44; mode: 27). The average age of respondents' spouses at first birth was 30 (range: 17-53; mode: 28). Eighty-six percent of mothers were married at the time of their first child's birth (n=334). Thirty percent of women were primiparous (n=168), 43% had two children (n=116), and 27% had three or more children (n=105). Most mothers breastfed their children: 97% of first children were breastfed (n=380), 98% of second children were breastfed (n=260), 97% of third children were breastfed (n=97), 92% of fourth children were breastfed (n=33), 93% of fifth children were breastfed (n=13), and all of sixth and seventh children were breastfed (n=4 and n=2 respectively). Total number of children for all long-term breastfeeding mothers was 830.

Thirty-two percent (n=125) of respondents' highest level of completed education was a Bachelor's degree, while an additional 33% had also postgraduate degrees (n=126). Eight percent of respondents were pursuing a degree at the time of the survey (n=51). Ninety percent of respondents were married at the time of the survey (n=349). Two-thirds (66%) of the respondents were employed at the time of the survey (n=256). Mothers worked on average 30 hours per week outside the home (range: 0-75 hours; mode: 40). Ninety-five percent of spouses were employed (n=332) and worked on average 44 hours per week outside the home (range: 0-100 hours; mode: 40). The most commonly reported

annual household income was greater than $100,000 (27%, n=102). Annual incomes of $40-59,000 and $60-79,000 were reported by an additional 21% and 18% each respectively. Only 3% (n=13) of the sample reported an annual household income below $20,000. The majority of respondents were white/caucasian (92%, n=358), with an additional seven percent reporting Hispanic or "other" (n=24) (an additional respondent was African American). Spouses were also mostly white/caucasian (89%; n=309). The majority of participants reported no religious affiliation (45%; n=176), while 39% (n=154) reported affiliation with a Protestant Christian denomination. An additional 9% reported Roman Catholic or Catholic affiliation.

The majority of respondents found out about the survey through Facebook (77%, n=296), while an additional 20% heard about it through a friend or relative (n=76). Two hundred and eleven long-term breastfeeding mothers elected to be contacted for follow-up interviews (45% of the sample).

Conclusion

The bias of the sample toward white, educated, high socioeconomic status mothers could limit its generalizability. However, the benefit of this bias is that it is skewed toward those who are able to successfully breastfeed for longer durations. As such, the results give us insights into the social factors that help or deter women who breastfeed for longer than average, and thus, how these factors might affect those who breastfeed for shorter durations. If the public health goal is to increase breastfeeding duration among those who struggle to make it to three or six months, examining what works or is a challenge for those who make it to a year or longer could inform what could

be improved for women of lower socioeconomic backgrounds. The following three chapters will present the results of the study as three separate papers.

CHAPTER THREE: "Who Supports Breastfeeding Women: A Look at Kin Investment in the U.S."

Introduction

Cooperative breeding has been described by some as a social system in which members of a group provide care for the offspring of others (Hrdy, 2009; Kramer, 2010a). While such a term is usually reserved for species that help further the reproductive interests of others at the expense of their own (Lukas & Clutton-Brock, 2012), many researchers have argued that humans should be considered cooperative breeders due to the extensive care human mothers receive from others (Kramer, 2010a; Mace & Sear, 2005; Meehan, Quinlan, & Malcom, 2013; Sear & Coall, 2011). Unique human life history traits such as long juvenile dependence, high child survival, and short inter-birth intervals are often attributed to cooperative breeding (Hrdy, 2004; Hrdy, 1999; Hrdy, 2009; Mace, 2000; Sear & Mace, 2008). Studies have shown that kin provide support for reproducing mothers and their offspring, and that this support affects fertility and child outcomes (Sear & Mace, 2008). Fathers, maternal grandmothers, maternal grandfathers, paternal grandparents, maternal and paternal siblings, and other children have been shown to help reproducing mothers, though who helps differs based on ecological context (for a review, see Sear and Coall, 2011).

Recent evolutionary research has turned toward examining the mechanisms through which kin influence fertility (Meehan et al., 2013; Snopkowski & Sear, 2015). The aim of this study is to examine who invests in breastfeeding mothers in a large,

industrial, post-demographic transition society. Given high mobility and geographic dispersion, the ability of kin to invest in reproducing mothers and their offspring may be limited. Here we explore two research questions. First, who provides support for breastfeeding mothers in the U.S.? Second, how do kin and non-kin influence breastfeeding duration? These questions will be addressed using quantitative methods and a sample drawn from mothers residing in 47 states with a wide range in length of breastfeeding. As such, this study is poised to address kin and non-kin influence on length of breastfeeding in the U.S., one mechanism through which kin may influence fertility.

Research Question 1: Who invests in breastfeeding mothers and their offspring?

Kin influence fertility through age at marriage, age at first birth, and length of breastfeeding, which impact inter-birth intervals and total completed fertility (Snopkowski & Sear, 2013). Some studies have shown that alloparental help tends to be associated with higher child survival, earlier ages at marriage and first birth, and shorter inter-birth intervals among mothers in traditional societies (Flinn, 1988; Hawkes et al., 1997; Kramer, 2004; Turke, 1988). Who provides alloparental care and what help they provide differs based on ecological context.

Help from kin to raise children tends to occur less frequently in post-demographic transition societies (Kramer, 2010b). Some research demonstrates that grandparents still provide support and investment for their adult children and grandchildren in these societies; however, the type of support they provide and effects of their support may differ substantially from kin-based societies. For example, as extended families disperse

geographically and are characterized by neolocal residence, childcare is often provided by institutions or paid caregivers rather than by grandparents or other kin (Kramer, 2010b). Grandparents in these societies have fewer grandchildren to invest in, and as such, their investment is theoretically greater per child than in pre-demographic transition societies (Coall & Hertwig, 2010). However, it is in this context of high child survival that their investment has few effects on survival, and researchers instead look for more nuanced effects of grandparental investment.

Some research has shown that grandparents in post-industrial countries provide some direct care for their grandchildren. In the U.S., for example, grandparents provide childcare for over a quarter of employed mothers (Guzman, 1999). Grandparents also provide childcare for their young grandchildren in Europe, and the help grandparents provide influences the fertility of their reproducing children (Hank & Buber, 2009). In the Netherlands, childcare provided by grandparents was associated with increased probability of having additional grandchildren in the future (Kaptijn, Thomese, van Tilburg, & Liefbroer, 2010).

In post-industrial societies, the impact of grandparental support on fertility and child outcomes is less clear, largely due to lower child mortality rates in these countries (Sear & Coall, 2011). However, grandparents may invest in their adult children's fertility in unique ways. Namely, encouraging their children to delay reproduction to invest in their own capital (income, education, finding a quality mate, etc.) may be a form of investing in their future grandchildren that seems counter to traditional notions of promoting one's inclusive fitness (Coall & Hertwig, 2010). Women who delay childbearing to pursue greater education and income frequently do so at the cost of

proximity to their kin and hence often do not reap the benefits of kin alloparental care. This loss of kin support may delay reproduction and lower fertility, though Coall and Hertwig (2010) note that this strategy may be aimed at increasing investment in each child. As such, the direct effect of grandparental investment on grandchildren may be harder to discern, in that their investment may be financially greater during the adult child's pre-reproductive years.

Additionally, grandparents have been shown to impact child emotional and behavioral wellbeing. For example, maternal grandparental involvement is associated with decreased emotional and behavioral problems in children in England and Wales (Tanskanen & Danielsbacka, 2012). No effect was found between paternal grandparents' involvement and emotional and behavioral problems among grandchildren, which the authors argue supports the differential sex-specific reproductive interests of maternal and paternal kin. Researchers have also found that grandparental investment has a stronger impact on the wellbeing of grandchildren when parents have limited resources (Henderson, Haslip, Sanders, & Louden, 2009; Lussier, Deater-Deckard, Dunn, & Davies, 2002).

Prediction 1.1: Maternal grandparents will provide more support for mothers and their offspring than paternal grandparents. Several studies have found that maternal and paternal kin generally differ in the investment they provide for mothers and their offspring. Maternal grandmothers tend to be more reliable in providing help with their grandchildren than other grandparents in many contexts (Euler & Michalski, 2007; Meehan, Helfrecht, & Quinlan, 2014; Pollet, Nelissen, & Nettle, 2009; Sear & Mace, 2008; Sear & Coall, 2011). One of the most consistent findings across the literature is

that maternal grandmothers tend to invest more than other grandparents. In order of the most investment and close relationships, maternal grandfathers generally follow maternal grandmothers, who are then followed by paternal grandmothers. Paternal grandfathers tend to invest the least in their grandchildren (Coall & Hertwig, 2010). Grandmothers, however, may not invest equally in their grandchildren. Fox and colleagues (2009) found that a grandmother's effect on her grandchildren's survival can be explained by the degree of X-chromosome relatedness between the two. The researchers found that boys have higher survival rates when maternal grandmothers rather than paternal grandmothers are present, while the opposite is true for female grandchildren (Fox et al., 2009). Furthermore, the amount a grandparent invests can also depend on residence patterns, length of generation span, availability of resources, degree of adult children's need, and paternity certainty (Coall & Hertwig, 2010; Snopkowski & Sear, 2015).

Due to sex-specific reproductive strategies, maternal and paternal kin differ in how they invest and how their investment impacts fertility (Coall & Hertwig, 2010). Most research indicates that maternal kin tend to enhance their daughters' health and more frequently encourage the use of contraceptives, while paternal kin tend to enhance fertility (Borgerhoff Mulder, 2009; Johow & Voland, 2012; Leonetti et al., 2007b). For example, in a Thai sample, living with the husband's kin after marriage results in a shorter interval between marriage to first birth and shorter inter-birth intervals, which in turn increase total fertility (Snopkowski & Sear, 2013). In some contexts, where the mother resides is less influential on her fertility than is the fact that her residence is normative in the given culture. For example, patrilineal Bengali women living patrilocally and matrilineal Khasi women living matrilocally were older at the time of

their first births than women who lived in non-normative situations (Leonetti & Nath, 2009). This delay in reproduction allowed for greater education and higher incomes as well as a faster pace of reproduction due to alloparental help from senior females in the household (Leonetti & Nath, 2009).

Prediction 1.2: Fathers/spouses will provide more support for their partners and offspring than other kin and non-kin. In addition to grandparents, fathers invest in their mates and offspring. Factors such as paternity certainty, mating interests, kin interests (in investing in his sister's children or his own), and his wife's reproductive value affect the degree of investment a husband devotes to his children (Leonetti, Nath, & Hemam, 2007a). Additionally, whether he resides with his children and the degree of investment in his wife and children by other kin can affect how much he invests. For example, in a culture like the United States where neolocal residence is considered the ideal form of postmarital residence, paternal investment is expected to be high. In some contexts, men provide substantial calories for their families, particularly when women are pregnant or lactating (Marlowe, 2003). Fathers also provide varying degrees of direct care for children (Hurtado & Hill, 1992). For post-adolescent sons, investment from fathers has been found to predict their number of offspring (Scelza, 2010). Additionally, in urban India, a father's death can have significant effects on child outcomes, particularly when the death occurs during the adolescent and late childhood years (Shenk & Scelza, 2012). This effect was found to be stronger on daughters than on sons.

Prediction 1.3: Same generation kin will provide less support than grandparents and spouses. The effect of investment by kin of reproductive age, measured by child survival, is mixed. Often the role of reproductive kin depends on family and economic

structure, such as wealth inheritance. In some cases, children do better when they have either maternal or paternal uncles present (as among the Kipsigis), while there is no effect of the presence of aunts or uncles on Venetian and Ache child survival (Borgerhoff Mulder, 2007; Derosas, 2002; Hill & Hurtado, 1996). Maternal uncles and either type of aunt positively affected the survival of Mormon children in the 19th century (Heath, 2003). However, in a matrilineal community in Malawi, child mortality is higher among children who live on land owned by women and who have maternal grandmothers and aunts present, though this is not true when men are the landholders (Sear, 2008). The variation of the effect of reproductive kin on child survival may have to do with these relatives' concern with caring for their own children (Sear & Mace, 2008). In addition to needing resources to support one's own children, siblings in some contexts may invest less in one another due to competition for resources, though this competition is reduced in some neolocal contexts as compared to communal households sharing resources (Mace, 2013).

Research Question 2: How does support from kin and non-kin influence breastfeeding duration?

One of the ways alloparents can impact fertility, child survival, and wellbeing is through their influence on breastfeeding duration.

Prediction 2.1: Grandparents, particularly maternal grandmothers, will significantly influence breastfeeding duration. Grandparents can influence maternal investment by encouraging or discouraging certain breastfeeding behaviors (Coall & Hertwig, 2010). Research has found that grandmothers in particular, as well as other kin,

influence breastfeeding initiation, exclusivity, and duration through providing emotional support and encouragement, childcare, and assistance with breastfeeding problems (Bentley et al., 1999; Coall & Hertwig, 2010; Ingram et al., 2002). In a Thai sample, residing with paternal kin had a negative influence on breastfeeding duration as compared to residence with maternal kin (Snopkowski & Sear, 2013). In a study of U.S. mothers, three-generation co-residence (grandparent, mother, child) had a negative effect on breastfeeding initiation among lower socioeconomic status households and a negative effect on duration beyond six months for all mothers (Pilkauskas, 2014). Additionally, frequent contact with the maternal grandmother has been correlated with lower breastfeeding durations among women in the UK (Emmott & Mace, 2015). Due to the potentially strong impact of grandmothers on their daughters' breastfeeding behaviors, some interventions have aimed at educating grandmothers to improve breastfeeding practices among their daughters. Many of these interventions have been successful in non-Western countries and among immigrant communities in Western countries (Aubel et al., 2004; Ingram et al., 2002).

Prediction 2.2: Spouses will have a significant influence on breastfeeding duration.

Spouses can also affect breastfeeding duration. In regards to fertility in general, researchers have found that in some contexts, spouses tend to have a greater influence on a woman's reproduction when her mother is absent (Leonetti et al., 2007b). The lack of dense kin networks in neolocal industrial countries such as the U.S. may explain in part why spouses tend to be so influential on their wives' fertility and breastfeeding behaviors. Many breastfeeding studies of white American women have found that spousal support impacts breastfeeding decisions (Wambach et al., 2005). A recent study conducted in the

UK found that high paternal involvement had a negative impact on breastfeeding duration (Emmott & Mace, 2015).

Prediction 2.3: Non-kin will have a more significant influence on breastfeeding duration than some kin (excluding maternal grandmothers and spouses). Research has shown that many individuals outside of kin may influence breastfeeding duration, such as healthcare providers, friends, breastfeeding support groups, and the media. Some studies have shown that physicians in the U.S. generally lack training in breastfeeding management (Clifford & McIntyre, 2008; Wambach et al., 2005). Lack of physician support with breastfeeding problems and encouragement to supplement with formula can negatively influence breastfeeding duration (Wambach et al., 2005). In contrast, encouragement from a physician to breastfeed can result in longer durations of breastfeeding; midwives, lactation consultants, peer counselors, and nurses can also influence breastfeeding (Clifford & McIntyre, 2008). Breastfeeding support groups such as La Leche League offer support for mothers through encouragement, practical help, information, and a social environment that is supportive of breastfeeding (Clifford & McIntyre, 2008). The degree to which a mother's employer supports breastfeeding can influence the mother's ability to continue breastfeeding after returning to work (Wolf, 2003). Finally, mothers often seek breastfeeding advice from close female friends (Heinig et al., 2009).

Data and Methods

Data for this study were derived from a survey that was distributed online through social media in January and February of 2015. Participants were recruited using

purposive/judgment sampling, a form of non-probability sampling, which involves recruiting individuals who meet a certain criteria for participation (Bernard, 2011). To recruit, the researcher posted a survey link and description of the study on her Facebook profile with the request that contacts share the survey with friends on their Facebook pages. Women were invited to participate if they were at least 18 years of age and had at least one child whom they had breastfed or were currently breastfeeding. In the post, participants were directed to an online survey on the University of Missouri's Qualtrics site. This recruitment method allowed for a wide dispersal of the survey, which would not have been possible if recruitment was restricted to face-to-face or other local recruitment methods. Respondent-driven sampling also made it possible to reach participants who do not breastfeed in public; in many cases, only close friends and family members are usually aware of the mother's breastfeeding behaviors. Due to this constraint, other studies on breastfeeding in industrial countries have used the Internet and media to recruit participants (Dowling & Brown, 2013). Given the often-private nature of breastfeeding, this recruitment method is likely the only way to obtain a large sample of mothers who breastfeed for longer durations. While this sampling method has the disadvantage of not being nationally representative, it benefits from having a larger proportion of mothers who breastfed for longer than the national average. As such, this study can provide a unique insight into the social climate that influences mothers who are able to breastfeed for longer durations.

Ethical permission for survey recruitment was obtained through the University of Missouri's Institutional Review Board. The survey included 100 open and closed-ended questions regarding demographics (age, education, employment, income, etc), infant

feeding data for each child (whether the child was still breastfeeding, age at weaning, age in which complementary foods were introduced, etc.), questions regarding the mother's social network, and questions about her breastfeeding experiences.

All mothers were asked questions regarding their support networks, including how frequently they consulted sources regarding breastfeeding during pregnancy and their first child's infancy. Respondents indicated who provided support and what type (emotional, financial, informational, and frequency of childcare). A list of fifteen relatives, friends, and other individuals was provided, with an option for "other." To remain consistent with the literature, three generations of kin are referred to as follows: "mother" refers to the participant, "child(ren)" refers to the participant's offspring, and maternal/paternal grandparents refer to the participant's parents and in-laws.

A total of 1,140 mothers initiated the survey, and the final sample included 594 respondents. Table 4 provides summary statistics for the sample. Fifty-four percent (n=317) of mothers were breastfeeding at least one child at the time of the survey. The average age of mothers at the time of the study was 34, with an average age at first birth of 27. Eighty-four percent of mothers were married at the time of their first child's birth. Mean number of children was two. Forty-one percent of women were primiparous, 38% had two children, and 22% had three or more children. Most mothers breastfed their children: 96% of first children were breastfed, and over 90% of all later-born children were breastfed. The total number of children in the sample was 1,132. The average weaning age for first children (for those who were not still breastfeeding) was 15 months.

Table 4. Sample summary statistics including maternal and household characteristics

Characteristic	Mean
Mother's Current Age	33.7
Mother's Age at First Birth	27.4
Spouse's Age at First Birth	29.7
Number of Children	1.9
Mother's number of siblings	2.0
	Percent of sample
Mothers Currently Employed	66%
Annual Household Income	
Less than $20,000	5%
$20-39,000	15%
$40-59,000	19%
$60-79,000	19%
$80-99,000	15%
Over $100,000	28%
Mother's Completed Education	
High School	15%
Associate's Degree	14%
Bachelor's Degree	34%
Master's Degree	24%
PhD/JD/MD	13%
Mother's Current Marital Status	
Single	8%
Married	87%
Divorced/separated	3%
Mother's Ethnicity	
Caucasian	92%
African American	>1%
Hispanic	4%
Native American	1%
Pacific Islander	>1%
"Other"	3%
Mothers who were Breastfed	60%

Thirty-one percent of respondents had a highest completed education level of a Bachelor's degree, while an additional 33% had postgraduate degrees. Two-thirds of the respondents were employed at the time of the survey. Mothers worked on average 30 hours per week outside the home. Ninety-four percent of spouses were employed and

worked on average 44 hours per week outside the home. The most commonly reported annual household income was greater than $100,000. Annual incomes of $40-59,000 and $60-79,000 were reported by nineteen percent each. Only 5% of the sample reported an annual household income below $20,000. The majority of respondents were white/Caucasian, with an additional seven percent reporting Hispanic or "other." Spouses were also mostly white/Caucasian (90%). Forty-five percent of participants reported no religious affiliation, and 38% reported affiliation with a Christian denomination. While the sample is not random or nationally representative, mothers from 47 states residing in urban and rural areas completed the survey.

As expected, kin were widely geographically dispersed. Mothers most frequently lived near their own mothers but frequently lived at least a 12-hour drive from their in-laws. Figure 1 displays the distance mothers lived from their children's maternal and paternal grandparents at the time of their first child's birth.

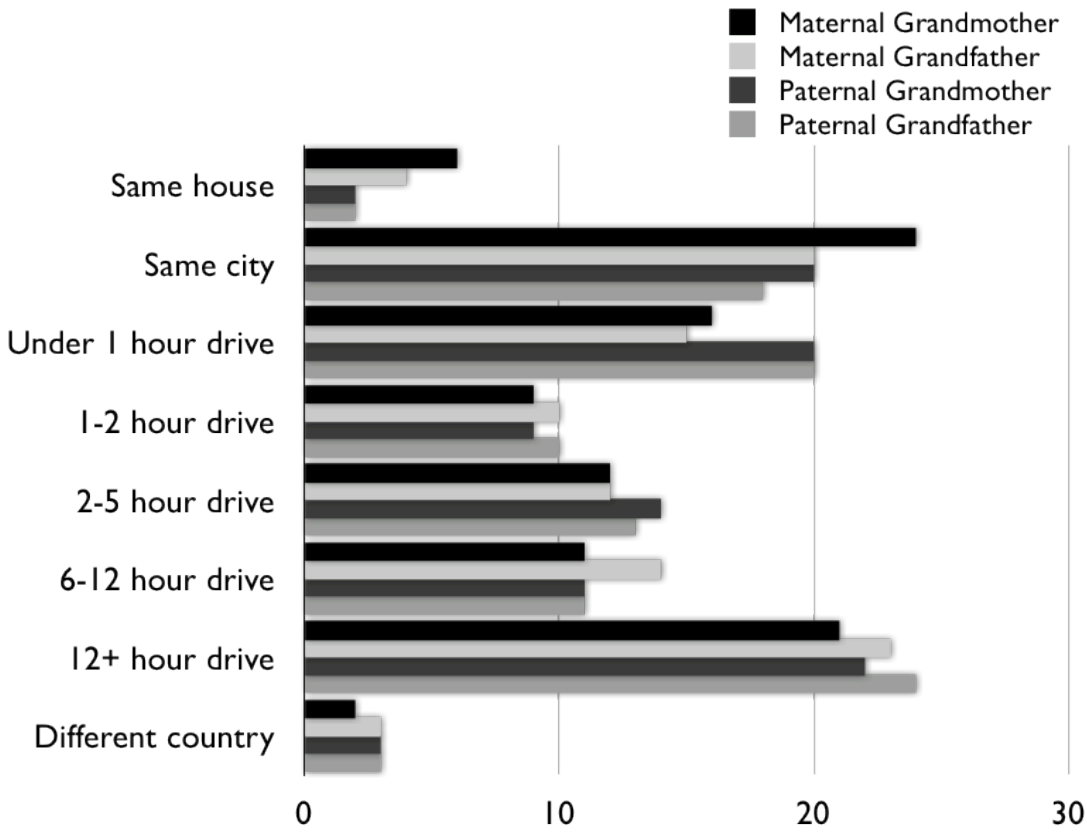

Fig 1 Geographic distance of the mother from maternal and paternal grandparents at the time of the first child's birth

The sample mothers reside in a cultural context that is largely unsupportive of breastfeeding despite recent public health efforts. Women in the U.S. face significant barriers to breastfeeding, such as physical problems (low perceived milk supply, tongue tie, mastitis, etc.), employment barriers, and lack of social support (Dermer et al., 2008). While breastfeeding initiation rates have risen substantially, with 79% of mothers attempting breastfeeding at least once, duration rates do not meet national and international recommendations. For example, 49% of children were breastfed at 6 months, 27% at 12 months, and just 10% at 18 months (CDC, 2015). The number of American mothers who breastfeed beyond 18 months is unknown, despite the WHO's

recommendation that breastfeeding continue for at least two years. The mothers in the current study's sample do not represent a random sample of the U.S. population. However, the sample is characteristic of mothers in the U.S. who tend to initiate and continue breastfeeding for longer durations (white, educated, married, middle to high SES) (Li, Darling, Maurice, Barker, & Laurence, 2005; Thulier & Mercer, 2009).

