

DePauw University Scholarly and Creative Work from DePauw University

Student research

Student Work

4-2019

Is Breastfeeding Truly Best? Evolutionary, Physiological, & Cultural Factors That Shape Breastfeeding Practices

Emily J. Green
DePauw University

Follow this and additional works at: <https://scholarship.depauw.edu/studentresearch>

 Part of the [Human and Clinical Nutrition Commons](#), [Maternal and Child Health Commons](#), and the [Physiological Processes Commons](#)

Recommended Citation

Green, Emily J., "Is Breastfeeding Truly Best? Evolutionary, Physiological, & Cultural Factors That Shape Breastfeeding Practices" (2019). *Student research*. 106.
<https://scholarship.depauw.edu/studentresearch/106>

This Thesis is brought to you for free and open access by the Student Work at Scholarly and Creative Work from DePauw University. It has been accepted for inclusion in Student research by an authorized administrator of Scholarly and Creative Work from DePauw University. For more information, please contact bcox@depauw.edu.

Is Breastfeeding Truly Best?

Evolutionary, Physiological, & Cultural Factors that Shape Breastfeeding Practices

Emily J. Green, Class of 2019

DePauw University Honor Scholar Program

Committee: Kevin Moore, Alicia Suarez, & Renee Madison

Table of Contents

Introduction	5
The Evolution of Lactation.....	11
The Physiological & Behavioral Mechanisms of Breastfeeding	17
Other Benefits of Breastfeeding	37
The Social Constraints of Breastfeeding & Policy Directions	44
Discussion.....	69
Afterword	79

Introduction

Today, it is rare to go a day without seeing or hearing about social and health issues related to women's bodies. Texas legislators are attempting to pass a bill that would allow the death penalty for women who have had abortions (Stracqualursi, 2019); the Ohio legislature has passed a heartbeat bill for abortions (Chokshi, 2019); and according to NPR, over 250 bills have been proposed this year alone to restrict access to abortion across the U.S. now that the balance of the Supreme Court has shifted (Farmer & Fortier, 2019). Beyond even the high-profile and vitriolic debates surrounding abortion, there are seemingly countless other issues within the scope of women's health: birth control, high mother and infant mortality rates in hospitals, breast and reproductive cancers, and more.

Given these mounting issues related to women's health, there is a myriad of approaches addressing them. Consequently, conflict inevitably erupts regarding the "right" approach. Yet at the heart of the conflict lies a singular question: *How can we best structure our social environment to improve the lives of women and provide them with effective and accessible healthcare?* Such a question is so complex that it cannot be resolved with a uni-dimensional approach. Sociological and gender studies approaches come from a place of challenging dominant social structures that restrict women's access to healthcare and perpetuate harmful gendered, racial, and heteronormative stereotypes. As a result, they have much to offer in terms of tackling institutional and policy weaknesses. Thus, the social sciences have a critically necessary place in formulating solutions.

At the same time, social sciences may not be the only useful approach to a given health issue. Specifically, it is worth introducing the expansively growing understandings of the human body and genome into the conversation. Biological and evolutionary approaches have much to offer in terms of understanding women's sexuality and behavior in conjunction with sociological approaches, as biology is not separate from our social world and our social world is not separate from biology. It is necessary to consider a framework in which we are predisposed to particular health outcomes or behaviors on the basis of our biology, but those biologically-influenced outcomes are also affected by the society we have created for ourselves.

Consider, for example, the female orgasm. In popular discourse, there is the expectation that women orgasm within the context of male sexual pleasure such that it does not exist independently of heterosexual, penetrative intercourse (Maines, 1999). By having such a male-oriented, heterosexual framework for understanding female orgasm, many people fundamentally misunderstand its biological characteristics and occurrence. The biological reality is that the large majority of women cannot orgasm from penetrative sex alone, and rather orgasm from clitoral stimulation (Maines, 1999). Yet socially, there is a perception that women who cannot orgasm from penetrative sex are somehow sexually defective and require medical treatment for "female sexual dysfunction" (Cacchioni, 2009). In this case, understanding evolutionary and biological contexts for why and how women orgasm can help prevent feelings of sexual inadequacy in women as well as unnecessary medicalization. Hopefully, such understandings can also help sexual partners adjust sexual

practices to maximize female pleasure without medical intervention. In this way, biology and evolution can empower women to better understand their bodies and prevent androcentric repression of female sexuality.

Although evolutionary and biological approaches can be powerful tools to help people understand their bodies and behaviors, as well as inform effective policy decisions, there remains an inherent danger in using biological and genetic research to inform political action. A recent example perfectly highlights such a danger: On October 17, 2018, a startling New York Times headline leapt from its page: “Why White Supremacists Are Chugging Milk (and Why Geneticists Are Alarmed)” (Harmon). The article describes the way that White supremacists have almost humorously misinterpreted the finding that people with European ancestry have a genetic advantage in terms of digesting lactose (Harmon, 2018). By their unsound logic, these findings prove some sort of innate, genetic white superiority; however, had they bothered to continue researching the topic, they would have realized that the trait is linked to the domestication of cattle and a mutation that allows for the continued digestion of lactose after childhood—a trait also found in East Africans and several pastoral populations (Harmon, 2018). Chugging milk as a result of these findings, although ridiculous and misinformed, reflects the ways that lay persons, and even scientific institutions, have used research to justify social inequality in terms of race, gender, and sexuality.

Even at the emergence of Darwin’s radical theory of natural selection, his scholarship was inundated with the prejudice of his time, specifically with women’s supposed inferiority. When his brilliant female French translator, Clémence Royer, challenged some of his

inaccurate thoughts about motherhood, she was promptly dismissed and replaced (Hrdy, 1999). She asserted that women and mothers have been mischaracterized in evolutionary theories as living objects, without the capacity for deep thought and passion; rather, women and mothers are agents of evolution. Despite her profound early insights, her theorizing was overlooked in favor of more traditional, albeit unfounded, gendered approaches. Herbert Spencer, seizing upon Darwin's contributions, founded the idea of the physiological division of labor, in which men's energies are predominantly spent on intellectual pursuits and women's energies on reproduction (Hrdy 1999). Such a division of labor meant that most women would be unable to engage in complex thought and abstract reasoning. Spencer's theories thus provided a biological backbone for the simple essentialist notion of women as solely reproductive vessels (Hrdy, 1999). In this way, Spencer illustrates the way that scientific institutions have produced the "evidence" for biological inequality, thereby solidifying the justifications for domestic, political, and social inequality.

Many of Darwin's contemporaries have also reinforced the idea of women as passive, reproductive, and unintelligent objects. Paul Broca, an anthropologist focused on taking craniometric measurements and dimensions of the human brain, used circular reasoning to explain women's smaller average brain size than men as a product of both physical and mental inferiority (Belkhir, 1994). Further, Gustav Le Bon, an early psychologist, expressed that women, based on their intelligence, were essentially no better than children and savages. Moreover, he likened the rare intelligent woman to a biological oddity, just as a two-headed gorilla would be (Belkhir, 1994). Craniometric measurements, although compelling in the

late nineteenth century, lost much of their allure at the onset of IQ intelligence testing.

Nevertheless, the pseudoscience of craniometry lent credence to patriarchal values about the inherent intellectual inferiority of women and justified their exclusion from education and politics.

In spite of this danger, there is a way to responsibly incorporate research into discourse and policy on many topics related to women's health and sexuality. For instance, Julie Seaman, the Associate Dean for Academic Affairs and Accelerated Juris Doctor Faculty Advisor at Emory University has published articles and book chapters revealing the ways that evolutionary science can be applied to policy and law. In "Form and (dys)function in sexual harassment law," Seaman (2005) applies evolutionary research on male sexual behavior and gendered patterns of discrimination to inform legal interpretations of Title VII about sexual harassment in the workplace. In this piece, they argue emphatically that "this approach neither excuses harassment by individuals nor suggests that sexual harassment is inevitable because the behavior is somehow genetically determined. Rather it recognizes that certain work environments are more likely, on average, to give rise to socially harmful and discriminatory patterns of behavior" that "constrain female autonomy and restrict access to resources to constrict female agency and choice" (Seaman, 2005, p.433). Thus, by understanding patterns of human behavior rooted in evolution and biology, we may be better able to better craft policy on such issues.