In the following section, methods and results are discussed for each hypothesis.

Results for Research Question 1: Who invests in reproducing mothers and their offspring?

Methods

The two-proportion z-test was used to determine how individuals differ in the quantity and types of support they provided for breastfeeding mothers and their offspring. In the survey, mothers reported whether individual kin and non-kin provided emotional support for themselves and for their children, informational support, financial support for themselves and their children, and frequency of childcare (occasional: less than once per month; frequent: monthly; or regular: daily or more than once per week). The z-test for proportions was used to test for statistical differences between the proportions of support mothers reported from pairs of individuals.

Results

Results indicate that mothers and their children received differing amounts of support from kin and non-kin. Figures 2-7 display the types of support and differences between individuals.

Emotional Support. Mothers reported the most emotional support from their spouses. They reported similarly high levels of emotional support from friends and maternal grandmothers. Fifty-two percent of mothers reported emotional support from maternal grandfathers and significantly less from sisters. Mothers received less support from paternal grandmothers than sisters. Sisters-in-law and brothers were reported to provide similar amounts of emotional support. Paternal grandfathers were reported by only one in five mothers, with the least support reported from brothers-in-law. Emotional support for mothers is depicted in Figure 2.

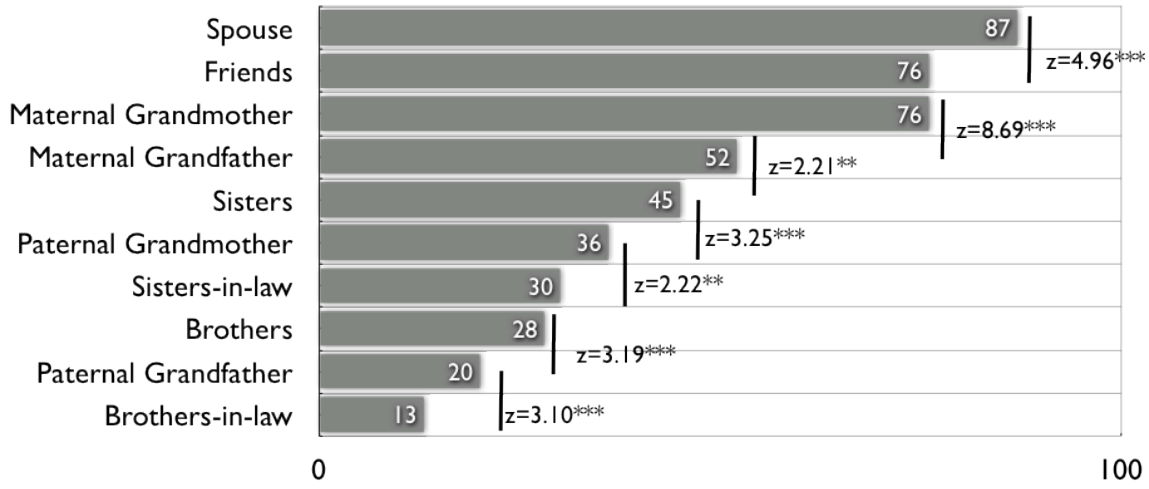

Fig 2 Percentage of mothers who reported receiving emotional support from specific individuals. Results from z-tests of proportions are displayed for significant differences between pairs. Non-significant results are not displayed. Statistical significance is displayed as follows: ***p<.001; **p<.05; *p<.10.

Mothers most frequently reported that spouses provided emotional support for children, followed by maternal grandmothers, then friends. There were no statistical differences in the frequency mothers reported support from friends, maternal

grandfathers, and paternal grandmothers. Emotional support for children from sisters and paternal grandfathers was reported more frequently than from sisters-in-law and brothers. Mothers reported the least emotional support for their children from brothers-in-law. Figure 3 presents the results of z-tests of emotional support for children.

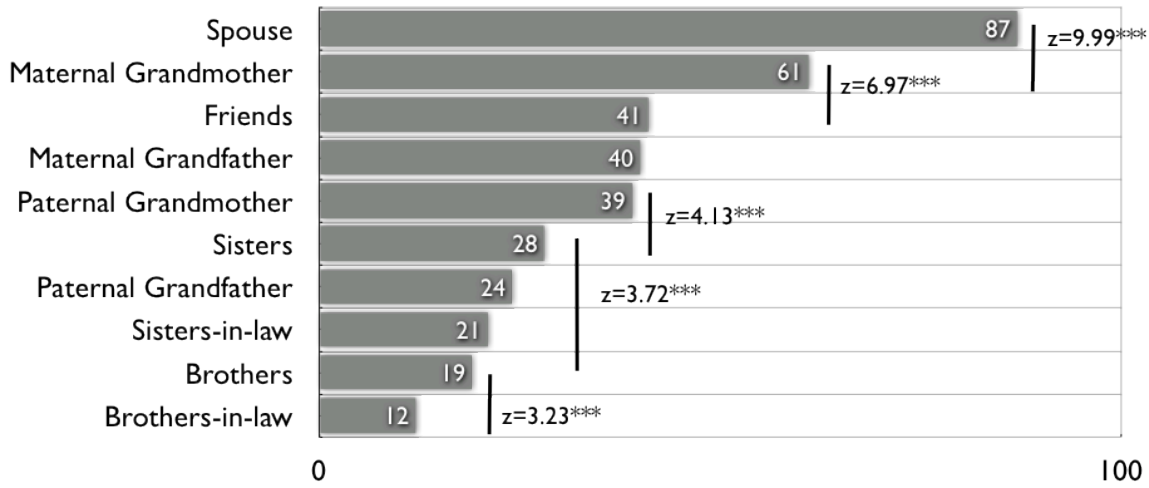

Fig 3 Percentage of mothers who reported receiving emotional support for their children from specific individuals. Results from z-tests of proportions are displayed for significant differences between pairs. Non-significant results are not displayed. Statistical significance is displayed as follows: ***p<.001; **p<.05; *p<.10.

Informational Support. Mothers reported the most informational support from spouses and grandmothers. Friends were reported significantly less often than maternal grandmothers, but more frequently than paternal grandmothers. Maternal grandfathers were reported as often as paternal grandmothers and more frequently than sisters. Both types of sisters were reported more often than paternal grandfathers, followed by brothers, with brothers-in-law reported with the least frequency. Figure 4 presents the results of z-tests of proportions for reported informational support.

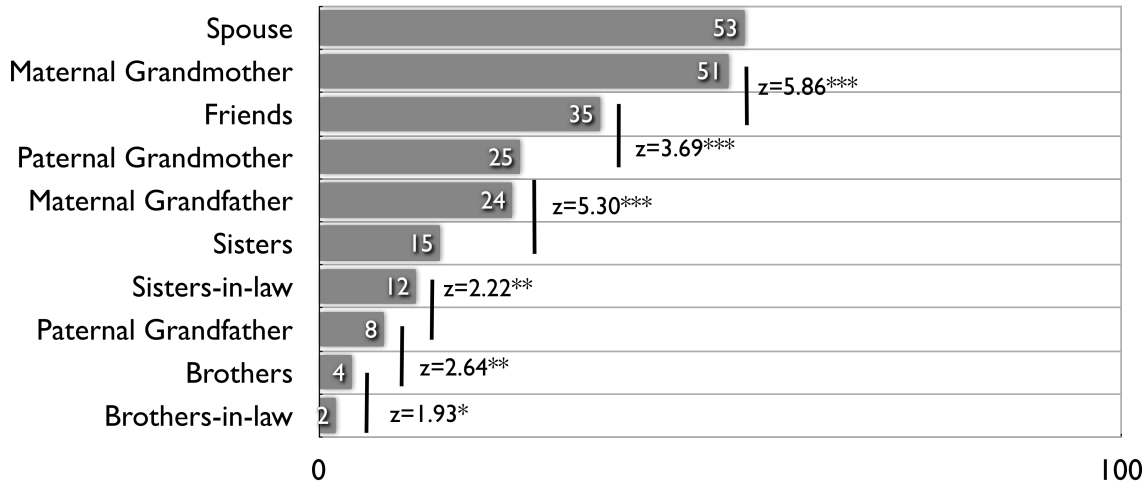

Fig 4 Percentage of mothers who reported receiving informational support from specific individuals. Results from z-tests of proportions are displayed for significant differences between pairs. Non-significant results are not displayed. Statistical significance is displayed as follows: ***p<.01; **p<.05; *p<.10.

Financial Support. Mothers received significant financial support from their spouses but little from other types of kin and non-kin. Maternal grandparents were reported to provide similar amounts of financial support and were reported significantly more frequently than paternal grandparents. Mothers reported receiving very little financial support from their friends and all types of siblings. Figure 5 presents the results of z-tests of proportions for reported financial support provided to mothers by individuals.

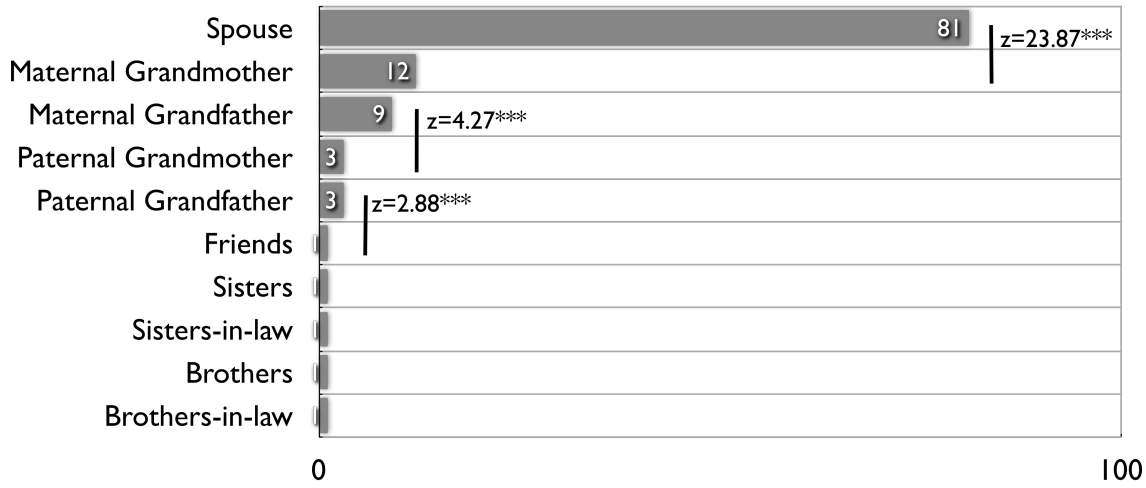

Fig 5 Percentage of mothers who reported receiving financial support from specific individuals. Results from z-tests of proportions are displayed for significant differences between pairs. Non-significant results are not displayed. Statistical significance is displayed as follows: ***p<.01; **p<.05; *p<.10.

Spouses were also reported to provide high levels of financial support for children. Again, maternal grandmothers and grandfathers provided similar support but significantly more than paternal grandparents. Friends and siblings were reported the least often to provide financial support for children. Figure 6 illustrates the proportions of financial support provided to children and the statistical differences between individuals.

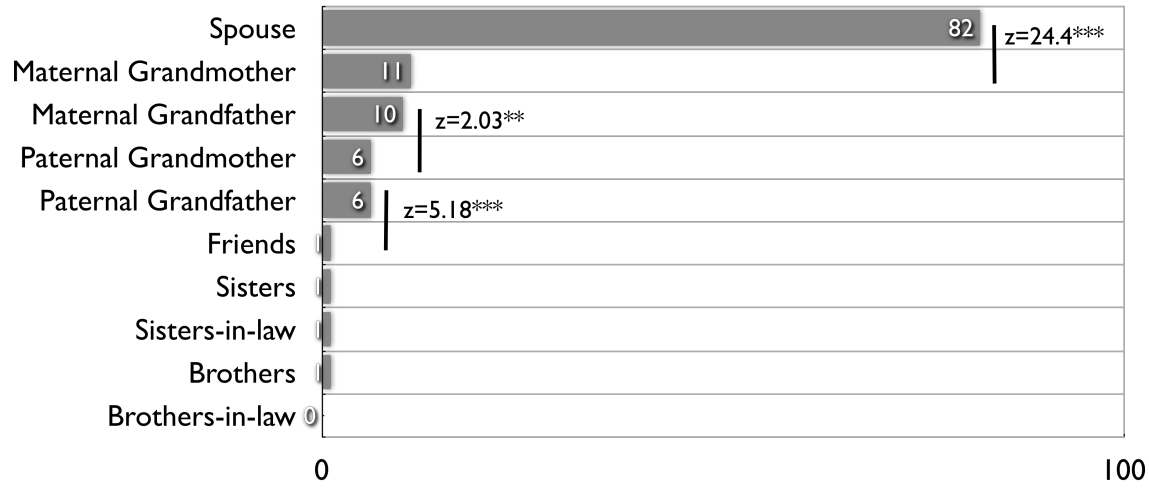

Fig 6 Percentage of mothers who reported receiving financial support for their children from specific individuals. Results from z-tests of proportions are displayed for significant differences between pairs. Non-significant results are not displayed. Statistical significance is displayed as follows: ***p<.01; **p<.05; *p<.10.

Childcare. Mothers reported on the frequency of childcare provided by each individual. Spouses were reported to provide the most regular childcare, followed by maternal grandmothers. Mothers reported very little regular childcare from other individuals. Figure 7 depicts the differences in proportions of childcare provided by individuals.

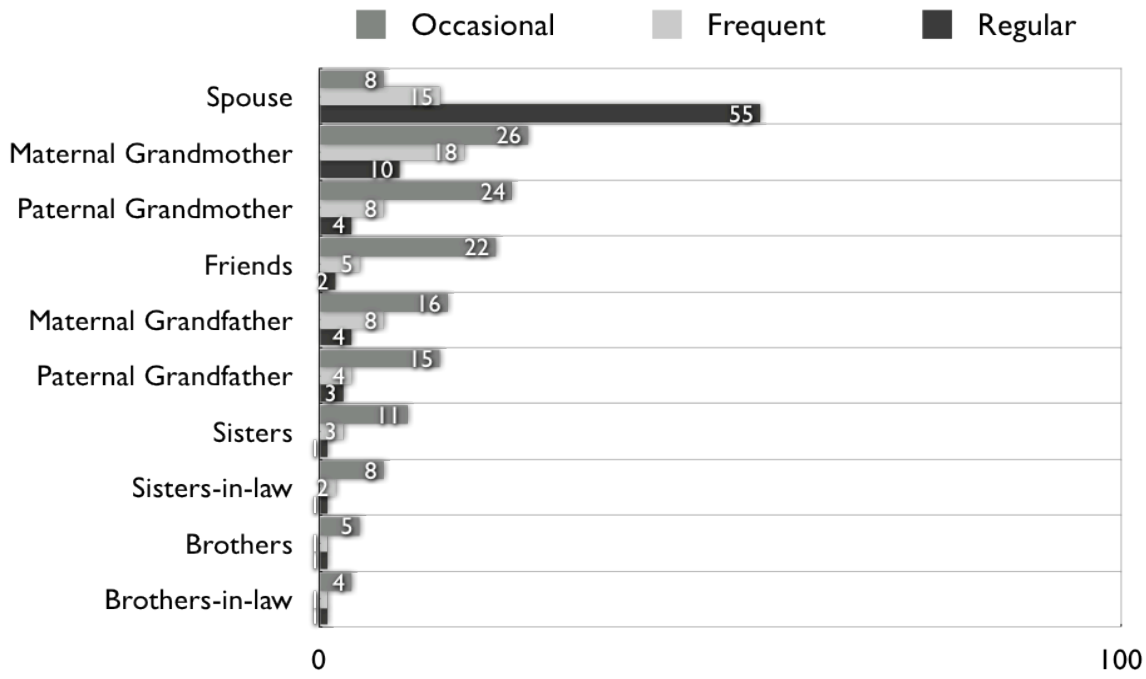

Fig 7 Percentage of mothers who reported receiving childcare support from specific individuals based on frequency. Frequency of childcare was defined as follows: occasional, less than once per month; frequent, monthly; regular, daily or several times per week.

Summary of Results by Prediction

Prediction 1.1: Maternal kin will provide more support than paternal kin: Supported.

Mothers consistently reported more support from maternal grandmothers than from other grandparents. Maternal grandparents were more frequently reported to provide financial support than paternal grandparents. Mothers reported that maternal grandfathers and paternal grandmothers often provided similar levels of support, while paternal grandfathers were reported less frequently. Maternal versus paternal differences were less pronounced among siblings. Sisters and sisters-in-law were consistently reported more often than either type of brother.

Prediction 1.2: Fathers/spouses will provide more support for their partners and offspring than other kin: Supported.

Spouses and maternal grandmothers were reportedly similar in the level of informational support they provided, but spouses were reported more frequently than any other individual across the other types of support.

Prediction 1.3: Same generation kin will provide less support than grandparents and spouses: Supported.

Across all types of support, siblings were not reported as frequently as other kin and friends. Few mothers reported that they received financial support from siblings.

Results for Research Question 2: How does support from kin and non-kin influence breastfeeding duration?

Methods

Event history analyses, specifically Kaplan-Meier and Cox regression, were used to determine the impact of kin support and other factors on the likelihood of mothers weaning their first children at any given age (in months). Cox regression tests the ability of independent variables to predict the timing of a given event. Cox regression allows the inclusion of censored observations in the model, improving the accuracy of estimates (Yamaguchi, 1991). It is particularly useful for predicting weaning ages in this sample, as not all mothers had weaned their children at the time of the survey and thus provided censored cases. Other studies have used Cox regression to predict the timing of breastfeeding cessation (Coppieters, Swennen, & Dramaix, 2014; Emmott & Mace, 2015;

Rempel, 2004; Scott, Binns, Oddy, & Graham, 2006).

Assumptions of Kaplan Meier and Cox regression were checked and found to be met in the study design and data: 1) the event status consisted of two mutually exclusive states, censored and event ("weaned"); 2) survival time was clearly defined (age at weaning or age at time of the study); 3) left censoring was not possible and was avoided; 4) censoring of participants was independent; 5) there were no secular trends; and 6) the amount and pattern of censorship was similar in the two groups included in the Kaplan-Meier analysis. The assumption of proportional hazards was met in the Cox regression analysis.

The dependent variable for the analysis was the weaning age for all first children under age 15 at the time of the survey. Only first children were included in the model to avoid any effect of prior maternal breastfeeding experience on breastfeeding duration (Bai, Fong, & Tarrant, 2015; Nagy, Orvos, Pal, Kovacs, & Loveland, 2001). For children who were not yet weaned, their age at the time of the survey was used. Mothers were asked on the survey whether they were currently breastfeeding their child. As such, the status variable was computed for children based on weaning status: zero represented those weaned and one represented those still breastfeeding. Cases with a value of one were censored.

Rather than using a backward stepwise procedure to eliminate insignificant covariates, all covariates of theoretical or empirical importance were included in the model. Covariates included those known to impact weaning age in this population, such as whether the mother was breastfed, the mother's age at the time of the survey, the

number of children the mother had at the time of the survey, annual household income, mother's completed level of education, mother's age at her first child's birth, and whether the mother had problems with breastfeeding the focal child (Forster et al., 2006; Thulier & Mercer, 2009).

Given the complexity of kin and non-kin support, several models were run to determine if different types of support have unique impacts on breastfeeding duration. For Model I, the variable of interest was emotional support for mothers provided by kin and non-kin, including spouses, maternal and paternal grandparents, and friends. Model II included informational support for the same individuals. Model III included financial support for the mother, while Models IV and V and looked at frequency of childcare provided by individuals (regular and frequent).

Finally, the aim of Model VI was to see if discussions specifically about breastfeeding involving kin and non-kin impact weaning age. The variable of interest was how frequently the mother consulted specific individuals/sources about breastfeeding during her first child's infancy (from never (1) to "all the time" (5)). Results of factor analyses indicated that paternal grandparents should be combined rather than included separately. In addition, employers and professional colleagues were combined as a result of factor analyses. SPSS-IBM Statistics 22 was used for all statistical analyses.

Results

Figure 8 displays the Kaplan Meier survival curve for weaning age in the sample. The Kaplan-Meier procedure is used to model the rate at which a given event occurs and is censored over time (Yamaguchi, 1991). This plot visually depicts the probability of

being weaned at any given point in time. The drops in the survival curve indicate when first children were weaned. Based on this plot, we can see that there are significant increases in the frequency of weaning at 6, 12, 18, and 24 months. Based on mothers' descriptions of how and why they decided to wean at a given age, these figures seem to be an accurate reflection of weaning ages, rather than rounded estimations. For example, many mothers indicated that they had set personal goals of breastfeeding to a certain age (6 months, 12 months, etc.) and that they weaned once their child reached the target age.

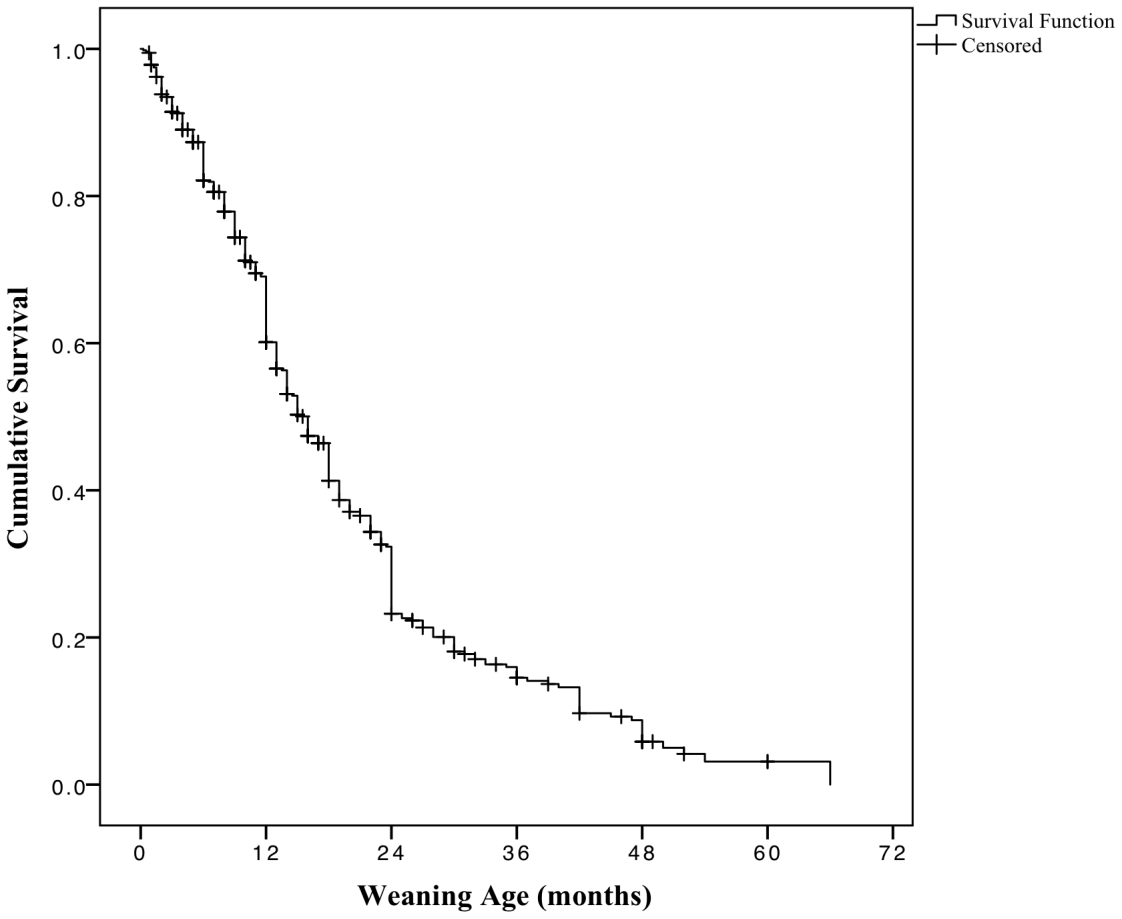

Fig 8 Kaplan Meier Survival Curve illustrates increases in weaning at 6, 12, 18, and 24 months.