Although there are numerous issues to which evolutionary science could be applied, I have chosen to focus more narrowly on breastfeeding. Lactation and breastfeeding have

evolved as an almost uniquely female embodied experience related to reproduction and women's health. Moreover, breastfeeding results in a variety of physiological, emotional, and behavioral effects, as well as health outcomes, not just for infants, but for mothers. By understanding the influence of evolution on these effects, we can better understand women's experiences breastfeeding. Yet evolutionary science cannot fully encapsulate American women's experiences breastfeeding. There are a variety of economic, social, racial, and class factors that influence and impede breastfeeding, even though it is an important aspect of infant and maternal health.

The goal of this thesis, then, is to describe the evolutionary and physiological processes of breastfeeding and examine how our social environment has affected breastfeeding practices in the U.S. Ultimately, both evolution and society interact to shape women's experiences of motherhood. It is my hope, that bringing evolution and biology into the discourse on breastfeeding to a greater degree can add clarity. Combined with feminist approaches, evolution can potentially provide a fresh approach to fraught practice and policy issues. Biological and healthcare approaches to understanding breastfeeding are ultimately limited given the social constraints of capitalism, sexism, racism, and class. Therefore, it is not until we take into account both biological and social factors that we can more fully understand this issue. That being said, there are necessary limitations to the extent that this topic can be examined in the scope of this paper. As a result, I will provide directions for further research.

This paper is divided into several sections. The first few sections examine the evolutionary origins, physiology, and behavioral outcomes of breastfeeding. The next few sections address several socially constraining factors that influence breastfeeding, including the formula industry, women's labor, and the sexualization of breasts. From there, I will address current laws and policies in place and suggest directions for future policy, rooted in an interdisciplinary approach. I will end this thesis with an afterword on my personal struggles with the tension that arises from combining 2 very different and often conflicting disciplines in a novel way.

The Evolution of Lactation

When Carolus Linnaeus designed a classification system for living things, he made an unusual choice and named an entire branch of the animal kingdom *Mammalia*, meaning “of the breast” (Schiebinger, 1993). In naming our entire class of animals *Mammalia*, he “made the female mammae the icon of that class” (Schiebinger, 1993, p. 382). Interestingly, mammals are the only class of animals that Linnaeus named after the reproductive organs of a specific sex, thereby irrevocably linking the nature of female mammals to breasts and nursing (Schiebinger, 1993). He may have ultimately made the choice to do so because of political and social pressures at the time for women to breastfeed their own infants; naming our class of animals after breasts implicitly reinforced those attitudes (Schiebinger, 1993). Conversely, Germans chose to name mammals *Säugetiere*, after “suckling animals” in order to shift the focus from the gendered act of lactating to the universal infant behavior of suckling (Schiebinger, 1993). In this way, even differences in nomenclature reflect cultural

essentialist attitudes about gender and motherhood. The nomenclature also alludes to the question as to why breastfeeding is a distinct ability of most female mammals. What of our evolutionary past has enabled women, but not men, to breastfeed? To understand the development of lactation, it is necessary to understand its ancient evolutionary context.

Early mammalian ancestors, known as *synapsids*, were still egg laying creatures known as monotremes that produced parchment-like eggshells (Oftedal, 2012). Unlike calcified eggs, these eggs had difficulty retaining moisture and were subject to desiccation, especially when exposed to arid climates. Most likely, early synapsids either buried their eggs in damp soil, moisturized them with damp skin, or kept them in a kind of marsupial pouch (Oftedal, 2012). However, given the knowledge that these early mammals developed high body temperature and metabolic rates, it is likely that they incubated their eggs to both keep them moist and protect them from temperature differences between the environment and the egg (Oftedal, 2012).

Synapsids, like amphibians, had “glandular skin” that produced substances to both moisturize the eggs and provide them with antimicrobial defenses and nutrients (Oftedal, 2012). Antibacterial secretions would have ultimately resulted in greater reproductive success by preventing bacterial, viral, or fungal infection of eggs and thereby increasing hatching success (Hrdy, 1999). These antimicrobial secretions would likely have represented an early stage in the development of what we know of as colostrum, the yellow, antibody-packed substance secreted from the nipples in the few days following birth, and breastmilk, which Hrdy (1999, p.136) affectionately refers to as “the cellular equivalent of a pharmacy.”

The origins of these early secretions likely reside in the apocrine-like glands on the skin, specifically hair follicles and sebaceous glands which share many physiological similarities with mammary glands (Oftedal, 2012). Thus, it is hypothesized that some apocrine-like glands slowly developed into mammary glands through natural selection via enhanced reproductive success. In addition to these structural similarities, fossil records also reveal the shift in dental development which corresponds to increased reliance on milk. In synapsids, teeth were replaced as the jaw grew with age; however, fossil records indicate that early mammals began to have delayed emergence of teeth, likely for the duration of lactation (Oftedal, 2012). This change provides evidence for development of milk reliance in our distant ancestors in conjunction with the development of antimicrobial and nutritious gland secretions.

Moreover, by understanding this history, we can understand the importance of the development of lactation in mammals and in humans to maximize reproductive success. Additionally, studying the ancient origins of lactation reveals that breastmilk, although a mode of infant feeding, may have primarily evolved to keep young safe from bacterial, fungal, and viral infections. This antimicrobial purpose of breastmilk is often overlooked in discourse on breastfeeding, and is an important reminder that breastfeeding does not serve an exclusively nutritional purpose.

Why Don't Men Lactate?

As for why predominantly only female mammals developed lactational abilities, the explanation seems to rest with the early division of responsibilities for egg supervision.

Given that in most mammal species, only females have mammary glands, it is most likely the case that the females of our early mammalian ancestors mainly tended the eggs and young offspring, thus requiring adaptations that would enhance their reproductive success by providing advantages to their eggs and freshly hatched young (Hrdy, 1999). Significantly, lactation is energetically expensive, and its emergence in mammals, particularly humans, would come with opportunity cost, specifically, the requirement of extensive additional caloric intake and the lengthening of birth intervals due to ovulation suppression, and subsequently the lowering of fertility (McNeilly, 1996). Even further, longer birth intervals and lower fertility rates would have lowered the number of ovulating females accessible to males and thereby increased male competition for females (Hrdy, 1999). The heightened competition has consequences for female sexuality and breastfeeding as it tends to increase males' attempts at maximizing reproductive control (Hrdy, 1999).

Interestingly though, it is not impossible for human males to lactate. In some cases, environmental estrogens and malnutrition that leads to pituitary and liver damage can induce lactation in human males, however, male lactation can also be induced with extensive nipple stimulation (Kinz & Hosken, 2008). Human males' ability to lactate resides with the structural similarities between the hormones estrogen and testosterone, and prolactin and human growth hormone (Kinz & Hosken, 2008). During sex differentiation between human males and females, the onset of androgenic hormones is what differentiates male and female breast tissue and nipple structure. Under the right conditions, men can also develop structures that would allow for lactation, especially given that men also have the ability to synthesize

estrogen, which is involved in lactation and breast development. Additionally, prolactin, the chemical that allows for the production of breast milk, is implicated in both male and female caregivers in a variety of species (Kinz & Hosken, 2008). Involved in both milk production and offspring defense, prolactin levels in the body can be increased via nipple stimulation. Increased prolactin levels can also lead to the production of breastmilk, even in males and nonpregnant or non-nursing females (Kinz & Hosken, 2008). Therefore, although male lactation is highly unusual in humans, it is not impossible.