As depicted in Table 5, all support variables in models one through five were insignificant in their effect on breastfeeding duration when controlling for key demographic variables, excluding emotional support from friends in model one. Mothers who reported receiving emotional support from friends were 31% less likely to wean at any given time as compared to mothers who did not report receiving emotional support from friends (p=.013).

Table 5. Survival regression results showing the effects of covariates on the timing of weaning the first child when controlling for key demographic and maternal variables

Covariate	Model I Emotional Support Odds Ratio	Model II Informational Support Odds Ratio	Model III Financial Support Odds Ratio	Model IV Frequent Childcare Odds Ratio	Model V Regular Childcare Odds Ratio
Spouse	0.983	0.866	1.064	1.046	0.845
Maternal Grandmother	1.052	1.197	1.106	1.172	0.724
Maternal Grandfather	0.984	1.058	0.703	0.764	1.103
Paternal Grandmother	1.133	1.095	0.975	0.702	1.033
Paternal Grandfather	1.125	1.091	0.982	1.140	1.151
Friends	0.691*	0.949	nil	1.380	0.528

*Statistical significance is represented as follows: p<.01.

Table 6 presents the results of model six, which examined the effect of frequency of consulting individuals about breastfeeding during the first child's infancy on breastfeeding duration (n=400; 119 cases censored; log likelihood 2726.92). Mothers were significantly less likely to wean at any given time the more frequently she spoke with her father (maternal grandfather) about breastfeeding. For each degree of frequency

mothers spoke with their fathers about breastfeeding, the likelihood of weaning decreased by 29%. Consulting La Leche League also had a protective effect on breastfeeding duration. Mothers were 27% less likely to wean at any given age the more frequently they consulted La Leche League about breastfeeding. More frequently consulting online sources for breastfeeding information also decreased the hazard of weaning by 11%. Frequently consulting a doctor about breastfeeding also predicted an earlier age at weaning, by 25%. Frequently speaking with an employer or work colleagues significantly increased the hazard of weaning by 23% (though only significant at the .06 level). More frequently consulting the spouse decreased the likelihood of weaning by 9% (though only significant at the .077 level). Frequency of consulting the maternal grandmother, paternal grandparents, friends, and lactation consultants did not significantly predict weaning age (at the p=.05 level).

Table 6. Survival regression results showing the effects of covariates on the timing of weaning the first child including frequency of mothers consulting specific sources about breastfeeding during the first child's infancy

Covariate	Odds Ratio	p Value	Confidence Intervals
Current Age	1.027	0.220	0.984-1.070
Mother's Highest Education	0.954	0.471	0.839-1.084
Mother was Breastfed	**0.516**	**<0.001**	**0.391-0.680**
Number of Children	**1.231**	**0.013**	**1.045-1.449**
Annual Income	1.059	0.239	0.963-1.164
Mother's Current Employment	1.193	0.231	0.894-1.592
Mother's Age at Birth	**0.931**	**0.007**	**0.883-0.981**
First Child's Gender	0.907	0.442	0.708-1.162
Breastfeeding Problems	1.254	0.130	0.936-1.680
Spouse	0.911	0.077	0.821-1.010
Maternal Grandmother	1.023	0.709	0.908-1.152
Maternal Grandfather	**0.712**	**0.006**	**0.559-0.909**
Paternal Grandparents	1.073	0.259	0.950-1.212
Friends	1.013	0.829	0.905-1.133
Employer and Colleagues	1.233	0.060	0.991-1.534

Doctor	**1.252**	**0.004**	**1.072-1.463**
Lactation Consultant	1.041	0.561	0.910-1.190
La Leche League	**0.733**	**<0.001**	**0.634-0.848**
Online Sources	**0.887**	**0.024**	**0.800-0.984**

In addition to the kin and non-kin variables of interest, some demographic variables also impacted breastfeeding duration. More children in the family increased the hazard of weaning by 23%. In contrast, greater maternal age at first birth decreased the hazard by 7%, while the mother having been breastfed decreased the hazard by 48%. Mother's current age, annual income, completed education, child's gender, and whether or not the mother had problems with breastfeeding were not significant in this model.

The Kaplan-Meier survival analysis (Kaplan & Meier, 1958). was used to compare the differences in weaning ages based on whether the mother was breastfed as an infant. Figure 9 shows the Kaplan-Meier survival curve. This plot depicts a significant difference between the hazard of weaning at any given point in time based on whether the mother was breastfed. The Log-Rank and Breslow tests were used to compare whether the two survival curves were approximately equal. A log rank test was run to determine if there were differences in the survival distribution for two groups (mother was breastfed, mother was not breastfed). The survival distributions for the two groups were statistically significantly different, $\chi 2(1)=15.817$, $p<.0005$. Mothers who were breastfed as infants had a median weaning age of 18 months (95% CI, 16.1 to 19.9 months), while mothers who were not breastfed as infants had a median time to weaning of 12 months (95% CI, 10.5 to 13.5 months). The results indicate that the mother having been breastfed herself had a significantly positive effect on breastfeeding duration for her first child.

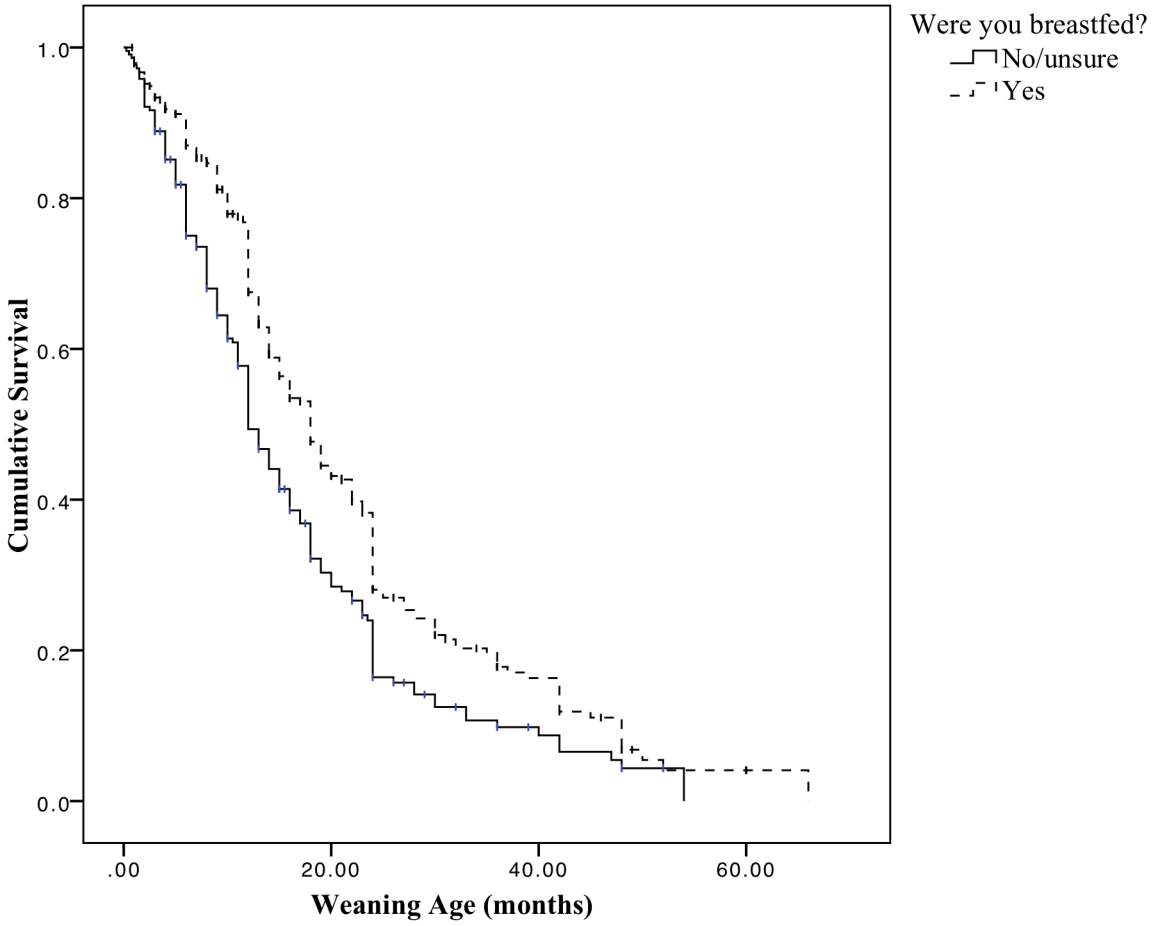

Fig 9 Survival function for weaning age after adjustment for key respondent characteristics. Separate survival curve lines depict differences in survival (weaning ages) in months based on whether the mother was breastfed.

Prediction 2.1: Grandparents, particularly maternal grandmothers, will significantly influence breastfeeding duration: Not supported. Frequency of discussing breastfeeding with the maternal grandmothers and paternal grandparents did not significantly impact weaning age. Frequently discussing breastfeeding with maternal grandfathers positively influenced breastfeeding duration.

Prediction 2.2: Fathers/spouses will have the most influence on breastfeeding duration:

Not supported. More frequently discussing breastfeeding with a spouse was associated with a later age at weaning, though not at the .05 level of significance.

Prediction 2.3: Non-kin will have a more significant influence on breastfeeding duration than kin (excluding maternal grandmothers and spouses): Supported. Some types of non-kin significantly influenced breastfeeding duration. Frequently consulting La Leche League had a positive impact on breastfeeding duration, while speaking with physicians had a negative impact. These types of non-kin had a more significant impact on breastfeeding duration than any kin except for the maternal grandfather. More frequently discussing breastfeeding with employers and co-workers had a negative effect on breastfeeding duration, but only at the .06 level of significance.

Discussion

Who supports breastfeeding mothers and what help do they provide?

Mothers reported that their spouses provided significantly more support than other individuals across almost all types of support (except informational support, which was statistically similar to maternal grandmothers). This may be due to the prevalence of neolocal residence and wide geographic dispersion of kin that characterizes the mothers in the sample as well as in other post-demographic transition societies (Kramer, 2010b). Low levels of financial support from all kin except the spouse is also unsurprising given the high annual incomes, high rate of marriage, high levels of education, and relatively late ages at first birth that characterize the sample.

As predicted, mothers frequently reported receiving support from maternal grandmothers, followed by maternal grandfathers. Paternal grandparents, particularly

paternal grandfathers, were reported less frequently. These trends have been found in other societies as well (Sear & Coall, 2011). Mothers also generally reported more support from female kin than male kin. As predicted, mothers did not report receiving much support from their siblings or siblings-in-law. This could be due to competition for familial resources among same-generation kin, distance between mothers and their siblings, a lack of resources to share (particularly financial) from siblings who are also raising children, and/or a cultural norm in which siblings tend not to expect support from same-generation kin.

How do kin influence breastfeeding duration?

Results indicate that how frequently mothers consult various helpers does impact breastfeeding duration, even when controlling for other variables known to impact breastfeeding. Having later born children increased the hazard for weaning among first children, while the child's gender, household income, mother's education, and whether or not the mother had problems with breastfeeding were insignificant. Income and education may have been insignificant in this model because the sample was characterized by high incomes and education levels, which are associated with higher breastfeeding durations among U.S. mothers (Thulier & Mercer, 2009). The lack of effect of breastfeeding problems on duration was surprising. This may be due to high levels of support for breastfeeding problems provided by other individuals (such as lactation consultants) or high levels of maternal commitment to overcoming breastfeeding problems.

Unlike other studies that have found that general or broad measures of support affect age at weaning (Emmott & Mace, 2015), the results of this study demonstrate that

the amount of general emotional support (except from friends), informational support, financial support, and childcare do not influence duration of breastfeeding. The impact of kin and non-kin on weaning age in this sample more specifically revolves around their advice, opinions, or approval of breastfeeding. While having others feed infants a bottle could undermine breastfeeding (as suggested by Emmott and Mace, 2015), mothers can pump breast milk and provide it for others to feed the baby while she is absent. As such, it is possible to continue breastfeeding even if others are watching and feeding the baby. The results of this study suggest that individuals may influence breastfeeding decisions more specifically by encouraging, approving, or offering advice rather than by providing general types of support for mothers and children. The more fine-tuned measurement of support in this study may suggest that Emmott and Mace's (2015) finding that frequent contact with maternal grandmothers negatively affected breastfeeding duration could reflect the maternal grandmother's feedback about breastfeeding rather than her provision of practical support.

The effect of mothers consulting La Leche League may reflect the organization's impact on behavior, the mother's motivation to solve breastfeeding problems or connect with other breastfeeding mothers, or both. Other studies on breastfeeding in the U.S., particularly among mothers who breastfeed for longer durations, have found that mothers report La Leche League to be an important source of support (Kendall-Tackett & Sugarman, 1995).

The significant effect of speaking with the maternal grandfather about breastfeeding was surprising. To test whether this could merely be a reflection of an emotionally close relationship, mothers' reported emotional closeness to their fathers was tested. The

results were not significant. In addition, maternal grandfathers' education did not impact breastfeeding duration. Therefore, it seems likely that speaking with one's father is not merely a reflection of a close relationship or having a highly educated father. It may indicate that the mother came from an intact home. It may also or alternatively reflect the degree of involvement or interest the maternal grandfather has in his daughter's parenting and the wellbeing of his grandchildren. Finally, this effect could indicate the degree of comfort the mother felt with breastfeeding around her father, which was uncommon in the sample.

Speaking with one's employer or colleagues increased the hazard of weaning, though this effect was only significant at the .06 level. Legal and cultural support for breastfeeding or pumping in the workplace is limited in the U.S. (though this is slowly changing; see (Atabay et al., 2015)). Many studies have found that the need to return to work has a negative impact on breastfeeding initiation and duration (Fein & Roe, 1998). Many employers also report little experience with breastfeeding and tend not to agree that work policies should change to accommodate breastfeeding (Libbus & Bullock, 2002). Many women have no paid maternity leave, and many employers, particularly small businesses, are not obligated to provide the facilities or time for mothers to pump and store breast milk. Perhaps frequently discussing breastfeeding with employers reflects the degree to which a mother feels that time for pumping needs to be requested or that her breastfeeding decisions are under surveillance.

Frequently discussing breastfeeding with doctors had a significantly negative impact on breastfeeding duration. This finding is supported by qualitative reports from mothers in the sample who indicated that they felt pressured by their doctors to wean

after a certain age. When asked how they responded to this pressure, many reported that they changed doctors. Others followed their doctors' recommendations to wean. The lack of physician training in breastfeeding in the U.S. has been documented elsewhere (Dermer et al., 2008).

The low statistical significance of the frequency with which mothers spoke with their spouses about breastfeeding may be attributed to the high frequency and low variation of this variable in the sample. Alternatively, it may be that, while mothers frequently discuss breastfeeding with their spouses, spouses may not be providing specific advice or opinions that alter the mother's breastfeeding decisions. A third interpretation could be that spouses have mixed views of breastfeeding, and that the positive and negative influences of spouses cancel one another out. Other studies have found that American fathers have ambivalent views about breastfeeding but may not to express their views strongly to their partners (Avery & Magnus, 2011).

Given the high amount of support maternal grandmothers provide and the importance of their support found in other studies, it was surprising that the frequency with which mothers spoke with maternal grandmothers about breastfeeding did not significantly impact breastfeeding duration. One possibility may be that maternal grandmothers' advice does impact breastfeeding duration, but that their advice is not always positive. The fact that many grandmothers in the U.S. do not always support breastfeeding has been found in other empirical studies (Bentley et al., 1999). It may be that some grandmothers express negative views about breastfeeding in conversations with their daughters, while others provide encouragement. Frequent negative advice would be expected to negatively impact breastfeeding duration, while frequent encouragement

should delay weaning. The lack of effect of maternal grandmother consultations in the model could be explained if maternal grandmothers' advice was roughly split between positive and negative in the sample.

An additional insight into the maternal grandmother's effect on duration may be found in the most significant variable in the model: whether or not the mother was breastfed. Compared to mothers who were not breastfed, mothers who were breastfed were 1.5 times as likely to continue breastfeeding their first child at any given time. This could reflect the mother's familiarity with breastfeeding or her mother's support of her decision to breastfeed. It could also indicate that she would be able to obtain assistance with breastfeeding problems from her own mother, an experienced breastfeeder. Other studies have found that whether mothers were breastfed themselves impacts breastfeeding duration (Forster et al., 2006).

Limitations

The first limitation of the study lies in the sample. Because it is not a random sample, the results cannot be assumed to be generalizable to the wider population of American women. The women in the sample were mostly older, white, married, educated mothers. The advantage of this, however, is that the sample is characteristic of women who tend to initiate and continue breastfeeding. This provides a unique insight into the characteristics of women who successfully breastfeed in American culture, which may allow us to better understand the factors that are important for sustaining breastfeeding in all new mothers.

An additional limitation of the study is that weaning ages were based on maternal

recall. Incorrect recall of the actual weaning ages for first children could affect the accuracy of the model. However, one study of Norwegian mothers found that recorded and recalled duration of breastfeeding were strongly correlated, and that the majority of mothers in their sample were able to recall the age at weaning to within one month of the recorded age (Natland et al., 2012). To limit the effect of this potential issue, only first children under age 15 were included in the model.

Conclusion

In sum, the results of this study support that humans are cooperative breeders. Fathers in this neolocal society provide a significant amount of emotional, informational, financial, and childcare support. Maternal grandmothers, despite geographical distance, also provide a significant amount of support for their adult daughters and grandchildren. Maternal grandfathers generally provide more support than paternal grandparents, while same generation kin and non-kin tend to provide the least amount of non-emotional support. Kin and non-kin support impact breastfeeding duration, at least as measured by the frequency mothers consulted them about breastfeeding during the first child's infancy. This suggests that conversations, advice, and encouragement of breastfeeding specifically may be what help mothers continue breastfeeding, rather than receiving general support from family and friends. Frequently consulting La Leche League and the maternal grandfather had a protective effect on breastfeeding duration for these mothers, while frequent consultations with doctors had a negative effect on duration. The most significant effect on breastfeeding duration may actually be found in the maternal grandmother's mothering behavior; mothers were significantly more likely to sustain breastfeeding their first children if they were breastfed by their own mothers.

CHAPTER FOUR: "Determinants of Weaning among Long-term Breastfeeding Women in the U.S."

Introduction

More than 30 years of scientific research has resulted in indisputable support for breastfeeding over the use of any infant formula (Ip et al., 2007). For children, breastfeeding is associated with a reduced risk of severe lower respiratory tract infections, asthma, childhood overweight and obesity, acute otitis media, diabetes, necrotizing enterocolitis, non-specific gastroenteritis, childhood leukemia, and sudden infant death syndrome (SIDS) (Ip et al., 2007; Moss & Yeaton, 2014). Studies have additionally found that breastfed infants score higher on cognitive tests than those fed infant formula (Horta et al., 2015). For mothers, breastfeeding is associated with reduced risk for breast and ovarian cancer, Type II diabetes, and postpartum depression (Ip et al., 2007). Ongoing research continues to yield new findings on the benefits of breastfeeding for both mother and child.

Despite such evidence, breastfeeding rates in the U.S. continue to lag behind public health goals. While the American Academy of Pediatrics recommends breastfeeding to at least one year of age, only 27% of American children born in 2011 were still breastfed at 12 months (CDC, 2015). Only 10% of American mothers continue to breastfeed at 18 months (CDC, 2015), and the proportion of mothers who breastfeed at two years, per WHO recommendations, is unknown.

Given the recent scholarly focus on breastfeeding initiation, exclusivity, and

duration in early infancy, the literature on breastfeeding beyond one year in the U.S. is sparse. The existing literature on long-term breastfeeding relies primarily on qualitative data. While breastfeeding duration has recently received a significant degree of scholarly attention, because studies aim for nationally representative samples, few include many mothers who breastfeed beyond 12 months. The present study will attempt to fill this gap by quantitatively assessing what factors influence breastfeeding duration in a large sample of long-term breastfeeding mothers. Specifically, this paper aims to:

1. Determine what factors influence weaning age after one year, including maternal, familial, and child characteristics. The latter will include whether the mother was breastfed, which has not previously been examined in the long-term breastfeeding literature. Cox regression, a form of event history analysis, is used to evaluate influential factors.
2. Explore long-term breastfeeding mothers' explanations of how and when they decided to wean their children utilizing qualitative reports.
3. Synthesize the results of both analytical approaches in order to describe the factors that influence weaning age for children who are breastfed at least 12 months.

Breastfeeding duration beyond infancy has many terms in the literature: long-term, prolonged, sustained, and extended breastfeeding. There is no consensus on what length of breastfeeding should be considered "long-term." Some breastfeeding researchers define long-term breastfeeding as beyond infancy or 6 months of age (Reamer & Sugarman, 1987), while others define it as any breastfeeding beyond 12 months (Buckley, 2001). Given that there is no clear definition of what can be considered long-

term breastfeeding, studies are difficult to compare. Here I define long-term breastfeeding as breastfeeding to at least 12 months.

An additional challenge in studying long-term breastfeeding is that mothers tend to practice it secretly. This has been termed "closet nursing" (Auerbach, 1976). Some research and public opinion agree that breastfeeding beyond infancy comes with significant social stigma in the U.S., and that mothers tend to develop strategies that allow them to continue breastfeeding while decreasing social disapproval. Nursing in private is one strategy; creating code words or signs with their older children is another way mothers keep their breastfeeding status hidden from others (Buckley, 1992). Stearns (2011) found that many mothers express concern about how to keep breastfeeding discreet when their children are old enough to initiate breastfeeding, but do not yet have the understanding of the need for public discretion. In this culture, breastfeeding is considered appropriate for infants, but breastfeeding a child old enough to ask for the breast puts the mother and child at risk for negative judgment from others who deem this outside the moral order (Stearns, 2011; Morse & Harrison, 1987; Morse, 1989). This secretive behavior paired with limited formal public health data collection on breastfeeding beyond 18 months makes long-term breastfeeding mothers a difficult population to study. Despite this difficulty, studies have found that mothers who breastfeed long-term in the U.S. tend to be white, older, more educated, of higher socioeconomic status, and less likely to be formally employed than mothers who breastfeed for less than six months or one year (Buckley, 1992; Kendall-Tackett & Sugarman, 1995; Reamer & Sugarman, 1987).

Most of the research on long-term breastfeeding has focused on mothers'

qualitative experiences and motivations. Mothers report that the benefits of breastfeeding beyond 12 months include bonding, positive emotional effects on the child, the ability to comfort an upset or hurt child, and better physical health or immunity (Buckley, 1992; Kendall-Tackett & Sugarman, 1995; Reamer & Sugarman, 1987). While the majority of mothers report these benefits at all ages past 6 months, Kendall-Tackett and Sugarman (1995) found that mothers' perception of these benefits declines from 6 to 12 months and again at 24 months of age.

Most qualitative studies suggest that many long-term breastfeeding mothers desire to allow the child to self-wean (Buckley, 1992; Hills-Bonczyk et al., 1994). Rempel (2004) found that the most frequently reported reason for weaning among mothers in her sample was that the child seemed ready. The second most frequent reason was that mothers felt that they had breastfed long enough to give their child the benefit of breastfeeding. In addition, some mothers reported that they weaned due to problems such as biting or insufficient milk.

There are several limitations of the current literature on long-term breastfeeding in the U.S. The first is that there are few studies, and many of these are dated (few were conducted after the millennium). In addition, sample sizes tend to be small (Buckley, 1992: 10; Hills-Bonczyk et al., 1994: 82; Kendall-Tackett & Sugarman, 1995:179; Reamer & Sugarman, 1987: 152; Rempel, 2004: only 41 mothers breastfed at 12 months; Stearns, 2011: 66 total, only 25 breastfed beyond 12 months). Existing studies recommend that future research needs to include mothers who breastfeed longer than 24 months, especially older children who are weaned in the pre-school years (Kendall-Tackett & Sugarman, 1995). Other studies on long-term breastfeeding mothers have

recommended that future research examine the effect of whether or not a mother was a breastfed as an infant on duration (Hills-Bonczyk et al., 1994). The current study was designed to address these gaps in the literature by utilizing a mixed methods approach to determine the factors that influence breastfeeding duration beyond one year in a larger sample of women who breastfeed long-term.

Methods

Approval of all recruitment methods and study materials was obtained through the University of Missouri's Institutional Review Board prior to initiating data collection. Participants were recruited using respondent-driven sampling, a form of non-probability sampling in which initial informants pass along information about the study to members of their own social networks (Bernard, 2011). This method has been used in previous studies (e.g., Dowling & Brown, 2013; Kendall-Tackett & Sugarman, 1995) and is appropriate because the population is somewhat hidden, as many long-term breastfeeders practice "covert nursing" (Buckley, 1992). Utilizing social media, the researcher posted the survey link and description on her Facebook profile and requested that contacts share the survey with their friends on their Facebook pages. Several participants requested permission to share the survey with their breastfeeding groups all over the country, and the survey was also advertised on a long-term breastfeeding blog (http://paa.la/). This method allowed for a wide dispersal of the survey, which would not have been possible if recruitment was restricted to local recruitment. It allowed for recruitment of a much larger sample of long-term breastfeeders than would have been possible using any random sampling technique. Respondent-driven sampling also made it possible to reach participants who do not breastfeed in public.

Women were invited to participate if they were at least 18 and had at least one child whom they had breastfed or were currently breastfeeding. In the social media post, participants were directed to an online survey on the University of Missouri's Qualtrics site. The survey included approximately 100 open and closed-ended questions regarding demographics (age, education, employment, income, etc), infant feeding data for each child (age at weaning, age at which complementary foods were introduced, etc.), questions regarding the mother's social network (who provided emotional, financial, and informational support for her and her children), and questions about her experiences with breastfeeding. Mothers who answered that they breastfed for 12 months or longer were additionally asked questions regarding their experiences with long-term breastfeeding.

To increase reliability, the survey was piloted with three mothers, one of whom took the survey while thinking aloud with the researcher present. Additionally, a local lactation consultant working for the University of Missouri Health Care provided feedback on the survey prior to data collection.

Qualitative Methods

This study employs a mixed methodology. For the qualitative portion of the study, 285 mothers responded to the question: "For the child(ren) you breastfed to 12 months or beyond, when and how would you or did you decide to wean them from the breast?" Each response was read, and initial codes were created in the Dedoose application (Dedoose, 2015). After the first round of coding, responses were re-read, and codes were refined. Code frequencies were exported from Dedoose, and a table was created in Excel to aggregate codes into primary weaning strategies.

Quantitative Methods

Cox regression, a form of event history analysis, was used to determine what factors predict weaning beyond 12 months. This method allowed censored cases, in which children were not yet weaned, to be included in the analysis. The dependent variable for the analysis was the child's age at weaning. For those who were not yet weaned, the child's age at the time of the survey was used. Independent variables for this analysis included the mother's age at the time of birth and at the time of the survey, mother's completed education level, annual household income, parity, whether the mother was breastfed, religious affiliation, and whether the mother was employed at the time of the survey.

In addition to the demographic variables described above, dummy variables were created for the weaning strategies that arose from the qualitative analysis. A zero/one variable was created for each of the five strategies: child-led weaning, mutual decision, mother-led weaning, external events, and undecided. These categories were mutually exclusive. All strategies were compared to the child-led strategy in the Cox regression analyses.

Four models were conducted for the analysis: I) first children over 12 months with all demographic/control variables; II) all children over 12 months with all demographic/control variables; III) first children over 12 months with controls and the five weaning strategies; IV) all children over 12 months with controls and the five weaning strategies. Models including only first children were included to control for past maternal breastfeeding experience. To control for the effect of a shared mother in the all children models, analysis included an adjustment for shared frailty. Shared frailty accounts for a common group effect (Gutierrez, n.d.). In this case, mother's ID was used

to identify the children who belonged to the same family. Event history analyses were conducted in SPSS-IBM version 22 and STATA.

Results

Sample Characteristics

Six hundred and seven (n=607) mothers completed the online survey. Over half of mothers in the full sample had breastfed or were breastfeeding first children over 12 months old (n=317). Of these long-term breastfeeding mothers, 84 were still breastfeeding their first children. There were 609 total children in the sample who were breastfed to at least 12 months; at the time of the survey, 152 were still breastfeeding. Table 7 presents summary statistics for the sample.

Table 7. Summary statistics for long-term breastfeeding mothers

Characteristic	**Mean**
Mother's Current Age	35
Mother's Age at First Birth	28
Spouse's Age at First Birth	30
Number of Children	1.9
	Percent of sample
Mothers Currently Employed	68%
Annual Household Income	
Less than $20,000	3%
$20-39,000	16%
$40-59,000	19%
$60-79,000	19%
$80-99,000	17%
Over $100,000	27%
Mother's Completed Education	
High School	13%
Associate's Degree	11%
Bachelor's Degree	36%
Master's Degree	26%
PhD/JD/MD	14%
Mothers Currently Married	91%
Mother's Ethnicity	

Caucasian	90%
African American	1%
Hispanic	3%
Native American	1%
Pacific Islander	1%
"Other"	4%
Mothers who were Breastfed	66%
Mothers who had problems breastfeeding	68%

Ninety-one percent of mothers were married at the time of the survey. Thirty-seven percent of women were primiparous, 43% had two children, and 20% had three or more children. Long-term breastfeeding mothers in the sample were highly educated and had high levels of annual household income. Two-thirds of the respondents were employed at the time of the survey. Hours per week worked outside the home averaged 29 with a range from zero to 75. Ninety-five percent of spouses were employed; spouses averaged 43 hours per week outside the home with a range from zero to 100. The majority of respondents were white/Caucasian (90%). Spouses were also mostly white/Caucasian (89%). The majority of participants reported affiliation with a religion (54%), while 46% reported no religious affiliation.

Previous studies have found that women who breastfeed long-term in the U.S. tend to be white, older, more educated, and from higher socioeconomic backgrounds than mothers who breastfeed for shorter durations (Buckley, 1992; Kendall-Tackett & Sugarman, 1995; Reamer & Sugarman, 1987). The mothers in the present sample could be considered generally representative of American women who breastfeed long-term given that they share these characteristics. While this bias toward white women of higher socioeconomic status could be viewed as a limit to its generalizability, it alternatively offers a unique insight into the factors that allow women to breastfeed longer than

average. As such, these insights could help us understand what factors to improve among women who are unable to breastfeed as long.

Qualitative Results: What do mothers say about how they decided to wean after 12 months? What factors affected their decisions?

Five general weaning strategies emerged from the data: 1) child-led weaning, 2) mother-led weaning, 3) mutual decision, 4) external events, and 5) undecided. Many mothers responded primarily with a general strategy for weaning. Some provided detailed explanations about the circumstances surrounding their weaning decisions for each child; still others responded primarily with the method they used to wean. Mothers' responses about the unique circumstances for weaning each child illustrated that weaning is influenced by maternal and child characteristics, as well as familial or external circumstances. Weaning strategies were counted and coded for all children in the sample over 12 months old (282 first children, 461 total children). Strategy frequencies are presented in Table 8. Strategies with detailed reasons are described in Table 9.

Table 8. Frequencies of weaning strategies according to maternal reports

Weaning Strategy	**First Children (n=282)**	**All Children (n=461)**
Child-led	110 (39%)	200 (43%)
Mother-led	98 (35%)	158 (34%)
Mutual	37 (13%)	58 (13%)
External Event	20 (7%)	24 (5%)
Undecided	17 (6%)	21 (5%)

Table 9. Reasons mothers provided for their weaning decisions, organized into general strategies

Weaning Strategies with Detailed Reasons
Child-led weaning
Child lost interest
Child self-weaned due to pregnancy/new birth
Mother-led
Biting
Child was too dependent
Child had difficult breastfeeding habits
Maternal embarrassment
Mother believed that nutrition/immunity benefits were no longer essential
Mother felt “touched out” or “wanted her body back”
Mother was ready to be done or felt overwhelmed
Nursing aversions/discomfort
Nursing took too much time or was restricting
Tandem nursing was too demanding
Tired of pumping
Weaned because of recommendations
Weaned due to child's age
Weaned to improve sleep
Mutual decision
Child seemed ready - mother encouraged
Child-led but encouraged by mom at certain age
External Events
Birth of sibling/pregnancy/miscarriage/conception
Husband uncomfortable with continued breastfeeding
Mother was traveling; abrupt weaning
Work was incompatible with breastfeeding
Undecided
Mom unsure of how to wean or has not decided how and when

“Child-led Weaning.” Forty-three percent (n=200) of mothers’ responses across all children focused on child-led weaning. Many mothers explicitly mentioned that “child-led weaning” was their approach or ideal strategy. Other mothers explained that their child lost interest in breastfeeding or self-weaned. Some mothers described that their child lost interest due to a change in milk supply or quality. For example, some children did not like colostrum after a sibling’s birth; in other cases, the mother’s supply dropped

dramatically during pregnancy. In these cases, the strategy was considered child-led because the mother wanted to allow her children to wean on their own, and mothers indicated that the change in milk supply or taste (and hence, weaning) was not particularly problematic for them or their children.

Here is how some mothers described their child-led strategies:

"When they stop wanting it, I stop giving it to them. They wean themselves when they are ready - no trauma, no stress, no negative feelings for them or I."

"You can't force a child to suck your boob, so whenever he doesn't want to anymore, I'll stop."

"I decided to let him nurse as long as he wanted to unless it felt like it was really being weird (which it didn't). But he himself just didn't desire it very much anymore. He was nursed on demand always."

"We do child-led weaning, so my 4 year-old self-weaned right around her 4th birthday. Part of me would really like to wean my 23 month-old right now just because it's very difficult to deal with the seemingly constant demands of a newborn and a toddler going through the regression associated with the new sibling transition. However, I know this period will be short-lived so I'm sticking it out because I don't want my toddler to associate weaning with her baby brother or stress her out even more during a time of transition. My plan with her is to continue child-led weaning."

"Mother-led Weaning." Around a third (34%) of children were weaned according to a mother-led strategy (n=158). Mothers indicated that they initiated weaning for many reasons. Some reasons revolved around the mother's mental or physical wellbeing; for example, some mothers said that "they wanted their bodies back," were "touched out," or

felt overwhelmed by nursing their older child. Some mothers simply stated that they were "done." Mothers responded that they wanted their "freedom back," and that nursing was restricting or inconvenient (including being tired of pumping at work). Other responses were unique to a particular child's behavior, such as biting, dependency, and difficult or embarrassing habits. Many mothers described having aversions or pain during breastfeeding while pregnant with a subsequent child.

Some mothers also decided that their children were "old enough" either due to their calendar age (including many who weaned on their children's birthdays), recommendations by experts (AAP and WHO) or others, or because the mother believed that the child was no longer receiving substantial nutritional or immune benefits. Still others indicated that they weaned to improve their own sleep, their child's sleep, or both.

The most common strategy for initiating weaning was to gradually reduce the number or length of nursing sessions over a period of time. Mothers also mentioned that they offered alternatives to breast milk, such as cuddling, reading stories, cow's milk or other foods. Some mothers indicated that they were able to explain to their older child that it was time to stop breastfeeding, and a few celebrated this milestone with what they called a "weaning party" (which is like a birthday party except the aim is to congratulate the child on their maturity).

Some mothers described their reasons for weaning as follows:

"I was going to let her self-wean, but I couldn't take the nipple torture anymore. My daughter really liked to play with the nipple she wasn't nursing on, and I often felt as though she were trying to make balloon animals."

"I decided to wean all of my children at two years based on WHO recommendations."

"My son's last nursing was first thing in the morning. By that point, it was just getting 'annoying' to me and he wasn't really getting milk anymore. He really just wanted to snuggle and feel close because he had transitioned into his own bed. We threw a weaning party to celebrate him getting 'big.'"

"For both [children] it happened naturally, and at the same age. If I had pushed breastfeeding longer, they probably would have, but there was a dramatic decrease in need and interest, so I weaned them and congratulated them for not needing to nurse anymore, and after the second one, I reclaimed my body."

"[The] goal was to avoid formula. CDC guidelines say kids can consume cows milk at 12 [months], so I weaned shortly after."

"Mutual-decision." The third category of responses included those that indicated that weaning was a mutual decision between mother and child (13%, n=58). Many responses in this category indicated that the mother encouraged a child who seemed ready, or that she was open to adjusting her strategy if the situation changed. Some of these mothers said that they hoped to allow the child to self-wean, but that they would consider initiating or encouraging weaning based on the situation (such as if the mother became pregnant or if she was no longer enjoying nursing). While this category was less clear-cut than the child-led or mutual strategies, these mothers indicated that they wanted to base their decision to wean on the interest of both parties involved. Some mothers simply stated that weaning was a mutual decision. Many of these mothers were not necessarily dedicated to child-led weaning but also did not want to wean based entirely on their own needs.

Some of these mothers described their strategy as follows:

"[We wean] slowly and with love when it is no longer satisfying for mom and child."

"At 12 months I stopped pumping at work so my supply during work hours really went down. At 17 months, I'm at a point where I just want my body back. I don't refuse my son, but he also shows less interest. I just want more freedom."

"External Events." A comparatively small category of responses (5%, n=20) included statements about how external events led to the weaning of a child. In some cases, the mother had to wean because she was ill, hospitalized, or had to take medications. Low supply was frequently cited as the reason a child weaned, frequently to the child's disappointment. Some mothers weaned because they had a miscarriage or wanted to conceive another child. A few mothers had to wean abruptly because they needed to travel away from the child for long enough to interrupt breastfeeding. In many of these cases, the mothers and children were both disappointed with the abrupt need to wean. Hence, these cases were considered "external" and not consistent with the desires of mother or child.

Mothers described the external events that necessitated weaning as follows:

"With my oldest I got sick and needed medication that meant I had to stop nursing."

"I was pregnant and training for a marathon and couldn't make milk anymore."

"Undecided." Finally, 5% of children were still breastfeeding because their mother was undecided in her approach to weaning (n=21). Mothers indicated that they were not sure how or when they would wean.

Here is how they described their decision-making:

"I am still in the process of figuring out how to wean."

"[I am] still deciding... [I] want to get through the winter months at least. [I] don't have

a plan to stop...don't know how long she and I "want" to go."

"I don't make decisions like this. Each day is just another day and we continue nursing. I don't know when we'll wean. I hope she'll wean when she is ready to, but you just never know. We take each day as it comes."

Quantitative Results: Factors Influencing Age at Weaning

Cox regression was used to quantitatively assess the factors that influenced age at weaning beyond 12 months. Model I includes only first children with maternal and familial characteristics. Analyses in Model II include all children breastfed to at least 12 months with maternal and familial characteristics. Model III analyses include first children with maternal and familial characteristics with the addition of weaning strategies. Finally, Model IV describes the results of analyses including all children, maternal and familial characteristics, and weaning strategies. Each model is described below in detail.

Model I: First children over 12 months with maternal and familial characteristics. Table 4 presents the event history results for Models I and II. When looking only at key demographic and child variables for first children, mother's age at the time of the survey, mother's level of education, number of children in the family, whether the mother was breastfed, religious affiliation, and current employment did not significantly predict the likelihood of being weaned at any point after 12 months.

Mother's age at the time of the first child's birth significantly decreased the hazard of weaning by 4% (p=.088), while level of income significantly increased the hazard of weaning at any given age beyond 12 months by almost 11% (p=.047).

Model II: All children over 12 months with maternal and familial characteristics.

When including all children who were breastfed to at least 12 months, we see a similar pattern as the first children model across all variables except for parity. For all children, each additional child in the family increased the hazard of weaning at any given time after 12 months by 26% (p=.001). As compared to the first children model, mother's age at first birth had a greater effect in reducing the hazard of weaning, while higher household income more significantly increased the hazard of weaning. This model was adjusted for each mother having multiple children using shared frailty.

Table 10. Results of the Cox Regression analysis for first and all children breastfed 12 months or more including maternal and familial characteristics

Covariate	**Model I: First Children (n=304)**		**Model II: All Children (n=609)**	
	Odds Ratio	**p value**	**Odds Ratio**	**p value**
Mom's Current Age	1.009	0.450	2.022	0.378
Mom's Age at Birth	**0.964**	**0.088**	**0.903**	**0.000**
Mom's Education Level	1.044	0.516	1.051	0.466
Number of Children	1.140	0.134	1.255	**0.001**
Annual Household Income	**1.109**	**0.047**	**1.247**	**0.000**
Mother was Breastfed	0.987	0.928	1.112	0.515
Religious Affiliation	1.249	0.122	1.299	0.105
Mother Currently Employed	1.290	0.121	1.172	0.374

Model III: First children over 12 months with weaning strategies. Table 11 presents the results for first and all children with the variables above plus weaning strategies. When mothers' weaning strategies are included in the model for first children, all demographic variables remain insignificant except mother's age at the child's birth and income. When compared to a child-led weaning strategy (the reference category for these analyses), having a mother who had not yet decided how or when to wean after 12 months reduced the hazard of weaning at any given age by 81% (though only significant at p=.10). Having a mutual weaning strategy did not significantly impact weaning age as

compared to a child-led strategy. The hazard of weaning was 2.9 times greater for children whose mothers said that an external event led to weaning as compared to mothers who had a child-led strategy (p<.001). First children whose mothers initiated weaning had a 1.37 times greater hazard of weaning as compared to children who were allowed to lead the weaning process.

Model IV: All children over 12 months with weaning strategies. The model for all children including weaning strategies is similar to the first children model, except that we again see that a greater number of children significantly increased the hazard of weaning (by 25%, p=.009). Income and maternal age at birth also had significant effects. Again, this model was adjusted for each mother having multiple children using shared frailty.

As in the first children model, an undecided weaning strategy significantly reduced the hazard of weaning at any given age (by 84% though only at p=.072). A mutual decision-making strategy had no effect, while the hazard of weaning was 3.2 times greater for children who were weaned due to an external event (p<.001). Mother-led strategies no longer had a significant effect on breastfeeding duration when all children were included in the model with shared frailty.

Table 11. Results of the Cox Regression analysis for first children and all children breastfed over 12 months including weaning strategies

Variable	**Model II: First Children (n=221)**		**Model IV: All Children (n=415)**	
	Odds Ratio	**p value**	**Odds Ratio**	**p value**
Mom's Current Age	0.996	0.763	1.000	0.959
Mom's Age at Birth	0.955	0.087	**0.903**	**0.000**
Mom's Education Level	1.059	0.467	1.082	0.350
Number of Children	1.083	0.446	1.254	**0.009**
Annual Household Income	**1.129**	**0.046**	**1.243**	**0.001**
Mother was Breastfed	0.907	0.598	0.933	0.722
Religious Affiliation	1.283	0.128	0.933	0.722

Mother Currently Employed	1.280	0.188	1.172	0.451
Undecided Strategy*	0.187	0.100	**0.125**	**0.047**
Mutual Strategy*	1.208	0.533	0.890	0.670
External Event Strategy*	**2.921**	**0.000**	**2.551**	**0.003**
Mother-Led Strategy*	1.366	0.087	**1.211**	**0.300**

*As compared to the child-led strategy

Discussion

Demographic Variables

Similar to other studies on breastfeeding duration, greater maternal age at the time of the child's birth predicted a later age at weaning (Thulier & Mercer, 2009). This is consistent with what we know about mothers who breastfeed for any duration in the U.S and for mothers who breastfeed long-term in particular. However, unlike the trend observed in the greater population (Thulier & Mercer, 2009), maternal education did not predict longer breastfeeding durations for those who already breastfed to 12 months. In all models, maternal education had no effect on weaning age. The mothers in this sample are highly educated; thus it may be that the lack of effect of education is due to low variation of this variable.

Perhaps surprisingly, increased level of household annual income had a negative effect on breastfeeding duration in all four models. This reveals that income and education may not have a linear effect on breastfeeding duration. Indeed, when examined with scatterplots, length of breastfeeding did not have a linear relationship with level of household income. It may be that greater income improves breastfeeding initiation and duration rates at lower socioeconomic levels, but that very high levels of income can have the opposite effect. This could indicate that mothers at higher levels of income have careers that do not accommodate breastfeeding or pumping beyond one year. As some mothers in the sample explicitly stated, some employers supported early breastfeeding,

but pumping at work was less supported after 12 months.

Mothers' current employment status at the time of the survey did not have an effect on breastfeeding duration, but it may be that the type of work the mother engages in is more important in determining her ability to continue breastfeeding beyond a year than merely whether or not she is employed. In this sample of highly educated and wealthy mothers, greater income predicted an earlier age at weaning even when children weaned between 6 and 12 months are included (Exp(B)=1.09; p=.037). This seems to indicate that the negative effect of income is not limited to long-term breastfeeding mothers, but may be attributed to an effect of very high-income levels.

Weaning strategies

Child-led weaning is the most commonly-reported strategy among mothers who breastfeed beyond one year. Another study on long-term breastfeeding reported the mothers' desires to let their children self-wean was a common motivator for breastfeeding beyond one year (Hills-Bonczyk et al., 1994).

The significant negative effect of mother-led weaning strategies and external events on breastfeeding duration as compared to child-led strategies counters what many in the American public and medical communities assert about long-term breastfeeding: that mothers continue to breastfeed for their own benefit (e.g., Stalker, 2004). Public opinion about mothers' selfish motivations for breastfeeding long-term abound online. One mother in the sample said that she felt pressured to wean after her child's first birthday, and that "some family members believe that [breastfeeding is] only beneficial through the first year, then the mother is just doing it for herself." However, these results indicate that first children who are allowed to lead the weaning process tend to breastfeed for longer

durations than those whose mothers initiate weaning. This demonstrates that, in many cases, the child's desire to breastfeed outlasts the mother's desire to continue. Some mothers indicated that their children weaned themselves sooner than the mother had hoped, but many mothers also pointed out that, regardless of the mother's wishes, it is impossible to force a child to nurse.

For all children, no difference was found between mutual and child-led strategies. This may be because the weaning ages of children whose mothers follow a child-led strategy and those who attempt to make the decision mutual do not look statistically different. Mutual strategy mothers may also be more similar to those following a child-led strategy than a mother-led strategy because they consider the child's desire to continue breastfeeding in determining when to wean. On the other hand, these mothers also considered their own desire to cease breastfeeding important and not superseded entirely by the child's need to continue.