So if male breastfeeding is theoretically possible, why don't men breastfeed regularly alongside women? The answer to this question may be due in part to different patterns of parental investment between sexes and paternity uncertainty. Given that human females have internal fertilization, it is almost impossible for human males to determine whether or not a female has already mated and had her egg fertilized (Trivers, 1972). Therefore, a human male cannot be sure that he parented the offspring, unlike human females who always experience maternity certainty, and may be less willing to invest extensive resources in that offspring. Moreover, sperm emission is a very small investment compared to the investment that human females make with 9 months of gestation. Thus, given that human males invest little in the mating process compared to human females and experience paternity uncertainty, they tend to be more unlikely to invest expensive resources in the survival of that infant (Trivers, 1972). Further, when there is high competition between males for females given the higher female investment levels, male investment tends to be lower given the greater risk of paternity uncertainty (Trivers, 1972). In essence, male lactation is a form of male parental

investment that may or may not be adaptive given environmental conditions (Kinz & Hosken, 2008). Given general mammalian and human mating processes, it seems that male breastfeeding has not necessarily been selected for.

Two species of fruit bats may provide some insight into the environmental conditions that make male lactation adaptive for a species. Dayak fruit bat and the masked flying fox males possess the capacity to lactate, and not necessarily as a result of environmental estrogens and pesticides or stress and pituitary damage (Kinz & Hosken, 2008). If pollutants and stress were the origins of lactation in the male bats, then one would only expect to see lactation in males with poor health; however, lactation has been observed widely across males in the species. Although the males produce less milk than the females and have less pronounced nipples, they still lactate, potentially as a supplementation to females' milk production (Kinz & Hosken, 2008). Given the unusual presence of lactation in these male mammals, it is necessary to examine the role that their environment and mating strategies have played in its development and what this could signify for humans. More research is needed to investigate the presence of lactation in the males, but the bats may be evidence that low male-male competition for mates and low predation could create the environmental conditions for male lactation (Kinz & Hosken, 2008).

Given this information, it is apparent that the overwhelming presence of lactation in females rather than males is a product of the way that environment and mating strategies have shaped adaptations. Ultimately, knowing that lactation likely evolved as an adaptive mechanism of female mammals to protect their offspring provides context for

conceptualizing lactation in modern mammals. Moreover, it lends further credence to the ideologies that females are active reproductive agents who have evolved mechanisms unique from males to enhance their individual reproductive successes.

The Physiological & Behavioral Mechanisms of Breastfeeding

Now that a framework for understanding the ancient evolutionary origins for the development of lactation in mammals has been established, we can better understand the way that environment, mating strategy, and reproductive advantage have shaped lactation to be an embodied experience almost completely unique to female mammals. In looking to modern mammals' biological and physiological processes related to breastfeeding, we can examine the way that breastfeeding affects women's bodies and behaviors. Moreover, such knowledge can help clear up misconceptions about breastfeeding, especially with regard to the choice to supplement breastfeeding with formula.

In this section I will provide an overview of several biological and physiological aspects of breastfeeding. In many cases, those aspects have direct correlations to particular behavioral responses and can help us understand women's breastfeeding experiences and challenge misconceptions about motherhood. I will primarily address three hormones implicated in breastfeeding: prolactin, luteinizing hormone (LH), and oxytocin. Each hormone is initially released following stimulation of the nipples by the infant (Trevathan, 2010). Such stimulation sends an electrical signal to the hypothalamus, which then signals the pituitary glands for the release of particular hormones (Trevathan, 2010). For each of these hormones, I will describe their unique roles and the biological and behavioral responses

associated with them. Those responses have numerous implications for how we think about breastfeeding and the emotional and social effects it has on women. I will also examine the unique relationship that mothers and infants have in negotiating breastfeeding, both within the sections on hormones and in an additional section discussing the weaning process.

Prolactin

Without prolactin, there would be no ability to produce milk (Trevathan, 2010). Therefore, it is fairly obvious that it is important to breastfeeding. It begins its path after the hypothalamus receives the sensory input, which decreases the secretion of dopamine and causes the anterior pituitary gland to increase its secretion of the hormone (Trevathan, 2010). Prolactin then makes its way to the breast tissues where it maintains milk production (Trevathan, 2010). Yet in addition to milk production, it has several emotional and behavioral components across a variety of species, specifically with lactational aggression, or aggression induced by nursing, and reduced stress responses. In this way, it is undeniably important for both maintaining milk production and defending young while also decreasing stress.