Interestingly, the difference between mother-led and child-led strategies disappears when all children are included in a model with shared frailty. For first children, then, a mother initiating weaning had a negative effect on duration, but across all children in families, only external events and undecided strategies had an effect. This may illustrate what was observed in the qualitative accounts: that weaning strategies are facultative. Many mothers described the unique circumstances surrounding their breastfeeding decisions for each child. For example, here is how one mother described how different circumstances affected her decisions: "For my first, I weaned her when she was 30 months, and I was still nursing her 17 month-old sister and was pregnant with another. For my second, she stopped at 18 months because of the taste of colostrum when I was 30

weeks pregnant and because she could tell it was uncomfortable to me (highly sensitive child). For my third, he stopped because I was pregnant and he didn't want to bother when my milk dried up. For my fourth, it will be primarily when he stops." Other mothers described how they allowed one child to self-wean and hoped to do so for others, but certain nursing habits in a given child led to the mother initiate weaning. When having a shared mother is accounted for, we see how the same mother can have different strategies for each child based on circumstances; hence, the boundaries between "child-led" and "mother-led" appear less stark. Given the dyadic nature of breastfeeding (Stearns, 2011), it is reasonable that unique circumstances between each mother-child pair affect age at weaning.

Qualitative reports from mothers regarding their weaning strategies elucidate the finding that increased parity significantly increases the hazard of weaning (in the "all children" models). Many mothers who initiated weaning described that they did so because they had become pregnant or had given birth to a subsequent child. While some mothers continued to follow a child-led weaning strategy in the same circumstances by either tandem nursing or allowing their children to nurse through a pregnancy, some mothers chose to wean their existing children instead.

Mothers' accounts in the sample also confirm reasons long-term breastfeeding women weaned in other studies. Mothers in one study frequently reported that their breastfeeding decisions were under surveillance, and that friends, family, and even strangers questioned or commented on the appropriate age for weaning (Stearns, 2011). Mothers in the current study remarked on this and the fact that they often chose to breastfeed their older children in private to avoid dealing with criticism. Mothers also

noted that they decided to wean when their child reached a certain age or began engaging in certain behaviors (asking for the breast, trying to nurse in public), as has been found in other studies on long-term breastfeeding (Stearns, 2011).

Limitations

Any future quantitative models of breastfeeding duration should address the limitations of variables that were not included in the model. This particular data set did not include questions about mothers' breastfeeding confidence, which other studies have found to be important in influencing breastfeeding duration (Brown, 2014; Thulier & Mercer, 2009). Social support variables were also excluded from these analyses, though future analyses will address social support among long-term breastfeeding mothers in the sample. An additional limitation is that the maternal variables (income, education, employment) were current at the time of the study; therefore, it is not possible to determine if a mother's status on these variables differed among her children. For example, the family's annual income could have been higher with later-born children than with earlier-born children. Further, mothers could have stayed home with breastfeeding children and returned to work later. However, the mother's current age and age at the time of the child's birth were included in an attempt to reduce the effect of this limitation.

Conclusion

Two key implications can be drawn from the results of this mixed methods study. First, long-term breastfeeding mothers frequently follow a "child-led" weaning strategy, which often results in a longer duration of breastfeeding. However, weaning strategies can be adapted to unique familial and individual circumstances and are influenced by the

dynamic between mother and child. While mothers who followed a "mother-led" strategy tended to wean earlier than those following a child-led strategy, many mothers wanted to breastfeed as long as recommended by experts and breastfed until one year or longer. Second, while some characteristics of long-term breastfeeding mothers had a predictable effect on breastfeeding duration, other factors had no effect or an effect that differs from the wider population. Increased education did not predict a later age at weaning, and maternal employment did not predict earlier breastfeeding cessation. Very high levels of income may have a negative effect on breastfeeding duration beyond one year, which may indicate the need for legislation, policy, and advocacy for greater support at work for those women who breastfeed long-term. Having more children also predicted an earlier age at weaning. For those mothers who wish to breastfeed through pregnancy or tandem nurse, support and pain relief may help these mothers continue.

Future research could address how support for long-term breastfeeding influences age at weaning. Further qualitative research is also needed to explore in more depth the association between very high levels of income and earlier weaning after one year. Continued research on long-term breastfeeding in the U.S. should be stressed given the AAP and WHO recommendations to breastfeed beyond 12 or 24 months. The results of this study illustrate that many mothers in the U.S. are motivated to follow their child's lead in regards to weaning despite living in a culture that does not support breastfeeding of toddlers and older children.

CHAPTER FIVE: Effects of Social Support on Breastfeeding Duration Among Long-term Breastfeeding Mothers in the U.S.

Introduction

The benefits of breastfeeding have been widely demonstrated. Organizations such as the American Academy of Pediatrics (AAP), World Health Organization (WHO), and Centers for Disease Control (CDC) recommend breastfeeding from one to two years and beyond. Initiation rates in the U.S. have increased in recent years, but breastfeeding rates beyond 6 and 12 months remain below public health targets (Healthy People 2020, 2015). For example, just over a quarter of children born in 2011 received breast milk at 12 months, and only 10% of mothers in the U.S. continue to breastfeed their 18 month-old children (CDC, 2015). It is unknown how many American mothers continue to two years and beyond.

Research has found that social support is important to breastfeeding mothers and may influence breastfeeding duration (Thulier & Mercer, 2009), and some studies have explored social support among long-term breastfeeding mothers (Rempel, 2004). However, it is not clear how social support or disapproval impacts actual breastfeeding decisions among mothers who breastfeed for at least 12 months. This study aims to determine who encourages and discourages long-term breastfeeding and how others influence a mother's breastfeeding decisions. Utilizing qualitative analyses, it will explore who reportedly pressured mothers to wean their children after 12 months. Quantitative analyses will be used to determine what factors, including social support, influence breastfeeding duration beyond one year.

Long-term Breastfeeding

Breastfeeding beyond infancy has been referred to as long-term, sustained, extended, and prolonged breastfeeding. While some breastfeeding researchers consider any duration beyond 6 months "long-term," others use this term to refer to breastfeeding beyond one year (Buckley, 2001; Reamer & Sugarman, 1987). Hence, there is no consistent benchmark for what is considered extended or long-term breastfeeding. In addition to the challenge of defining the phenomenon, recruitment for studies of long-term breastfeeding is complicated in that this behavior is often practiced covertly (Reamer & Sugarman, 1987; Auerbach, 1976). Due to common social stigma of nursing older children in the U.S., mothers often develop strategies to hide breastfeeding, such as developing code words with their older children or nursing only in private places (Buckley, 1992; Stearns, 2011). In this study, breastfeeding to 12 months or beyond is considered long-term.

Given the lack of public support for long-term breastfeeding in the U.S., some studies have focused on mothers' support networks. Many studies rely on samples drawn from La Leche League organizations and conferences; they have found that La Leche Leage (LLL) is a frequently cited source of support for mothers' decisions to breastfeed beyond infancy. For example, 93% of LLL leaders and 88% of LLL members reacted positively to mothers who breastfed their older children according to maternal reports (Kendall-Tackett & Sugarman, 1995). While LLL may be an important source of support for long-term breastfeeding mothers, its significance may be inflated in these studies given that respondents were active in the organization.

Spouses were consistently reported as sources of support for long-term

breastfeeding (78% in Hills-Bonczyk et al., 1994; 75% in Kendall-Tackett & Sugarman, 1995). Other frequent supporters include maternal grandmothers (31% in Hills-Bonczyk et al., 1994), sisters and other relatives, friends, and some co-workers. Kendall-Tackett and Sugarman (1995) found, however, that most relatives, employers, and strangers tended to react more negatively than positively to long-term breastfeeding. Rempel (2004) found that prenatal breastfeeding support scores of friends, mothers, and mothers-in-law dropped at 9 months, and that mothers still breastfeeding at 12 months reported less support from all individuals than the support they reported at 9 months. The author also found that support is correlated with mothers' intentions and behavior at 9 months, suggesting that social norms influence how long a mother breastfeeds beyond infancy (Rempel, 2004).

Though mothers in all studies on long-term breastfeeding reported numerous benefits, they also reported that there are some negative aspects of breastfeeding beyond infancy. These include social stigma (42% of mothers in one sample), embarrassment, and restriction of maternal activities (Reamer & Sugarman, 1987). One study found that some negative aspects are reported more frequently as the child ages, such as social stigma (29% at 6 months, 44% at 12 months, 61% at 24 months) (Kendall-Tackett & Sugarman, 1995). Additionally, mothers reported that nursing an older child comes with unique challenges that include maternal impatience (Buckley, 1992).

While the existing literature has increased our understanding of the experiences of long-term breastfeeding mothers, it is still unclear how social support and stigma influence breastfeeding and weaning decisions after the first year. This study will describe who pressures mothers to wean after 12 months according to maternal reports,

and how consulting with others about breastfeeding influences long-term breastfeeding duration.

Methods

Prior to collecting data, recruitment methods and survey materials were approved by the University of Missouri's Institutional Review Board. Respondent-driven sampling was used to recruit participants for the study, which encourages initial participants to share information about the study with friends and family (Bernard, 2011). Given that many long-term breastfeeding mothers in the U.S. tend to nurse in private, this method was uniquely suited to recruit participants whose behavior is often hidden (Buckley, 1992). Recruitment involved the researcher posting an ad for the survey on her Facebook page. The ad provided a study description and link to the survey, and it requested that others share the ad on their own social media sites. Participants also shared the ad with breastfeeding support groups. This method allowed the survey to reach participants across the U.S. in a matter of days. Similar studies have used respondent-driven sampling as well as social media to recruit mothers whose identifying behavior is often covertly practiced (Dowling & Brown, 2013; Kendall-Tackett & Sugarman, 1995).

Any mother over the age of 18 who had breastfed at least one child was invited to participate. The survey was hosted by the University's Qualtrics site. There were 100 open and closed-ended questions regarding the mother's social network, infant feeding practices for each child, demographics, and breastfeeding experiences. Long-term breastfeeding mothers were asked additional questions about their experiences with nursing a child at or beyond 12 months.

Qualitative Methods

Long-term breastfeeding mothers were asked if they had felt pressured to wean when their children were 12 or more months old, and if so, by whom. A total of 158 mothers listed 261 groups or individuals whom they felt pressured them to wean. Each individual or group was counted and tallied in Excel.

Quantitative Methods

Event history analysis, specifically Cox Regression, is used to study correlations between explanatory variables and the timing and occurrence of events (Yamaguchi, 1991). The advantage of this method is that it allows censored cases, those individuals who have not yet experienced the event, to be included in the analysis. In other words, it tests whether the variables in the model (such as age, income, etc.) can statistically predict the timing of an event. In the present study, cessation of breastfeeding is the event in question, and children who had not been weaned at the time of the survey were considered censored. Explanatory variables found in other studies to influence breastfeeding duration were included, such as mother's current age, education, annual income, and employment status. Only first children were included in the analysis in an attempt to control for previous breastfeeding experience. In addition, the influence of others in a mother's social network was measured by how frequently she consulted the source or individual about breastfeeding during her first child's infancy on a scale from one (never) to five ("all the time"). Sources of information included the spouse, maternal grandmother, maternal grandfather, paternal grandparents, friends, employers and colleagues, doctors, lactation consultants, La Leche League, and online sources. Event history analysis was conducted in SPSS-IBM version 22. Additionally, summary statistics on the social disadvantages of long-term breastfeeding are presented.

Results

Sample Characteristics

Of the full sample of 607 mothers who completed the survey, 317 had breastfed or were currently breastfeeding their first child who was over 12 months old. Participants resided in 47 of 50 states. Eighty-four long-term breastfeeding mothers were currently breastfeeding their first child. Table 12 presents summary statistics of the sample of long-term breastfeeding mothers.

Table 12. Summary statistics for the sample of long-term breastfeeding mothers (n=317)

Characteristic	**Mean**
Mother's Current Age	35
Mother's Age at First Birth	28
Spouse's Age at First Birth	30
Number of Children	1.9
	Percent of sample
Mothers Currently Employed	68%
Annual Household Income	
Less than $20,000	3%
$20-39,000	16%
$40-59,000	19%
$60-79,000	19%
$80-99,000	17%
Over $100,000	27%
Mother's Completed Education	
High School	13%
Associate's Degree	11%
Bachelor's Degree	36%
Master's Degree	26%
PhD/JD/MD	14%
Mothers Currently Married	91%
Mother's Ethnicity	
Caucasian	90%
African American	1%
Hispanic	3%
Native American	1%
Pacific Islander	1%
"Other"	4%
Mothers who were Breastfed	66%

Mothers who had problems breastfeeding	68%

Mothers averaged 35 years of age and gave birth to their first children at age 28. The majority of respondents were married at the time of first birth and at the time of the survey (91%). Most mothers in the sample had completed at least a four-year college degree at the time of the survey (76%), and around two-thirds were currently employed. Almost all married women had employed spouses (95%), and annual household incomes were high. Over a quarter of mothers reported incomes of greater than $100,000 per year. Most mothers and their spouses were white/Caucasian and over half reported affiliation with a religion. Two-thirds of mothers were breastfed by their own mothers, and 68% of mothers reported having problems breastfeeding their first child.

Previous studies have found that long-term breastfeeding mothers in the U.S. tend to be older, more educated, white, and of higher socioeconomic statuses than those who breastfeed for shorter durations (Buckley, 1992; Kendall-Tackett & Sugarman, 1995; Reamer & Sugarman, 1987). The mothers in the current study share these characteristics, suggesting that the sample may be considered generally representative of those who breastfeed long-term in the U.S. In addition, these mothers who succeed at breastfeeding for longer than average give us a unique insight into the factors that could be improved to help all mothers breastfeed for longer durations.

Qualitative Results

Mothers who breastfed to 12 months or beyond were asked the question: "Did you feel pressure from anyone to wean your child from the breast at or after 12 months of age?" Frequencies of reported pressure from categories of people are presented in Table

13. Individuals were aggregated into categories, and exemplary quotes are provided for each category.

Table 13. Percentage of mothers who mentioned an individual or group as encouraging them to wean their child after 12 months

Individual	Percentage
Any Family*	80%
Parents	27%
In-laws**	25%
"Family"	21%
Society	22%
Spouse	19%
Friends	18%
Healthcare Providers***	14%

*"Any family" includes parents, in-laws, siblings, grandparents, and "family."
**"In-laws" includes parents-in-law and siblings-in-law.
***"Healthcare providers" includes doctors, nurses, pediatricians, and dentists.

Family. The majority of mothers mentioned that one or more members of their family had pressured them to wean after 12 months (80%). "Family" in general was mentioned by 21% of mothers. Mothers' parents were the family members most frequently mentioned to encourage weaning (27%), with mothers' own mothers reported by 18%. A quarter of mothers reported pressure from their parents-in-law. Siblings and siblings-in-law also reportedly pressured mothers to wean (8%).

Mothers stated the following when asked to describe who pressured them to wean their child at or after 12 months:

"Pretty much everyone but especially my mother. I think she thought my choices were a direct reflection on her."

"Well-meaning, annoying, misinformed relatives."

"The children's grandparents made it a requirement of the kids staying overnight, even if

they weren't needing the breast to go to sleep."

"My mom. She was okay with nursing up to about 2. She doesn't know that my daughter nursed until she was 3."

"Family members, especially my parents. They felt it was keeping her from growing up."

"My sisters-in-law would tell me that once they could ask, they should be weaned."

Spouses. Nineteen percent of mothers stated that they felt pressure from their spouse or baby's father to wean after one year. One mother said that she felt pressure "lately from [her] husband since [her baby is] almost two and is currently obsessed with 'boobies'." Another mother stated, "My husband started pressuring at 24 months because he thought it was time, but backed off when I told him that it was up to our son."

Society. Many mothers (22%) mentioned that they felt pressure from society in general to discontinue breastfeeding after one year. This included strangers (6%) and neighbors (1%). Other seldom-mentioned non-family or friends who reportedly pressured mothers to wean included daycare providers, employees at WIC, employers, coworkers, and members of their church.

Mothers described this pressure as follows:

"Society makes it seem wrong to breastfeed longer than a year. Also, coworkers got tired of covering me while I pumped after a year into it."

"[My] employer no longer allowed [me] to pump at work."

"[My] coworkers have expressed that they think it's 'weird.' I don't talk about it at work."

"WIC doesn't approve of breastfeeding after 12 months."

Friends. Eighteen percent of mothers reported that they had friends who disapproved of

their decision to breastfeed beyond one year. On mother said that she felt pressure "only from a friend who thought I was scarring my child." Another mother reported that "several friends stated that breastfeeding a child "who can walk up and ask for it is 'creepy.'"

Healthcare providers. Fourteen percent of mothers reported that they felt pressure to wean after 12 months from their physician, their child's pediatrician, nurses, or dentists. For example, one mother responded: "Our pediatrician; because of this, I switched doctors for his one year appointment."

Everyone. Some mothers reported that "everyone" or nearly everyone in their lives was unsupportive of their decision to breastfeed as long as they did (6%). One mother said, "after 30 months, I had lots of critics." Another said that everyone in her social network disapproved except her children.

Quantitative Results

All mothers were asked to respond whether they perceived disapproval from others as a disadvantage of breastfeeding at specific ages (0-6 months, 7-12 months, 13-24 months, 25-36 months, and beyond 36 months). Not all mothers responded to each question, but mothers were included whether they breastfed to the age in question or not. For example, a mother who breastfed for 18 months could have responded that they perceived social disapproval as a disadvantage of breastfeeding a three-year-old. Table 14 provides the percentage of mothers who perceived social disapproval as a disadvantage of breastfeeding at each age.

Table 14. Percentage of mothers who responded that they perceived disapproval from certain individuals was a disadvantage of breastfeeding based on the child's age

Disadvantage of Breastfeeding by Age	Child's Age in Months	Percentage of Mothers	Sample size*
Family Disapproves	0-6	4%	120
	7-12	7%	120
	13-24	47%	125
	25-36	77%	123
	Beyond 36	89%	125
Friends Disapprove	0-6	6%	84
	7-12	8%	84
	13-24	41%	86
	25-36	77%	86
	Beyond 36	91%	89
Society Disapproves	0-6	9%	162
	7-12	18%	162
	13-24	59%	169
	25-36	82%	168
	Beyond 36	91%	171
Healthcare provider disapproves	0-6	3%	76
	7-12	8%	77
	13-24	48%	81
	25-36	81%	80
	Beyond 36	95%	81

*Sample size refers to the number of long-term breastfeeding mothers who responded to the question.

Across individuals, long-term breastfeeding mothers seldom reported disapproval from family, friends, and healthcare providers as a disadvantage of breastfeeding up to 12 months (less than 10%). However, 18% of mothers reported societal disapproval as a disadvantage of breastfeeding between 7-12 months. Reported disapproval increased in the second year of life, with almost half of mothers (47%) reporting that disapproval from family, 41% from friends, 59% from society, and 48% from healthcare providers was a disadvantage of breastfeeding. Mothers reported disapproval as a disadvantage of breastfeeding into the third year of life in even higher numbers: 77% of family and

friends, and over 80% of society and healthcare providers. Most mothers felt that disapproval from family, friends, society, and their healthcare providers was a disadvantage of breastfeeding beyond 36 months (nearly or over 90% in all categories).

Table 15 illustrates the results of the event history analysis. The final model included the following variables: number of children in the family, annual household income, the mother's current employment status, and the frequency with which mothers consulted individuals/sources about breastfeeding during the first child's infancy. Consistent with the breastfeeding literature, the mother's parents and in-laws are referred to as maternal and paternal grandparents, respectively. Initial analyses were conducted that also included potentially relevant maternal and demographic variables, such as mother's current age, whether the mother was breastfed, the mother's completed education level, the first child's gender, and whether the mother had problems breastfeeding the focal child. However, none of these additional maternal and familial characteristics were significant or impacted the results of other variables; hence, they were omitted in the final model.

Table 15. Results of the Cox Regression analysis including support variables

Variable	Odds Ratio	p Value	Confidence Intervals
Number of Children	**1.366**	**<0.001**	**1.164-1.603**
Annual Income	1.070	0.194	0.966-1.186
Mother's Current Employment	1.370	0.066	0.979-1.915
Spouse	1.003	0.970	0.881-1.141
Maternal Grandmother	0.987	0.838	0.868-1.122
Maternal Grandfather	**0.751**	**0.043**	**0.570-0.991**
Paternal Grandparents	1.122	0.129	0.867-1.303
Friends	0.964	0.572	0.850-1.094
Employer and Colleagues	1.227	0.103	0.960-1.567
Doctor	1.091	0.343	0.912-1.305
Lactation Consultant	1.132	0.099	0.977-1.312
La Leche League	**0.748**	**<0.001**	**0.647-0.864**
Online Sources	0.920	0.162	0.820-1.034

The odds ratio indicates the degree of impact a variable has on the predicted outcome, in this case, age at weaning. Any value over one indicates an increased risk of the event occurring, while a value below one indicates a decreased risk of weaning. More frequently speaking with the maternal grandfather and La Leche League about breastfeeding reduced the likelihood (hazard) of weaning by 25% each. The frequency with which mothers consulted spouses, maternal grandmothers, paternal grandparents, friends, employers and colleagues, doctors, lactation consultants, and online sources did not significantly influence the age at weaning. Children were 37% more likely to be weaned at any given age after 12 months with each additional child in the family. Though not significant at the .05 level, maternal employment predicted a 37% higher likelihood of weaning as compared to mothers who were not employed at the time of the survey.

Discussion

While many studies have shown that maternal education, income, age, and problems with breastfeeding significantly impact breastfeeding duration, these variables were not significant for long-term breastfeeding mothers in this sample. The traits that characterize these mothers - white, married, highly educated, high incomes - are those that are associated with longer breastfeeding duration in the U.S. (Thulier & Mercer, 2009). It may be that once a certain level of education or income is achieved, having more education or money no longer significantly impacts breastfeeding decisions. Analyses of scatterplots indicate that the relationship between income and breastfeeding duration is non-linear; in other words, duration does not predictably increase with income. Additionally, low variation in education among these mothers may partly explain the lack of effect of education on breastfeeding duration.

Of the control variables, only parity and current employment status influenced breastfeeding duration beyond one year. More children in the family lowered the odds of continuing to breastfeed the first child by 37%. When mothers were asked why they weaned when they did, many mothers indicated that they were pregnant or had had another child. Some older children lost interest in breastfeeding when supply dropped during pregnancy or if they disliked the taste of colostrum. Other mothers stated that they chose to wean their older child due to pain or nursing aversions during pregnancy or because they did not want to tandem nurse.

Employment status increased the hazard of weaning, though this variable was not significant at the .05 level. Other studies have found that returning to work has a negative impact on breastfeeding duration (Thulier & Mercer, 2009). It may be that employment was not as strong in predicting weaning age among long-term breastfeeding mothers because the effect of returning to work on breastfeeding is more important earlier in a child's infancy. For example, older children usually nurse less frequently and tend to persist the longest with nursing sessions that surround sleeping and waking (Gribble, 2008). Given that these sessions tend to take place outside of most work hours, maternal employment might have less of an effect on nursing older children.

As other studies on long-term breastfeeding have indicated, mothers perceive more social disapproval for their breastfeeding decisions as their children age (Kendall-Tackett & Sugarman, 1995). Whether it is from family or friends, society or healthcare providers, mothers report similar levels of disapproval at certain ages, with nearly all mothers feeling that social disapproval was a disadvantage of breastfeeding a three-year-old.