In order to conceptualize lactational aggression, it is necessary to consider that in our mammalian evolutionary past, it may have once been adaptive to have increased protective hostility in order to prevent an infant from falling prey to other animals or even human infanticide (Heise & Lippke, 1997). To understand, it is helpful to examine experiments using rodents. Mother rodents, such as mice and voles, often lose their litters to infanticidal males who wish to kill the pups, cease lactation to forcibly reinstate fertility, and

subsequently mate with the female (Heise & Lippke, 1997). Yet after the female has invested extensive energy into nursing her pups, she becomes extremely protective of them. The longer a mother vole nurses her pups, the more aggressively she defends them from male conspecifics who may wish to harm them (Heise & Lippke, 1997).

Lactation ultimately becomes the key in understanding a mother's aggression. In experiments where mother mice's nipples were removed, thereby preventing nursing, the mothers did not demonstrate the fierce protectiveness that nursing mothers did (Svare & Gandleman, 1976). In other experiments where virgin mice were hormonally manipulated to have larger nipples, nipple stimulation led to aggressive behavior in defense of pups even when they did not mother the pups (Svare & Gandleman, 1976). Thus, nipple stimulation seems to be an important prerequisite for aggressive defense of pups against conspecifics. The research on mice presents compelling evidence for lactational aggression in rodents; however, there is also evidence that lactational aggression occurs in a wide variety of mammals, including non-human primates and even humans. In Japanese macaques, nursing mothers were observed to have a significant increase in aggression after the first 1 to 2 weeks of nursing (Schino, D'Amato, & Troisi, 2004). Ledesma, De Luis, Montejo, Llorca, and Perez-Urdaniz (1988) also found that postpartum human women had greater levels of aggression toward others compared to control groups. This research reveals that maternal aggression is not unique to rodents and may also influence human maternal behavior.

Some research has also linked lower levels of anxiety with heightened lactational aggression. Maestriperi and D'Amato (1991) found that mother mice had reduced reactivity

to fearful stimuli when pregnant or nursing compared to virgin mice. Additionally, nursing mothers exhibited greater aggression (e.g., higher number of attacks, more time spent attacking, less time between the introduction of the male and first attack) than virgin mice when a male was introduced to the cage on the seventh day of nursing (Maestriperi & D'Amato, 1991). Their research provides further evidence for the associations between lactation, anxiety, and aggression; nursing, rather than merely maternity, predicts aggression.

Lactational aggression and reduced autonomic arousal has also been researched in human mothers. For instance, researchers found that exclusively breastfeeding mothers were significantly more aggressive to confederates than both mothers who breastfed and bottle-fed their babies, and college women who had never had children (Hahn-Holbrook, Holt-Lunstad, Holbrook, Coyne, & Lawson, 2011). With this finding, merely being a mother was not predictive of aggression; rather, breastfeeding and autonomic arousal predicted aggression. Mothers who exclusively breastfed demonstrated more aggression than mothers who breastfed less or did not breastfeed at all, and mothers who breastfed some were more aggressive than mothers who did not breastfeed at all (Hahn-Holbrook et al., 2011). The researchers found that the increased aggression with lactation is associated with the lower systolic blood pressure and subsequent reduced autonomic stress responses (Hahn-Holbrook et al., 2011).

Some researchers also compared postpartum women, women with hyperprolactinemic amenorrhea, a condition which causes heightened prolactin levels, and female hospital employees who had not recently given birth or nursed (Mastrogiamomo, Fava, Fava, Kellner,

Grismondi, & Cetera, 1982-83). They found that 7 days after birth, postpartum women and women with hyperprolactinemic amenorrhea had comparable levels of heightened hostility compared to the control group of hospital employees. This finding implicates prolactin in lactational aggression (Mastrogiacomo et al., 1982-83). Additionally, Fleming, Ruble, Flett, and Shaul (1988) found that women, even non-depressed women experience lower levels of “positive feelings” with regard to husbands in the few months following birth. In this way, it is hypothesized that lactational aggression may contribute to postpartum depression via hostile feelings toward others following birth. Once adaptive in deep mammalian history, lactational aggression could have prevented infanticide by conspecifics; however, it may now be associated with behaviors that are considered inappropriate, including hostility toward one’s partner (Mastrogiacomo et al., 1982-83).