The lack of impact on breastfeeding duration beyond one year from most

individuals in the mothers' support networks may indicate what other studies have noted: long-term breastfeeding mothers are often internally motivated and may not be as easily influenced by others to wean before they feel that they and/or their children are ready (Hills-Bonczyk et al., 1994; Kendall-Tackett & Sugarman, 1995). Qualitative statements from some mothers in the sample indicate that this may be the case. For example, when mothers faced criticism from physicians, they often ignored it or changed physicians. Some mothers reported that others eventually stopped discussing weaning with them after they had breastfed beyond a certain point. It may be that some mothers' confidence in their breastfeeding decisions allowed them to continue even when those close to them, and society at large, disapproved of their decisions.

Frequently consulting La Leche League had a significantly positive effect on breastfeeding duration beyond one year. Other studies have found that long-term breastfeeding mothers often report La Leche League to be a significant source of support (Kendall-Tackett & Sugarman 1995). Having a strong support network of other breastfeeding mothers may have boosted maternal confidence and their ability to overcome criticism, while providing assistance with problems and technique.

Perhaps surprisingly, discussing breastfeeding with the maternal grandfather decreased the likelihood of weaning at any given age after one year. Grandparents are seldom included in studies of breastfeeding, and when they are, focus is usually on the maternal grandmother (Winterburn, Jiwa, & Thompson, 2003). In this study, maternal grandmothers had little effect on the duration of long-term breastfeeding. This may be driven by the fact that a grandmother's advice can be positive or negative, rather than indicating that their advice does not matter (Bentley, Dee, & Jensen, 2003). As some

mothers mentioned explicitly, maternal grandmothers were frequently not supportive of their decisions to breastfeed beyond a certain age. Almost a fifth of mothers listed their mothers (referred to as maternal grandmothers in this study) as individuals who encouraged them to wean after a year. Grandfathers, however, were seldom mentioned. Most women never or seldom spoke with their fathers about breastfeeding, but it is clear that their support mattered to the mothers who did. It may be that the impact of the maternal grandfather indicates paternal interest in his grandchildren or daughter's parenting decisions, or the openness of the father-daughter relationship. Alternatively, this effect could indicate the mother's comfort with breastfeeding around her father, which was uncommon among most mothers in the sample.

Limitations

Any quantitative study of breastfeeding is subject to the limitation of the variables that were included. Some studies have found that a mother's confidence in her ability to breastfeed impacts breastfeeding duration (Brown, 2014). This variable was not included in the present study. Future research should explore whether confidence continues to influence breastfeeding duration beyond one year. A further limitation is that maternal characteristics such as education level, employment status, and household income were measured at the time of the study. It is therefore unknown when the mother returned to work, which could explain why the effect of maternal employment was not more significant.

Implications

The most significant non-social variable that led to earlier weaning was parity. Some mothers expressed regret that their older children weaned during or after

pregnancy, due to low milk supply or the change in taste. Education about breastfeeding during pregnancy and tandem nursing may help these mothers should they want to adjust their family planning to achieve breastfeeding goals.

While not highly significant, employment had a negative impact on breastfeeding duration among mothers who achieved long-term breastfeeding. This study demonstrates that policies and support for breastfeeding in the workplace may be most important earlier in a child's infancy. As such, it is essential to promote policies that extend maternity leave and breastfeeding support at work to help mothers reach CDC and AAP breastfeeding recommendations.

Additionally, frequent contact with other breastfeeding mothers seems to encourage mothers to breastfeed even in the face of criticism. Increasing the number of local chapters of La Leche League and mothers' access to breastfeeding support groups may raise breastfeeding rates into the second year of life.

Speaking with family and friends may help sustain breastfeeding as long as their advice is positive. While many mothers indicated that the negative views of others did not change their decision to breastfeed long-term, these mothers also reported disapproval from others in increasingly high numbers as duration of breastfeeding increased. Based on the results of this study, public health efforts should aim at educating the public on the benefits and normalcy of long-term breastfeeding.

CHAPTER SIX: Discussion and Conclusion

The aim of this chapter is to synthesize the results of the three papers included in this study. Paper One (Chapter 3) presented the results of an analysis that examined the effect of kin and non-kin support on weaning age of first children among all mothers in the sample (n=594). Paper Two (Chapter 4) assessed the influence of maternal, familial, and child characteristics, including weaning strategies, on the weaning age of first children who are breastfed to at least 12 months. Paper Three (Chapter 5) presented the results of a similar analysis that explored the effect of kin and non-kin support on weaning age of first children among mothers who had breastfed for at least 12 months. The next section will integrate and synthesize the results of Papers One and Three, which looked at how support influences breastfeeding duration, as well as provide implications for policy. The following section will synthesize the results of Papers Two and Three, both of which examined the effect of various factors on long-term breastfeeding duration. Finally, the chapter will include a discussion of the theoretical implications of the study and a brief conclusion.

Integrating Papers One and Three: How do support and other factors influence breastfeeding duration among long-term breastfeeding mothers and those who breastfeed for shorter durations?

How social support influences breastfeeding duration has seldom been examined quantitatively. Papers One and Three examined how social support and other maternal and child characteristics influenced breastfeeding duration. This section will attempt to integrate these two papers in order to explore what differences may exist between

mothers who breastfeed for any duration and those who do so for at least one year. Understanding these differences may help us approach an understanding of how to improve social conditions to promote breastfeeding of any duration.

Maternal/Familial Characteristics

Whether the mother was breastfed significantly reduced the hazard of weaning (by 48%) among all mothers, while this variable had no effect among mothers who had breastfed at least one year. The lack of significance among long-term breastfeeding mothers suggests that whether the mother was breastfed impacts early maternal decision-making but not longer-term weaning decisions. It could be that mothers who were breastfed received early support for their decisions or helpful advice about breastfeeding from their mothers who had also breastfed, while these effects had played out after a year of breastfeeding and other influences became more important. Other studies have also found that mothers who were breastfed did so for longer durations than those who were not breastfed (Forster et al., 2006), but no one else has examined the effect of this variable on long-term breastfeeding.

Greater parity (number of children in the family) increased the odds of weaning in both groups, though the effect was slightly greater among long-term breastfeeding mothers (37% vs. 23%). This may be because more first children were already weaned in the larger sample before the mother became pregnant with a sibling. Qualitative reports among long-term breastfeeding mothers indicate that many children were weaned around the time of a mother's pregnancy or the birth of a new sibling.

Income, education, mother's current age, child's gender, and problems with breastfeeding had no effect on weaning age in either sample. High incomes and education

levels were common in both samples of mothers; hence, it may be that these variables were insignificant in predicting breastfeeding duration because high incomes and education levels are associated with longer breastfeeding durations among American women (Thulier & Mercer, 2009), and there was insufficient variation in the sample to detect differences.

Current employment status was not significant among all mothers, but predicted earlier weaning among long-term breastfeeding mothers (though only significant at .07 p value). It may be that employment status did not significantly predict breastfeeding duration in the sample because of measurement error. Employment status was current to the time of the survey, rather than the time at which the mother weaned each child. Qualitative reports among long-term breastfeeding mothers suggest that some mothers did wean because of incompatibility with work. Other studies have also found that returning to work generally has a negative effect on breastfeeding duration (Thulier & Mercer, 2009).

Increasing maternal age at birth predicted later weaning (by 7%) among all mothers, but this variable had no effect among long-term breastfeeding mothers. There was greater variation in age at first birth among mothers in the full sample than in the long-term breastfeeding sample. As such, it may be that the lower amount of variation in ages at first birth in the smaller sample of long-term breastfeeding mothers explains why this variable had no effect on breastfeeding duration in that analysis.

Support Variables

Frequency of discussing breastfeeding with maternal grandmothers, paternal grandparents, friends, and lactation consultants had no significant effect on breastfeeding

duration among mothers in the full sample or the long-term breastfeeding sample.

The low statistical significance of the frequency with which mothers spoke with their spouses about breastfeeding may be attributed to the high frequency and low variation of this variable in both samples. Alternatively, it may be that, while mothers frequently discussed breastfeeding with their spouses, spouses may not provide specific advice or opinions that alter the mother's breastfeeding decisions. Finally, it could be that spouses have mixed views of breastfeeding, and that the positive and negative influences of different spouses (or even within the same spouse) cancel one another out. Qualitative reports from long-term breastfeeding mothers indicate that some spouses are not supportive of continued breastfeeding at certain ages. Other studies have found that American fathers have ambivalent views about breastfeeding or tend not to express their views strongly to their partners (Avery & Magnus, 2011).

It was surprising that the frequency with which mothers spoke with their mothers (the maternal grandmother) did not impact breastfeeding duration in either sample given the high levels of support they provided. It may be that advice from maternal grandmothers does impact breastfeeding duration, but that there is great variation in the type of advice grandmothers provide. In other words, some maternal grandmothers may provide encouragement for breastfeeding, while others are more negative in their view of breastfeeding beyond a certain age. Qualitative reports from mothers in the long-term breastfeeding sample indicate that grandmothers frequently advised them to wean before the mothers felt that they or their children were ready. Other studies have documented that the maternal grandmothers in the U.S. do not always support breastfeeding (Bentley et al., 2003).

More frequent discussion of breastfeeding with maternal grandfathers predicted longer durations of breastfeeding in both groups (29% all, 25% long-term). Few mothers spoke frequently or at all with their fathers about breastfeeding, so this effect is driven by a small number of women who did consult their fathers about breastfeeding. This significance could reflect many different aspects of the father-daughter relationship. First, it could indicate that the mother comes from an intact home, or at least that she maintains frequent communication with her father. Second, it could reflect the degree of interest her father has in her parenting and her children. Third, it may be that these mothers feel a degree of openness with their fathers that other mothers do not feel. Finally, it could be that mothers who tend not to speak with their fathers about breastfeeding are uncertain of the father's opinion on the matter, in which case mothers who do have these discussions may be receiving more direct support for breastfeeding (at least from their fathers). These mothers may also be able to breastfeed comfortably in front of their parents, rather than feeling that they must hide it because of their father's discomfort.

Frequently discussing breastfeeding with employers and colleagues predicted an earlier age at weaning among all mothers (by 23%, though only at the .06 level of significance), but not among long-term breastfeeding mothers. This effect may explain the lack of significance of current employment status. The significance of this variable among all mothers may reflect the effect of returning to work, which might not be accounted for by current employment status because employment was not measured at the time of weaning. Including mothers who were employed early in their children's infancy may clarify the effect of returning to work, and how difficult it is for mothers to sustain breastfeeding after returning to work. Though employment policies are currently

changing to be more supportive of breastfeeding in some places (Atabay et al., 2015), cultural and legal support for breastfeeding or pumping in the workplace is limited in the U.S. Some employers report having little experience with breastfeeding and tend not to think that work policies should be altered to accommodate breastfeeding (Libbus & Bullock, 2002). In this country, most women do not have paid maternity leave, and many employers, particularly small businesses, are not required to provide time or facilities for women to pump and store breast milk. It could be that some mothers feel the need to negotiate their right to pump at work, which is reflected in how frequently they discuss breastfeeding with their employers and coworkers. If so, these mothers may feel that their breastfeeding decisions are under surveillance or may be dealing with either covert or overt opposition.

Frequently speaking with doctors about breastfeeding significantly increased the hazard of weaning among all mothers (by 25%), but this effect was not seen among long-term breastfeeding mothers. The lack of physician training on breastfeeding has been documented elsewhere (Dermer et al., 2008) and may help explain why doctors can have a negative rather than a positive effect on breastfeeding duration among some mothers. Qualitative statements from some mothers in the long-term breastfeeding sample may explain why physicians had less of an impact among these mothers. For example, when some mothers faced criticism from physicians, they ignored it or changed physicians. It may be that support from La Leche League or maternal confidence helped these mothers surmount criticism from physicians, while mothers without this support or confidence were more likely to follow a doctor's advice against continued breastfeeding. It may also be that mothers who plan to breastfeed long-term are more educated about breastfeeding

than other mothers and do not solicit their doctor's advice as often.

Frequently consulting online sources about breastfeeding during the first child's infancy predicted a later age at weaning among all mothers (by 11%), but this effect was not seen among long-term breastfeeding mothers. The significance among all mothers could reflect the mother's interest in solving breastfeeding problems, learning about breastfeeding, or connecting with other breastfeeding mothers via online support groups. If so, the difference in weaning ages among those who go online more frequently than others could be attributed to the mother's interest, motivation to breastfeed, or time given to attaining breastfeeding information. The lack of significance among long-term breastfeeding mothers could be explained by the fact that most of these mothers may already be educated or dedicated to breastfeeding and are less affected by further research or breastfeeding advice once they have already breastfed for a year.

Frequently consulting La Leche League (LLL) for breastfeeding advice was protective in both groups (27% all, 25% long-term). This effect could be a reflection of the organization's impact on maternal decision-making, the mother's motivation to resolve breastfeeding problems, or to connect with other breastfeeding mothers. A further explanation for the significant effect of LLL on breastfeeding duration could be the fact that mothers are able to observe other mothers breastfeed when they attend meetings. Many scholars have noted that breastfeeding is a learned behavior, and due to the general lack of approval for breastfeeding in public in the U.S. (Wolf, 2003), LLL meetings may be one of the few places mothers can learn to breastfeed and overcome difficulties. Among long-term breastfeeding mothers there may also be an element of reverse causality, where women who are long-term breastfeeders may join LLL to help others

with breastfeeding or to interact with other women who are long-term breastfeeders.

The lack of significant influence on breastfeeding duration after a year from most people in mothers' support networks may suggest what other studies have noted: long-term breastfeeding mothers tend to be internally motivated and may be less likely to base their weaning decisions on the advice of others (Hills-Bonczyk et al., 1994; Kendall-Tackett & Sugarman, 1995; Rempel, 2004). Some mothers in the sample stated that other people eventually stopped discussing breastfeeding or weaning with them. It is possible that the degree of confidence some mothers had in their breastfeeding decisions pushed them to continue even when those around them disapproved of their decisions.

Policy Implications

The women in the sample generally represent a demographic of American women who succeed in breastfeeding for longer durations than average - highly educated, high socioeconomic status, older at first birth, and Caucasian (Thulier & Mercer, 2009). Even among all mothers, the average age at weaning was high: 18 months among all mothers and 23 months among long-term breastfeeding mothers. This is in stark contrast to the average weaning age of three months for the general population of U.S. mothers (CDC, 2015). Hence, while income and education did not significantly predict age at weaning in this sample, the characteristics of mothers in the sample speak to the importance of socioeconomic status and education in general for breastfeeding success.

Support for breastfeeding at work is important for all mothers to continue breastfeeding after returning to work (Atabay et al., 2015). Though only slightly significant, the negative effect of employment on breastfeeding duration is even seen among long-term breastfeeding women. The implication here is not to discourage

mothers from working. On the contrary, the push needs to be for more supportive work environments and policies that promote breastfeeding, such as longer, paid, maternity leave and breaks, space, and storage for pumping.

Frequently discussing breastfeeding with maternal and paternal grandmothers, friends, and spouses did not significantly predict weaning age in either sample. However, how frequently mothers consulted La Leche League (LLL) significantly predicted a later age at weaning among all and long-term breastfeeding mothers. It may be that mothers who breastfeed longer are reaching out to sources they know will support them in breastfeeding, rather than consulting others who may or may not support them, despite being close or related. This could reflect that advice received by LLL is nearly always in support of continued breastfeeding (hence the protective effect), while advice received from others can be positive or negative. This is supported by qualitative evidence among long-term breastfeeding mothers who frequently reported that they felt pressured to wean after a year by their parents, in-laws, spouses, physicians, and friends. On the other hand, not a single mother reported that they felt pressured to wean by someone affiliated with LLL. As such, the effect of others on a mother's breastfeeding decisions may be significant, but the lack of statistical significance reflects the mixed messages mothers receive from these individuals. Other studies have found that American mothers receive mixed breastfeeding advice from family and friends (Clifford & McIntyre, 2008).

These findings have two primary implications. First, expanding LLL chapters to reach more women in the U.S. could benefit mothers and increase breastfeeding duration rates. Second, public health education efforts need to expand beyond the mother to her spouse, extended family, and the public. Many mothers in the sample reported

encouragement and discouragement from multiple sources, including society at large. Other studies have highlighted the conundrum the modern mother faces: "breast is best" and "good" mothers breastfeed, but keep it private and don't do it too long (Wolf, 2008). Many mothers in the sample commented on the pressure they felt not to nurse in public, receiving negative comments or rude looks from strangers. These mothers reside in a culture that judges them for not breastfeeding, but condemns them for not successfully hiding it or allowing their children to nurse longer than some deem appropriate. The great task for public health is to determine how to create a culture change, a movement that not only promotes the benefits of breastfeeding infants, but normalizes breastfeeding older children and establishes that breastfeeding is not a sexual act that should be conducted in bathrooms, behind closed doors, or under blankets.

Integrating Papers Two and Three: What predicts breastfeeding duration among long-term breastfeeding mothers?

Given the limited number of studies on long-term breastfeeding in the U.S., Papers Two and Three provide some insights into previously unexplored issues long-term breastfeeding mothers face. The effect of social support on breastfeeding duration after 12 months has not been previously explored. Additionally, while some studies (Buckley, 1992; Hills-Bonczyk et al., 1994) have found that many long-term breastfeeding mothers follow a child-led weaning strategy, none have thus far explored how these strategies impact breastfeeding duration. The following sections will attempt to integrate these two papers to better understand the factors that impact long-term breastfeeding in the U.S.

Maternal/Familial Characteristics

Parity significantly predicted a later age at weaning in both analyses of the long-

term breastfeeding sample. More children in the family predicted an earlier age at weaning, whether weaning strategies or support networks were included or not. Qualitative reports from mothers highlight the importance of parity in regards to weaning age for older children. For example, many mothers stated that they decided to wean because they wanted to conceive, had become pregnant, or had given birth to another child and did not want to tandem nurse. Mothers who followed a child-led weaning strategy often chose to continue nursing their older child through pregnancy or the birth of a sibling, but some children chose to stop on their own when the milk supply or taste changed. Some mother-child pairs desired to continue breastfeeding through a pregnancy, but were unable to do so due to lack of supply. These mothers often expressed regret because they felt that their older child was weaned prematurely. Mothers need to be provided with information about breastfeeding during and after a pregnancy, as some mothers may prefer to adjust their family planning decisions in order to achieve their breastfeeding goals.

Current employment was insignificant in the weaning strategies model, but slightly significant (at .07 level) in the support model. However, it is possible that the type of position the mother holds at work is more important in influencing her breastfeeding decisions than merely whether or not she is employed. When controlling for the influence of others on breastfeeding decisions, annual household income was not significant. Greater income predicted an earlier age at weaning when only controlling for weaning strategies and not the influence of others. In this sample, income does not appear to have a linear effect on breastfeeding duration. It may be that mothers feel greater pressure and receive less support when in very high or low paying positions. The sample was

characterized by high incomes with few families making less than $40,000 per year. As such, the typical negative effect of low socioeconomic status on breastfeeding duration was not observed (Thulier & Mercer, 2009). However, the skew toward high incomes reveals a trend not typically seen in the breastfeeding literature: women in high-stakes positions may find it difficult to continue breastfeeding beyond a certain age. As some mothers explicitly stated, early support for breastfeeding from employers waned after 12 months.

Weaning Strategies

The weaning strategy model highlights the importance of external events interrupting the breastfeeding relationship, and that children whose mothers generally adhered to a child-led strategy weaned later than those whose mothers decided when to wean. Child-led weaning was the strategy most frequently reported by mothers who weaned after 12 months. Other researchers have found that mothers who breastfeed long-term often cite their desire to let their children lead the weaning process as a motivator for continued breastfeeding (Hills-Bonczyk et al., 1994). These results also highlight a fact that counters public opinion on long-term breastfeeding: children often desire to continue breastfeeding beyond infancy. Some mothers expressed regret that their children weaned earlier than the mother wanted to continue, but many mothers pointed out that it is not possible to force a child to breastfeed. Mothers often stated that they wanted to follow the child's lead, even when the mother would prefer to be done with breastfeeding. Interestingly, the strength of the child-led strategy effect diminished when all children are included and a shared mother was accounted for. This bolsters the notion that many factors influence breastfeeding duration, some of which may differ from child

to child and family to family.

Support Variables

The support model illustrates the protective effect frequently consulting LLL has on breastfeeding duration beyond one year, as well as the positive impact that open communication about breastfeeding with the maternal grandfather can have on duration. As previously explained, the lack of significant effect that discussing breastfeeding with some individuals has on duration may reflect one or more scenarios. First, it may suggest that mothers who breastfeed long-term do not tend to base their weaning decisions on the opinions or advice of others. Qualitative evidence suggests that this could be the case: some mothers in the sample stated that they ignored those who criticized their breastfeeding decisions. Other studies on long-term breastfeeding mothers have also found that the opinions of others do not necessarily influence a mother's decisions (Rempel, 2004). Alternatively, the lack of significant effect of others on weaning age could reflect the mixed advice a mother receives from these sources. Either way, qualitative reports from mothers reveal that most of these women feel pressured from many individuals to wean at a certain age. Some mothers stated that the criticism they received from others made them feel sad, frustrated, judged, or alone in their effort to do what they perceived to be the right thing for their children.

It may also be the case that individuals who support the mother's choice to breastfeed for a certain duration reinforce her confidence, while some criticism tends not to dissuade mothers from their commitment to reaching their goal. Many mothers reported that they received a good deal of criticism but that they chose to ignore it. On the other hand, frequently consulting La Leche League had a significant positive impact on

duration in every model, indicating that some advice or information does influence breastfeeding duration. In other words, it does not appear that encouragement and criticism are unimportant in shaping the mother's decision on how long to breastfeed; rather, mothers may follow advice selectively. They may choose to follow the advice of those who agree with them or of those who the mothers perceive to be credible sources on breastfeeding. Older, educated mothers may question the authority of physicians (who are often not trained on breastfeeding, (Dermer et al., 2008)), family members, and strangers. In contrast, La Leche League is an organization devoted to disseminating research and education regarding breastfeeding. LLL leaders are successful breastfeeders, who are required to have nursed for a year; they provide a model to emulate as well as a support group (LLLI, 2015).

Policy Implications

One implication of the weaning strategies model is that the American public and medical providers need to be educated about long-term breastfeeding. Many mothers stated that others criticized them for breastfeeding long-term because they believed it was against the wishes or best interest of their children. Similar statements have been made by physicians, even in publications (for an example, see Stalker, 2004). This study challenges that notion by demonstrating that children who are allowed to decide when to wean choose to wean later than those whose mothers made this decision. In fact, many mothers expressed frustration that their child was not yet ready, and mothers said that they felt "touched out," tired, and wanted their bodies back.

If public health recommendations are for mothers to breastfeed to one or two years and beyond, even in industrialized countries, there needs to be a significant culture

change to normalize long-term breastfeeding. Healthcare providers and the general public need to be educated on the continued benefits of breastfeeding beyond infancy. In addition, the fact that many children prefer to breastfeed well into toddlerhood must be disseminated and accepted publicly. Maternal accounts of receiving criticism about their choice to breastfeed long-term abound in this study, but they can also be seen on any online forum or news story about the latest "strange" mother who breastfeeds her three, four, or five-year-old (see (Donaldson James, 2015)). Clearly there is a disconnect between the reality - that children often need and want to continue breastfeeding as toddlers or preschoolers - and the cultural notion that this is somehow abnormal or characteristic of sexual abuse on the part of the mother (Dettwyler, 2004). Studies in other cultures and evolutionary analyses of human development indicate that the "natural" age for weaning is somewhere between two and a half and seven years of age (Dettwyler, 2004). While this has been known for some time in academic circles, it has yet to sway public opinion. Until it does, it seems likely that children in the U.S. will continue to be weaned prematurely.

An additional implication of the weaning strategies model is highlighted by the finding that the weaning process is largely shaped by unique circumstances. When including all children and accounting for the shared mother, the statistical difference between mother-led and child-led strategies disappeared. This reinforces what other researchers have noted - that breastfeeding is a dyadic relationship (Stearns, 2011). The desires and needs of the mother, child, and external circumstances combine to influence how long breastfeeding will continue, even when the mother hopes to allow the child to decide. As such, the flip side of educating the public about the normalcy of long-term

breastfeeding is to educate breastfeeding mothers and their supporters about the unique nature of the weaning process. Some children will nurse until age four if allowed, while others will choose to wean at just over a year old. Either way, extolling the virtues of long-term breastfeeding should be done without criticizing mothers who do not breastfeed for a certain duration. Even when fully allowing the child to decide, some mother/child dyads will not breastfeed for two years.

Finally, even mothers who successfully breastfeed beyond a year benefit from receiving information and support from others, particularly La Leche League. As previously stated, increasing women's access to LLL groups and leaders may help raise breastfeeding duration rates to meet national and international recommendations.

Theoretical Implications

Maternal Investment and Child-led Weaning

The qualitative statements made by mothers in this sample and studies among other long-term breastfeeding mothers indicate that many of these mothers are motivated to allow their children to lead the weaning process (Kendall-Tackett & Sugarman, 1995). This is often part of a broader approach to parenting, such as attachment parenting, which promotes bed-sharing, long-term and on-demand breastfeeding, baby-wearing (in slings, for example), and sensitive care-giving (Faircloth, 2010). Some mothers in the sample mentioned that they felt their approach to child-led weaning was more natural and was the healthy thing to do for their children. One could argue that these mothers are following a very high quality investment strategy. Some mothers explicitly stated that they chose to continue breastfeeding their older children despite maternal exhaustion, depletion, and desire to wean. As Trivers (1974) noted, parental resources may diminish

over time when providing substantial parental investment. As children age and the interests of child and parent diverge, the child needs to be more proactive in demanding parental investment (Trivers, 1974). Some long-term breastfeeding mothers in the sample stated that they wished to wean, but that their children still desired to breastfeed. One result of continuing despite maternal desire to wean could be reduced outward conflict between the mother and child. Some of these mothers mentioned that child-led weaning was easy for their child and benefited their relationship. In contrast, some mothers who led the weaning process described conflict and difficulty in denying a child the breast. In sum, it could be argued that many long-term breastfeeding mothers in the U.S. tend to follow a high investment strategy in which they desire to mitigate parent-offspring conflict in favor of the child—suggesting, following Trivers, that fertility will be reduced or maternal depletion may result (Trivers, 1974).

Social Support and Breastfeeding

The significant impact of frequently consulting La Leche League regarding breastfeeding during infancy highlights what other scholars have noted: social support and training in technique are both essential to human mothers successfully learning how to breastfeed (Volk, 2009). While mothers in the sample received a considerable amount of emotional, financial, and childcare support from others, particularly the father and maternal grandmother, this support did not impact breastfeeding duration. Mothers living in a strongly neolocal society may rely on broad support from others to raise children but help from others who can provide support specific to the techniques and social aspects of breastfeeding seems to be most important in determining breastfeeding duration. As stated previously, the goal of LLL is to provide such support, whereas support for and

knowledge of breastfeeding may be mixed among relatives, friends, colleagues, and others, and hence shows neither a strong positive nor negative influence on breastfeeding. As demonstrated in this sample, mothers received a great deal of emotional support from their close relatives, but these same individuals most frequently encouraged mothers to wean at a certain age. Ultimately, the importance of LLL, and for some mothers, the maternal grandfather, provides some support for the theory that humans are cooperative breeders at least in regards to successful breastfeeding.

Conclusion

Public health organizations around the world recommend that mothers breastfeed for one to two years and beyond, as long as the child and mother both desire to continue (AAP, CDC, WHO). Evolutionary studies estimate that the "natural" age for weaning in humans is anywhere from two and a half to seven years of age (Dettwyler, 2004), and cross-cultural studies in small-scale societies tend to find that weaning age is typically two to four years of age (Fouts & Lamb, 2004; Hill & Hurtado, 1996; Hirasawa, 2004; Konner, 1977; Sellen, 2001b; Yovsi, 2003). Indeed, some studies have found that children continue to benefit from receiving breast milk beyond one year, and that a dose-response effect has been documented for many of the positive effects of breastfeeding on child health (Mortensen, 2013). Despite the acceptance of these benefits in academic circles, much of the American public continues to hold the view that breastfeeding beyond a certain age is useless or even potentially damaging. This is just one of the many challenges mothers in the U.S. face when deciding how long they should breastfeed.

This project aimed to quantitatively and qualitatively assess what factors influence weaning age in a sample of 594 American mothers, including maternal and

child characteristics, weaning strategies, and the support of kin and non-kin. These mothers resided in 47 different states and breastfed for an average of 18 months. Over half of the women in the sample breastfed at least one child to 12 months or beyond. As such, this sample was well suited to examine the effect of various factors on long-term breastfeeding. In addition, looking at the factors that impact long-term breastfeeding gives us a unique insight into how to improve breastfeeding duration among all mothers.

This mixed methods study provides several insights into the factors that influence breastfeeding duration among all mothers and long-term breastfeeding mothers. First, results indicate that mothers in the U.S. receive significant help from others, particularly spouses and maternal grandmothers. Frequently speaking with LLL and maternal grandfathers had a positive effect on any breastfeeding duration, while speaking with doctors and coworkers had a negative effect on duration among mothers in the full sample. The mother having been breastfed as an infant had a positive effect on duration, but this effect was not found among mothers who breastfed beyond one year. Greater parity and in some cases higher income had a negative effect on breastfeeding duration. Qualitative reports indicate that mothers who breastfeed long-term often strive to allow their children to guide the weaning process, which is associated with longer durations of breastfeeding. Additionally, mothers receive significant criticism from others to wean after one year, particularly from family, friends, and society. Finally, mothers perceive more disapproval as their children age, with nearly all mothers feeling that social disapproval is a disadvantage of breastfeeding beyond three years.

The results of the present study indicate a need to explore the effects of higher incomes and education levels on breastfeeding duration, and how the timing of a

mother's return to work affects her ability to continue breastfeeding. The results presented here also demonstrate the relevance of maternal reproductive decision-making in industrial societies to human behavioral ecology and evolutionary theory. While mothers in societies like the U.S. tend not to reside in close-knit kin groups, this study suggests that raising children in such a culture still requires the help of alloparents. The question is not whether cooperative breeding still applies to post-industrial families, but rather, who provides support. Mothers still receive significant help from their spouses, parents, and in-laws, though they also receive help from non-relatives. Future studies could explore who these non-kin helpers are in more depth; it may be that daycare, baby-sitters, and co-ops provide significant care that allow mothers to continue high investment strategies with few kin helpers near them.

While mothers are often the focus of public health education efforts, this study exemplifies the need to educate the public and individuals in mothers' social networks. Even physicians could benefit from being educated on the benefits of long-term breastfeeding and maternal motivations for doing so. Mothers who have support from other breastfeeding mothers, such as through La Leche League, breastfeed longer. Increasing mothers' access to support groups may improve breastfeeding duration, particularly among mothers who receive little support from those in their immediate social networks. Ultimately, a cultural paradigm shift is desperately needed to see breastfeeding duration rates reach public health goals. While breastfeeding is widely regarded as best for an infant, mothers in the U.S. perceive significant pressure not to nurse in public and to wean before their child is "too old." Wide cultural acceptance of the weaning process as something between mother and child may give mothers the

confidence they need and bolster their commitment to overcoming significant physical and institutional barriers to breastfeeding.

APPENDIX: Survey

"Extended Breastfeeding"

Informed Consent:

Purpose of study: The purpose of this study is to find out how mothers experience extended breastfeeding (defined here as 12 months or longer), including how they decide to continue breastfeeding and who supports them.

Participation: Participation in this study is entirely voluntary. Any participant who wishes to withdraw their information from the study may do so at any time. Participants do not have to answer any question they do not want to answer.

Activities: Participants will be asked some personal information questions and some closed and open-ended questions about their experiences with extended breastfeeding.

Confidentiality: Participants' names will not be recorded in the data. Any personal information provided in this interview will be held in strict confidentiality.

Potential risks: Risks expected from this study do not exceed what participants would be exposed to during a typical conversation.

Potential benefits: Benefits of this study include a better understanding of how mothers decide to continue breastfeeding at 12 months and beyond. This could potentially extend to a better understanding of how public policy can be amended to support these mothers.

Who can participate: Any woman who is at least 18 years old, who has or is currently breastfeeding one or more children at or after age of 12 months, and is willing to participate.

Time commitment: This survey will take approximately 30 minutes.

If you have questions or concerns regarding this study, please contact one or more of the following:

Jayme Cisco, PhD Student, Department of Anthropology, University of Missouri-Columbia, Jnctf7@mail.missouri.edu

Principle Investigator/Advisor: Dr. Mary Shenk, Associate Professor, Department of Anthropology, University of Missouri-Columbia, shenkm@missouri.edu

UMC IRB: 483 McReynolds 573-882-9585 www.research.missouri.edu

Q2 I have read, understood, and printed a copy of, the above consent form and desire of my own free will to participate in this study.

- ❍ Yes
- ❍ No

If No Is Selected, Then Skip To End of Survey

Q1 Were you breastfed?
❍ Yes
❍ No
❍ Unsure

Answer If Were you breastfed? Yes Is Selected
Q2 How long were you breastfed (in months)?_____

Q3 If you have siblings, do you ever remember seeing your mother breastfeed?
❍ Yes
❍ No

Q4 How many siblings do you have?

Q5_A How many sisters and/or brothers do you have? Sisters

Q5_B Brothers

Q6 Do you remember ever seeing anyone besides your mother breastfeed?
❍ Yes
❍ No

Q6_A If yes, who?

Instructions: Please answer the following questions in regards to the first child you breastfed. You do not need to respond to items that are not applicable to you, and you may add unique information in the "other" sections provided.
Q7 What was your marital status at the time of your child's birth?
❍ Single
❍ Married
❍ Divorced/Separated
❍ Widowed
❍ Remarried

Q8 What was your age at your child's birth?

Q9 What was the age of the baby's father (or your partner) at your first child's birth?

Q10 What was your mother's age at the time of your birth?

Q11 Which of the following were living at the time of your child's birth?
Your mother
Your father
Your mother-in-law
Your father-in-law

Q12 Where did you live at the time of your child's birth (city, state, country)?_____

Q13 Where did the following relatives live at the time of your child's birth?

	Same house	Same city	Under 1 hour drive	1-2 hour drive	2-5 hour drive	6-12 hour drive	12+ hour drive	Different country
Your mother	❍	❍	❍	❍	❍	❍	❍	❍
Your father	❍	❍	❍	❍	❍	❍	❍	❍
Your mother-in-law	❍	❍	❍	❍	❍	❍	❍	❍
Your father-in-law	❍	❍	❍	❍	❍	❍	❍	❍
Your sister(s)	❍	❍	❍	❍	❍	❍	❍	❍
Your sister(s)-in-law	❍	❍	❍	❍	❍	❍	❍	❍
Other:	❍	❍	❍	❍	❍	❍	❍	❍

Q14 How often did you consult the following people and sources about breastfeeding while you were pregnant with your child?

	Never	Seldom (a few times)	Occasionally (monthly)	Frequently (weekly)	All the time (more than once/week)
Your spouse	❍	❍	❍	❍	❍
Your mother	❍	❍	❍	❍	❍
Your father	❍	❍	❍	❍	❍
Your mother-in-law	❍	❍	❍	❍	❍
Your father-in-law	❍	❍	❍	❍	❍
Your sister(s)	❍	❍	❍	❍	❍
Your friends	❍	❍	❍	❍	❍
Your brother(s)	❍	❍	❍	❍	❍

Your brother(s)-in-law	❍	❍	❍	❍	❍
Other relatives	❍	❍	❍	❍	❍
Doctors/nurses	❍	❍	❍	❍	❍
Lactation consultants	❍	❍	❍	❍	❍
Employer	❍	❍	❍	❍	❍
Professional colleagues	❍	❍	❍	❍	❍
La Leche League	❍	❍	❍	❍	❍
Books	❍	❍	❍	❍	❍
Online blogs/forums	❍	❍	❍	❍	❍
Other: Other: text	❍	❍	❍	❍	❍
	❍	❍	❍	❍	❍

Q15 How often did you consult the following people and sources about breastfeeding during your child's infancy?

	Never	Seldom (a few times)	Occasionally (monthly)	Frequently (weekly)	All the time (more than once/week)
Your spouse	❍	❍	❍	❍	❍
Your mother	❍	❍	❍	❍	❍
Your father	❍	❍	❍	❍	❍
Your mother-in-law	❍	❍	❍	❍	❍
Your father-in-law	❍	❍	❍	❍	❍
Your sister(s)	❍	❍	❍	❍	❍
Your sister(s)-in-law	❍	❍	❍	❍	❍
Your brother(s)	❍	❍	❍	❍	❍
Your brother(s)-in-law	❍	❍	❍	❍	❍
Other relatives	❍	❍	❍	❍	❍
Your friends	❍	❍	❍	❍	❍

Doctors/nurses	❍	❍	❍	❍	❍
Lactation consultants	❍	❍	❍	❍	❍
Employer	❍	❍	❍	❍	❍
Professional colleagues	❍	❍	❍	❍	❍
La Leche League	❍	❍	❍	❍	❍
Books	❍	❍	❍	❍	❍
Online blogs/forums	❍	❍	❍	❍	❍
Other:	❍	❍	❍	❍	❍

Q16 How close would you say you were (emotionally) with the following people at the time of your child's birth?

	No relationship	Emotionally distant	Friendly acquaintance	Somewhat close	Very close
Your spouse	❍	❍	❍	❍	❍
Your mother	❍	❍	❍	❍	❍
Your father	❍	❍	❍	❍	❍
Your mother-in-law	❍	❍	❍	❍	❍
Your father-in-law	❍	❍	❍	❍	❍
Your sister(s)	❍	❍	❍	❍	❍
Your sister(s)-in-law	❍	❍	❍	❍	❍
Your brother(s)	❍	❍	❍	❍	❍
Your brother(s)-in-law	❍	❍	❍	❍	❍
Other relatives	❍	❍	❍	❍	❍
Your friends	❍	❍	❍	❍	❍
Healthcare provider(s)	❍	❍	❍	❍	❍
Employer	❍	❍	❍	❍	❍
Professional colleagues	❍	❍	❍	❍	❍

Other:	❍	❍	❍	❍	❍

Q17 Please indicate if any of the following individuals currently provide support and what type:

	Emotional support for you	Emotional support directly to your child(ren)	Information regarding child rearing	Financial support for you	Financial support directly for your child(ren)	Occasional childcare (less than once per month)	Frequent childcare (Monthly)	Regular childcare (Daily or several times per week)
Your spouse	❑	❑	❑	❑	❑	❑	❑	❑
Your mother	❑	❑	❑	❑	❑	❑	❑	❑
Your father	❑	❑	❑	❑	❑	❑	❑	❑
Your mother-in-law	❑	❑	❑	❑	❑	❑	❑	❑
Your father-in-law	❑	❑	❑	❑	❑	❑	❑	❑
Your sister(s)	❑	❑	❑	❑	❑	❑	❑	❑
Your sister(s)-in-law	❑	❑	❑	❑	❑	❑	❑	❑
Your brother(s)	❑	❑	❑	❑	❑	❑	❑	❑
Your brother(s)-in-law	❑	❑	❑	❑	❑	❑	❑	❑
Other relatives	❑	❑	❑	❑	❑	❑	❑	❑
Your friends	❑	❑	❑	❑	❑	❑	❑	❑
La	❑	❑	❑	❑	❑	❑	❑	❑

Leche League Other:	❑	❑	❑	❑	❑	❑	❑	❑

Instructions: Please answer the following questions about feeding your child or children (including any that were not breastfed).
Q18 How many children do you have?

Q19 Are you currently breastfeeding?
❍ Yes
❍ No

Answer If Are you currently breastfeeding? Yes Is Selected
Q20 If you are currently breastfeeding, do you know how long you plan to breastfeed this child? (in months)

Q21 What is the longest you breastfed any of your child(ren)? (In months, including any still nursing)
Months:

Q22 Was your first child breastfed?
❍ Yes
❍ No

Answer If Was your first child breastfed? No Is Selected
Q23 Please answer the following questions regarding feeding your first child:
Child's current age:
Gender:
Age of introduction of foods other than formula:
Age child first slept through the night:
Child's age at which your menstrual cycle resumed:
For what reasons did you not breastfeed this child?

Answer If Was your first child breastfed? Yes Is Selected
Q24 Please answer the following questions regarding breastfeeding your first child:
Child's current age:
Gender:
Age at weaning:
Age of introduction of foods other than breast milk:
Age child first slept through the night:
Age of night weaning:
Child's age at which your menstrual cycle resumed:
Did you have any problems with breastfeeding this child?
If so, did you seek help and from whom?

Answer If Was your first child breastfed? Yes Is Selected

Q17 What was your style of breastfeeding your first child at each of the following ages?

	On-demand	Scheduled	"Don't offer, don't refuse"	None (weaned from the breast)
First week	❍	❍	❍	❍
2-4 weeks	❍	❍	❍	❍
2 months	❍	❍	❍	❍
3 months	❍	❍	❍	❍
4-6 months	❍	❍	❍	❍
7-9 months	❍	❍	❍	❍
10-12 months	❍	❍	❍	❍
13-18 months	❍	❍	❍	❍
19-24 months	❍	❍	❍	❍
25-30 months	❍	❍	❍	❍
31-36 months	❍	❍	❍	❍
Beyond 36 months	❍	❍	❍	❍

Answer If How many children do you have? Text Response Is Greater Than or Equal to: 2

Q26 Was your second child breastfed?

❍ Yes

❍ No

Answer If Was your second child breastfed? No Is Selected

Q27 Please answer the following questions regarding feeding your second child:

Child's current age:

Gender:

Age of introduction of foods other than formula:

Age child first slept through the night:

Child's age at which your menstrual cycle resumed:

For what reasons did you not breastfeed this child?

Answer If Was your second child breastfed? Yes Is Selected

Q28 Please answer the following questions about breastfeeding your second child:

Child's current age:

Gender:

Age at weaning:

Age of introduction of foods other than breast milk:

Age child first slept through the night: (5)

Age of night weaning: (6)

Child's age at which your menstrual cycle resumed:

Did you have any problems with breastfeeding this child?

If so, did you seek help and from whom?

Answer If Was your second child breastfed? Yes Is Selected
Q28 What was your style of breastfeeding your second child at each of the following ages?

	On-demand	Scheduled	"Don't offer, don't refuse"	None (weaned from the breast)
First week	❍	❍	❍	❍
2-4 weeks	❍	❍	❍	❍
2 months	❍	❍	❍	❍
3 months	❍	❍	❍	❍
4-6 months	❍	❍	❍	❍
7-9 months	❍	❍	❍	❍
10-12 months	❍	❍	❍	❍
13-18 months	❍	❍	❍	❍
19-24 months	❍	❍	❍	❍
25-30 months	❍	❍	❍	❍
31-36 months	❍	❍	❍	❍
Beyond 36 months	❍	❍	❍	❍

Answer If How many children do you have? Text Response Is Greater Than or Equal to: 3
Q29 Was your third child breastfed?
❍ Yes
❍ No

Answer If Was your third child breastfed? No Is Selected
Q30 Please answer the following questions regarding feeding your third child:
Child's current age:
Gender:
Age of introduction of foods other than formula:
Age child first slept through the night:
Child's age at which your menstrual cycle resumed:
For what reasons did you not breastfeed this child?

Answer If Was your third child breastfed? Yes Is Selected
Q31 Please answer the following questions about breastfeeding your third child:
Child's current age:
Gender:
Age at weaning:
Age of introduction of foods other than breast milk:
Age child first slept through the night:
Age of night weaning:

Child's age at which your menstrual cycle resumed:
Did you have any problems with breastfeeding this child?
If so, did you seek help and from whom?

Answer If Was your third child breastfed? Yes Is Selected
Q32 What was your style of breastfeeding your third child at each of the following ages?

	On-demand	Scheduled	"Don't offer, don't refuse"	None (weaned from the breast)
First week	❍	❍	❍	❍
2-4 weeks	❍	❍	❍	❍
2 months	❍	❍	❍	❍
3 months	❍	❍	❍	❍
4-6 months	❍	❍	❍	❍
7-9 months	❍	❍	❍	❍
10-12 months	❍	❍	❍	❍
13-18 months	❍	❍	❍	❍
19-24 months	❍	❍	❍	❍
25-30 months	❍	❍	❍	❍
31-36 months	❍	❍	❍	❍
Beyond 36 months	❍	❍	❍	❍

Answer If How many children do you have? Text Response Is Greater Than or Equal to: 4
Q33 Was your fourth child breastfed?
❍ Yes
❍ No

Answer If Was your fifth child breastfed? No Is Selected
Q34 Please answer the following questions regarding feeding your fourth child:
Child's current age:
Gender:
Age of introduction of foods other than formula:
Age child first slept through the night:
Child's age at which your menstrual cycle resumed:
For what reasons did you not breastfeed this child?

Answer If Was your fifth child breastfed? Yes Is Selected
Q35 Please answer the following questions about breastfeeding your fourth child:
Child's current age:
Gender:
Age at weaning:
Age of introduction of foods other than breast milk:

Age child first slept through the night:
Age of night weaning:
Child's age at which your menstrual cycle resumed:
Did you have any problems with breastfeeding this child?
If so, did you seek help and from whom?

Answer If Was your fifth child breastfed? Yes Is Selected
Q36 What was your style of breastfeeding your fourth child at each of the following ages?

	On-demand	Scheduled	"Don't offer, don't refuse"	None (weaned from the breast)
First week	❍	❍	❍	❍
2-4 weeks	❍	❍	❍	❍
2 months	❍	❍	❍	❍
3 months	❍	❍	❍	❍
4-6 months	❍	❍	❍	❍
7-9 months	❍	❍	❍	❍
10-12 months	❍	❍	❍	❍
13-18 months	❍	❍	❍	❍
19-24 months	❍	❍	❍	❍
25-30 months	❍	❍	❍	❍
31-36 months	❍	❍	❍	❍
Beyond 36 months	❍	❍	❍	❍

Answer If How many children do you have? Text Response Is Greater Than or Equal to: 5
Q37 Was your fifth child breastfed?
❍ Yes
❍ No

Answer If Was your sixth child breastfed? No Is Selected
Q38 Please answer the following questions regarding feeding your fifth child:
Child's current age:
Gender:
Age of introduction of foods other than formula:
Age child first slept through the night:
Child's age at which your menstrual cycle resumed:
For what reasons did you not breastfeed this child?

Answer If Was your sixth child breastfed? Yes Is Selected
Q39 Please answer the following questions about breastfeeding your fifth child:
Child's current age:

Gender:
Age at weaning:
Age of introduction of foods other than breast milk:
Age child first slept through the night:
Age of night weaning:
Child's age at which your menstrual cycle resumed:
Did you have any problems with breastfeeding this child?
If so, did you seek help and from whom?

Answer If Was your sixth child breastfed? Yes Is Selected
Q40 What was your style of breastfeeding your fifth child at each of the following ages?

	On-demand	Scheduled	"Don't offer, don't refuse"	None (weaned from the breast)
First week	❍	❍	❍	❍
2-4 weeks	❍	❍	❍	❍
2 months	❍	❍	❍	❍
3 months	❍	❍	❍	❍
4-6 months	❍	❍	❍	❍
7-9 months	❍	❍	❍	❍
10-12 months	❍	❍	❍	❍
13-18 months	❍	❍	❍	❍
19-24 months	❍	❍	❍	❍
25-30 months	❍	❍	❍	❍
31-36 months	❍	❍	❍	❍
Beyond 36 months	❍	❍	❍	❍

Answer If How many children do you have? Text Response Is Greater Than or Equal to: 6
Q41 Was your sixth child breastfed?
❍ Yes
❍ No

Answer If Was your sixth child breastfed? No Is Selected
Q42 Please answer the following questions regarding feeding your sixth child:
Child's current age:
Gender:
Age of introduction of foods other than formula:
Age child first slept through the night:
Child's age at which your menstrual cycle resumed:
For what reasons did you not breastfeed this child?

Answer If Was your sixth child breastfed? Yes Is Selected

Q43 Please answer the following questions about breastfeeding your sixth child:
Child's current age:
Gender:
Age at weaning:
Age of introduction of foods other than breast milk:
Age child first slept through the night:
Age of night weaning:
Child's age at which your menstrual cycle resumed:
Did you have any problems with breastfeeding this child?
If so, did you seek help and from whom?

Answer If Was your sixth child breastfed? Yes Is Selected
Q44 What was your style of breastfeeding your sixth child at each of the following ages?

	On-demand	Scheduled	"Don't offer, don't refuse"	None (weaned from the breast)
First week	❍	❍	❍	❍
2-4 weeks	❍	❍	❍	❍
2 months	❍	❍	❍	❍
3 months	❍	❍	❍	❍
4-6 months	❍	❍	❍	❍
7-9 months	❍	❍	❍	❍
10-12 months	❍	❍	❍	❍
13-18 months	❍	❍	❍	❍
19-24 months	❍	❍	❍	❍
25-30 months	❍	❍	❍	❍
31-36 months	❍	❍	❍	❍
Beyond 36 months	❍	❍	❍	❍

Answer If How many children do you have? Text Response Is Greater Than or Equal to: 7
Q45 Was your seventh child breastfed?
❍ Yes
❍ No

Answer If Was your eighth child breastfed? No Is Selected
Q46 Please answer the following questions regarding feeding your seventh child:
Child's current age:
Gender:
Age of introduction of foods other than formula:
Age child first slept through the night:
Child's age at which your menstrual cycle resumed:
For what reasons did you not breastfeed this child?

Answer If Was your eighth child breastfed? Yes Is Selected
Q47 Please answer the following questions about breastfeeding your seventh child:
Child's current age:
Gender:
Age at weaning:
Age of introduction of foods other than breast milk:
Age child first slept through the night:
Age of night weaning:
Child's age at which your menstrual cycle resumed:
Did you have any problems with breastfeeding this child?
If so, did you seek help and from whom?

Answer If Was your eighth child breastfed? Yes Is Selected
Q48 What was your style of breastfeeding your seventh child at each of the following ages?

	On-demand	Scheduled	"Don't offer, don't refuse"	None (weaned from the breast)
First week	❍	❍	❍	❍
2-4 weeks	❍	❍	❍	❍
2 months	❍	❍	❍	❍
3 months	❍	❍	❍	❍
4-6 months	❍	❍	❍	❍
7-9 months	❍	❍	❍	❍
10-12 months	❍	❍	❍	❍
13-18 months	❍	❍	❍	❍
19-24 months	❍	❍	❍	❍
25-30 months	❍	❍	❍	❍
31-36 months	❍	❍	❍	❍
Beyond 36 months	❍	❍	❍	❍

Answer If How many children do you have? Text Response Is Greater Than or Equal to: 8
Q49 Was your eighth child breastfed?
❍ Yes
❍ No

Answer If Was your eighth child breastfed? No Is Selected
Q50 Please answer the following questions regarding feeding your eighth child:
Child's current age:
Gender:
Age of introduction of foods other than formula:

Age child first slept through the night:
Child's age at which your menstrual cycle resumed:
For what reasons did you not breastfeed this child?

Answer If Was your eighth child breastfed? Yes Is Selected
Q51 Please answer the following questions about breastfeeding your eighth child:
Child's current age:
Gender:
Age at weaning:
Age of introduction of foods other than breast milk:
Age child first slept through the night:
Age of night weaning:
Child's age at which your menstrual cycle resumed:
Did you have any problems with breastfeeding this child?
If so, did you seek help and from whom?

Answer If Was your eighth child breastfed? Yes Is Selected
Q52 What was your style of breastfeeding your eighth child at each of the following ages? (If you used more than one style, indicate the style you used most commonly.)

	On-demand	Scheduled	"Don't offer, don't refuse"	None (weaned from the breast)
First week	❍	❍	❍	❍
2-4 weeks	❍	❍	❍	❍
2 months	❍	❍	❍	❍
3 months	❍	❍	❍	❍
4-6 months	❍	❍	❍	❍
7-9 months	❍	❍	❍	❍
10-12 months	❍	❍	❍	❍
13-18 months	❍	❍	❍	❍
19-24 months	❍	❍	❍	❍
25-30 months	❍	❍	❍	❍
31-36 months	❍	❍	❍	❍
Beyond 36 months	❍	❍	❍	❍

Answer If What is the longest you breastfed your child(ren)? (In months, including any still nursing) Months: Is Greater Than or Equal to: 1
Q53 How encouraging or discouraging were the following individuals of your decision to breastfeed any of your child(ren) from 0-6 months of age?

	Very discouraging	Somewhat discouraging	Neutral	Somewhat encouraging	Very encouraging
Your spouse	❍	❍	❍	❍	❍

Your mother	❍	❍	❍	❍	❍
Your father	❍	❍	❍	❍	❍
Your mother-in-law	❍	❍	❍	❍	❍
Your father-in-law	❍	❍	❍	❍	❍
Your sister(s)	❍	❍	❍	❍	❍
Your sister(s)-in-law	❍	❍	❍	❍	❍
Your brother(s)	❍	❍	❍	❍	❍
Your brother(s)-in-law	❍	❍	❍	❍	❍
Other relatives	❍	❍	❍	❍	❍
Your friends	❍	❍	❍	❍	❍
Doctors/nurses	❍	❍	❍	❍	❍
Lactation consultant	❍	❍	❍	❍	❍
Employer	❍	❍	❍	❍	❍
Professional colleagues	❍	❍	❍	❍	❍
La Leche League	❍	❍	❍	❍	❍
Strangers	❍	❍	❍	❍	❍
Other:	❍	❍	❍	❍	❍

Answer If What is the longest you breastfed your child(ren)? (In months, including any still nursing) Months: Is Greater Than or Equal to: 7

Q54 How encouraging or discouraging were the following individuals of your decision to breastfeed any of your child(ren) from 7-12 months of age?

	Very discouraging	Somewhat discouraging	Neutral	Somewhat encouraging	Very encouraging
Your spouse	❍	❍	❍	❍	❍
Your mother	❍	❍	❍	❍	❍
Your father	❍	❍	❍	❍	❍
Your mother-in-law	❍	❍	❍	❍	❍
Your father-in-law	❍	❍	❍	❍	❍
Your sister(s)	❍	❍	❍	❍	❍

Your sister(s)-in-law	❍	❍	❍	❍	❍
Your brother(s)	❍	❍	❍	❍	❍
Your brother(s)-in-law	❍	❍	❍	❍	❍
Other relatives	❍	❍	❍	❍	❍
Your friends	❍	❍	❍	❍	❍
Doctors/nurses	❍	❍	❍	❍	❍
Lactation consultants	❍	❍	❍	❍	❍
Employer	❍	❍	❍	❍	❍
Professional colleagues	❍	❍	❍	❍	❍
La Leche League	❍	❍	❍	❍	❍
Strangers	❍	❍	❍	❍	❍
Other:	❍	❍	❍	❍	❍

Answer If What is the longest you breastfed your child(ren)? (In months, including any still nursing) Months: Is Greater Than or Equal to: 13

Q55 How encouraging or discouraging were the following individuals of your decision to breastfeed any of your child(ren) from 13-18 months of age?

	Very discouraging	Somewhat discouraging	Neutral	Somewhat encouraging	Very encouraging
Your spouse	❍	❍	❍	❍	❍
Your mother	❍	❍	❍	❍	❍
Your father	❍	❍	❍	❍	❍
Your mother-in-law	❍	❍	❍	❍	❍
Your father-in-law	❍	❍	❍	❍	❍
Your sister(s)	❍	❍	❍	❍	❍
Your sister(s)-in-law	❍	❍	❍	❍	❍
Your brother(s)	❍	❍	❍	❍	❍
Your brother(s)-in-law	❍	❍	❍	❍	❍

Other relatives	❍	❍	❍	❍	❍
Your friends	❍	❍	❍	❍	❍
Doctors/nurses	❍	❍	❍	❍	❍
Lactation consultants	❍	❍	❍	❍	❍
Employer	❍	❍	❍	❍	❍
Professional colleagues	❍	❍	❍	❍	❍
La Leche League	❍	❍	❍	❍	❍
Strangers	❍	❍	❍	❍	❍
Other:	❍	❍	❍	❍	❍

Answer If What is the longest you breastfed your child(ren)? (In months, including any still nursing) Months: Is Greater Than or Equal to: 19

Q56 How encouraging or discouraging were the following individuals of your decision to breastfeed any of your child(ren) from 19-24 months of age?

	Very discouraging	Somewhat discouraging	Neutral	Somewhat encouraging	Very encouraging
Your spouse	❍	❍	❍	❍	❍
Your mother	❍	❍	❍	❍	❍
Your father	❍	❍	❍	❍	❍
Your mother-in-law	❍	❍	❍	❍	❍
Your father-in-law	❍	❍	❍	❍	❍
Your sister(s)	❍	❍	❍	❍	❍
Your sister(s)-in-law	❍	❍	❍	❍	❍
Your brother(s)	❍	❍	❍	❍	❍
Your brother(s)-in-law	❍	❍	❍	❍	❍
Other relatives	❍	❍	❍	❍	❍
Your friends	❍	❍	❍	❍	❍
Doctors/nurses	❍	❍	❍	❍	❍
Lactation consultants	❍	❍	❍	❍	❍
Employer	❍	❍	❍	❍	❍
Professional	❍	❍	❍	❍	❍

colleagues					
La Leche League	❍	❍	❍	❍	❍
Strangers	❍	❍	❍	❍	❍
Other:	❍	❍	❍	❍	❍

Answer If What is the longest you breastfed your child(ren)? (In months, including any still nursing) Months: Is Greater Than or Equal to: 25

Q57 How encouraging or discouraging were the following individuals of your decision to breastfeed your child(ren) from 25-30 months of age?

	Very discouraging	Somewhat discouraging	Neutral	Somewhat encouraging	Very encouraging
Your spouse	❍	❍	❍	❍	❍
Your mother	❍	❍	❍	❍	❍
Your father	❍	❍	❍	❍	❍
Your mother-in-law	❍	❍	❍	❍	❍
Your father-in-law	❍	❍	❍	❍	❍
Your sister(s)	❍	❍	❍	❍	❍
Your sister(s)-in-law	❍	❍	❍	❍	❍
Your brother(s)	❍	❍	❍	❍	❍
Your brother(s)-in-law	❍	❍	❍	❍	❍
Other relatives	❍	❍	❍	❍	❍
Your friends	❍	❍	❍	❍	❍
Doctors/nurses	❍	❍	❍	❍	❍
Lactation consultants	❍	❍	❍	❍	❍
Employer	❍	❍	❍	❍	❍
Professional colleagues	❍	❍	❍	❍	❍
La Leche League	❍	❍	❍	❍	❍
Strangers	❍	❍	❍	❍	❍
Other:	❍	❍	❍	❍	❍

Answer If What is the longest you breastfed your child(ren)? (In months, including any still nursing) Months: Is Greater Than or Equal to: 31

Q58 How encouraging or discouraging were the following individuals of your decision to breastfeed your child(ren) from 31-36 months of age?

	Very discouraging	Somewhat discouraging	Neutral	Somewhat encouraging	Very encouraging
Your spouse	❍	❍	❍	❍	❍
Your mother	❍	❍	❍	❍	❍
Your father	❍	❍	❍	❍	❍
Your mother-in-law	❍	❍	❍	❍	❍
Your father-in-law	❍	❍	❍	❍	❍
Your sister(s)	❍	❍	❍	❍	❍
Your sister(s)-in-law	❍	❍	❍	❍	❍
Your brother(s)	❍	❍	❍	❍	❍
Your brother(s)-in-law	❍	❍	❍	❍	❍
Other relatives	❍	❍	❍	❍	❍
Your friends	❍	❍	❍	❍	❍
Doctors/nurses	❍	❍	❍	❍	❍
Lactation consultants	❍	❍	❍	❍	❍
Employer	❍	❍	❍	❍	❍
Professional colleagues	❍	❍	❍	❍	❍
La Leche League	❍	❍	❍	❍	❍
Strangers	❍	❍	❍	❍	❍
Other:	❍	❍	❍	❍	❍

Answer If What is the longest you breastfed your child(ren)? (In months, including any still nursing) Months: Is Greater Than or Equal to: 36

Q59 How encouraging or discouraging were the following individuals of your decision to breastfeed your child(ren) from beyond 36 months of age?

	Very discouraging	Somewhat discouraging	Neutral	Somewhat encouraging	Very encouraging

Your spouse	❍	❍	❍	❍	❍
Your mother	❍	❍	❍	❍	❍
Your father	❍	❍	❍	❍	❍
Your mother-in-law	❍	❍	❍	❍	❍
Your father-in-law	❍	❍	❍	❍	❍
Your sister(s)	❍	❍	❍	❍	❍
Your sister(s)-in-law	❍	❍	❍	❍	❍
Your brother(s)	❍	❍	❍	❍	❍
Your brother(s)-in-law	❍	❍	❍	❍	❍
Other relatives	❍	❍	❍	❍	❍
Your friends	❍	❍	❍	❍	❍
Doctors/nurses	❍	❍	❍	❍	❍
Lactation consultants	❍	❍	❍	❍	❍
Employer	❍	❍	❍	❍	❍
Professional colleagues	❍	❍	❍	❍	❍
La Leche League	❍	❍	❍	❍	❍
Strangers	❍	❍	❍	❍	❍
Other:	❍	❍	❍	❍	❍

Q60 What do you feel are the positive aspects of breastfeeding at the following ages?

	0-3 months	4-6 months	7-12 months	13-24 months	25-36 months	Beyond 36 months
Nutritional benefits for your child	❑	❑	❑	❑	❑	❑
Immunity benefits for your child	❑	❑	❑	❑	❑	❑
Child's' cognitive Development/IQ	❑	❑	❑	❑	❑	❑
Health benefits for you	❑	❑	❑	❑	❑	❑
Postpartum weight loss	❑	❑	❑	❑	❑	❑
Delaying the return of your menstrual cycle	❑	❑	❑	❑	❑	❑
Mother-child bonding	❑	❑	❑	❑	❑	❑
Your child's emotional well-being	❑	❑	❑	❑	❑	❑
Positive effects on child's behavior	❑	❑	❑	❑	❑	❑
Aiding with child's sleep	❑	❑	❑	❑	❑	❑
Other	❑	❑	❑	❑	❑	❑

Answer If What is the longest you breastfed your child(ren)? (In months, including any still nursing) Months: Is Less Than or Equal to: 11
Q61 Do you or would you you encourage other mothers to breastfeed as long as or longer than you did? Why or why not?

Answer If If you are currently breastfeeding, do you know how long you plan to breastfeed this child? (in months) Text Response Is Greater Than or Equal to: 12
Q62 If you are currently breastfeeding, for what reasons do you hope to continue to 12 months or beyond?

Q63 What do you feel are the negative aspects (if any) of breastfeeding at the following ages?

	0-6 months	7-12 months	13-24 months	25-36 months	Beyond 36 months
Restricts Activities	❑	❑	❑	❑	❑
Pain/problems with breastfeeding	❑	❑	❑	❑	❑
"Dependence" of child	❑	❑	❑	❑	❑
Embarrassment	❑	❑	❑	❑	❑
Disapproval of family	❑	❑	❑	❑	❑
Disapproval of friends	❑	❑	❑	❑	❑
Disapproval of society	❑	❑	❑	❑	❑
Disapproval of healthcare providers	❑	❑	❑	❑	❑
Other	❑	❑	❑	❑	❑

Q64 Did you ever feel compelled to breastfeed only in private? If so, what was the age of your child(ren) when you began feeling this way (in months)?

❍ Yes:_____

❍ No

Q65 Did you perceive any disapproval of breastfeeding from certain individuals or in specific places? If so, from whom and in what places? How did you deal with this?

Answer If What is the longest you breastfed your child(ren)? (In months, including any still nursing) Months: Is Less Than or Equal to: 11

Q66 What do you think would improve society's acceptance of breastfeeding?

Answer If What is the longest you breastfed any of your child(ren)? (In months, including any still nursing) Months: Is Greater Than or Equal to: 12
Q67 Please answer the following questions about your experience with breastfeeding at 12 months or beyond.

Q68 For what reasons did you decide to breastfeed any or all of your children at 12 months or beyond?

Q69 Do you or would you encourage other mothers to breastfeed to 12 months or beyond? Why or why not?

Q70 If you asked the child(ren) you breastfed at or beyond 12 months why he/she likes to nurse, what do you think he/she would say?

Q71 How frequently does your older child (12 months or older) nurse in a 24 hour period?

Q72 Did or does your breastfeeding older child (12 months or older) have any breastfeeding habits that are challenging due to their age? If so, what are they?

Q73 For the child(ren) you breastfed to 12 months or beyond, when and how would you or did you decide to wean them from the breast?

Q74 Did you feel pressure from anyone to wean your child from the breast at or after 12 months of age? If so, from whom?
- ❍ Yes: _____
- ❍ No

Answer If Did you feel pressure from anyone to wean your child from the breast at or after 12 months of age? If so, from whom? Yes Is Selected
Q75 Do you feel that your child's gender had anything to do with this pressure to wean? If so, why?
- ❍ Yes:_____
- ❍ No

Q76 If you perceived disapproval of breastfeeding your 12 month or older child(ren), did you encounter difficulties once they were old enough to talk about breastfeeding or initiate nursing themselves? How did you deal with this?

Q77 What do you think would improve society's acceptance of breastfeeding children over 12 months?

The following questions concern demographic information about you and your immediate family.

Q78 What is your current age?

Q79 What is your current marital status?
- ❍ Single
- ❍ Married
- ❍ Divorced/separated
- ❍ Widowed
- ❍ Remarried

Q80 At what age did you first marry?

Q81 What is the highest level of education you have completed?
- ❍ Junior high/middle school
- ❍ High school
- ❍ Associate's degree (2 years of college)
- ❍ Bachelor's degree
- ❍ Master's degree
- ❍ PhD/JD/MD/other professional degree
- ❍ Other:_____
- ❍ Currently pursuing a degree/qualification: (please specify): _____

Answer If What is your current marital status? Married Is Selected
Q82 What is the highest level of education your spouse or partner has completed?
- ❍ Junior high/middle school
- ❍ High school
- ❍ Associate's degree (2 years of college)
- ❍ Bachelor's degree
- ❍ Master's degree
- ❍ PhD/JD/MD/other professional degree
- ❍ Other:_____
- ❍ Currently pursuing a degree/qualification: (please specify):_____

Answer If What is your current marital status? Divorced/separated Is Selected And What is your current marital status? Widowed Is Selected
Q83 What is the highest level of education your former spouse has completed?
- ❍ Junior high/middle school
- ❍ High school
- ❍ Associate's degree (2 years of college)
- ❍ Bachelor's degree
- ❍ Master's degree
- ❍ PhD/JD/MD/other professional degree
- ❍ Other:_____

Q84 What is the highest level of education your mother completed?
- ❍ Junior high/middle school
- ❍ High school
- ❍ Associate's degree (2 years of college)
- ❍ Bachelor's degree
- ❍ Master's degree
- ❍ PhD/JD/MD/other professional degree
- ❍ Other:_____
- ❍ Currently pursuing a degree/qualification: (please specify):_____

Q85 What is the highest level of education your father completed?
- ❍ Junior high/middle school
- ❍ High school
- ❍ Associate's degree (2 years of college)
- ❍ Bachelor's degree
- ❍ Master's degree
- ❍ PhD/JD/MD/other professional degree
- ❍ Other:_____
- ❍ Currently pursuing a degree/qualification: (please specify):_____

Q86 Please indicate your annual household income:
- ❍ Less than $20,000
- ❍ $20-39,000
- ❍ $40-59,000
- ❍ $60-79,000
- ❍ $80-99,000
- ❍ More than $100,000

Q87 Are you currently employed (including self-employment)?
- ❍ Yes
- ❍ No

Answer If Are you currently employed (including self-employment)? Yes Is Selected
On average, how many hours per week do you work?
Hours outside the home:____
Hours worked from home:____

Answer If Yes Is Selected
Q89 What is your current occupation?

Answer If What is your current marital status? Married Is Selected
Q90 Is your spouse or partner currently employed (including self-employment)?
- ❍ Yes
- ❍ No

Answer If Is your spouse currently employed (including self-employment)? Yes Is Selected
On average, how many hours per week does he/she work?
Hours outside the home:____
Hours worked from home:____

Answer If Is your spouse currently employed (including self-employment)? Yes Is Selected
Q92 What is your spouse's (or partner's) current occupation?

Q93 Please indicate your ethnic background:
- ❍ White/Caucasian
- ❍ Hispanic
- ❍ African American
- ❍ Native American
- ❍ Pacific Islander
- ❍ Other:_____

Answer If What is your current marital status? Married Is Selected
Q94 Please indicate your spouse's (or partner's) ethnic background:
- ❍ White/Caucasian
- ❍ Hispanic
- ❍ African American
- ❍ Native American
- ❍ Pacific Islander
- ❍ Other:_____

Q95 Do you identify with a religious tradition? If so, which one?

Answer If What is the longest you breastfed your child(ren)? (In months, including any still nursing) Months: Is Greater Than or Equal to: 12
Q96 Is there anything else about your experience with breastfeeding a child 12 months or older that you would like to share?

Answer If What is the longest you breastfed your child(ren)? (In months, including any still nursing) Months: Is Less Than or Equal to: 11
Q97 Is there anything else about your experience with breastfeeding that you would like to share?

Q98 How did you find out about this study?
- ❍ University of Missouri clinic advertisement
- ❍ Facebook
- ❍ From a friend or relative
- ❍ Blog/website: _____
- ❍ Other :_____

Q99 Would you like the primary researcher to contact you to share more about your breastfeeding experiences over the phone or Skype? (If yes, you will be prompted to enter your first name and email/phone number to schedule a brief interview. If you select no, you will be taken to the end of the survey.)

❍ Yes

❍ No

If No Is Selected, Then Skip To End of Survey

Answer If Would you like the primary researcher to contact you to share more about your breastfeeding experiences over the phone or Skype? (If yes, you will be prompted to enter your first name and email/pho... Yes Is Selected

Q100 Please enter your first name and email and/or phone number to be contacted for a follow-up interview. We appreciate your time!

First name:_____

Email:_____

Phone number :_____

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VITA

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Jayme hopes to continue researching breastfeeding in the United States in order to help inform policy and promote breastfeeding for longer durations. She is married to Jonathan Cisco, Assistant Director of the Campus Writing Program at the University of Missouri, and researcher and educator in adolescent literacy, post-secondary literacy, and writing across the curriculum. She is mother to one son, Quinn. Contact Jayme at jaymecisco@gmail.com.