Taken together, these non-human animal and human studies suggest that lactation and its corresponding reduced stress responses and heightened prolactin levels could increase aggressive displays by reducing fear in mothers who invest extensively in their offspring through breastfeeding. This association makes sense in an evolutionary context given that lower fear responses enable breastfeeding mothers to have greater aggression in defense of their infants (Hahn-Holbrook et al., 2011). The research on prolactin and lactational aggression also suggests that breastfeeding not only serves as a source of nutrition for infants. Rather, it also seems to be related to a mother’s relationship with both her infant and the adults she comes into contact with (Svare & Gandelman, 1976). In this way, breastfeeding goes beyond merely feeding, and contributes to a complex evolutionary

dynamic between parent and offspring in which the parent invests in their young and has an interest in protecting that investment. Furthermore, lactational aggression has implications for how we might better understand women's postpartum experience and how that relates to breastfeeding and elevated prolactin.

By understanding this biological and evolutionary dimension of breastfeeding, people can be better able to challenge stereotypical depictions of motherhood as an exclusively joyous and loving time; rather, it can be a time of feeling what some would consider positively unmotherly. Given that it is not necessarily pathological to have negative feelings following birth and pregnancy, we can reconceptualize "normal" motherhood and include common experiences without shaming women for not fitting into a socially prescribed image of motherhood.

Ovulation Suppression

In addition to milk production and lactational aggression, the suckling stimulus also results in the suppression of ovulation, or amenorrhea, for the duration of breastfeeding. Ovulation suppression has numerous health implications for both mothers and infants and may be vital to the survival of both. In order to understand how the ovulation suppression mechanism works, I will describe the interaction between luteinizing hormone (LH) and gonadotrophin-releasing hormone (GnRH). A normal menstrual cycle begins with the growth of ovarian follicles, which begin to convert and release androgens from the follicle into oestradiol, an estrogenic compound (McNeilly, 1996). This conversion occurs as a result of the pituitary's release of LH in response to the secretion of GnRH from the

hypothalamus. The pulsating pattern of GnRH and LH ultimately drive the ovulatory cycle. Thus, when an infant breastfeeds and stimulates their mother's nipples, this pattern of release is disrupted as the hypothalamus decreases its secretions of GnRH (McNeilly, 1996). The lower secretions of GnRH signal for the anterior pituitary to reduce its secretions of LH and thereby prevent the growth of ovarian follicles and decrease the release of oestradiol. The cycle only returns to normal when the infant is almost fully weaned (McNeilly, 1996). The period of time during which an infant stimulates the mother's nipples may thus affect when a mother is able to conceive again.

Researchers have found marked differences in the average period of postpartum amenorrhea between mothers who nurse and who do not nurse. On average, mothers who do not nurse begin their ovulatory cycles about 3 months postpartum, whereas nursing mothers may experience postpartum amenorrhea for over 2 years (Howie & McNeilly, 1982). Additionally, ovulation returns more slowly in mothers who fully breastfeed their children without supplementation of formula than mothers who partially breastfeed (Howie & McNeilly, 1982). The differences between non-nursing mothers' and nursing mothers' periods of lactational amenorrhea is also consistent cross-culturally, even between Alaskan Eskimo and rural Indian women. When comparing postpartum conception rates, the women who breastfed their infants conceived new children much later than women who did not breastfeed (Howie & McNeilly, 1982). Moreover, more frequent breastfeeding and longer durations of breastfeeding are associated with longer periods of amenorrhea (Howie & McNeilly, 1982). Additionally, Gallup and Hobbs (2011) found that low birth intervals

significantly increase the risk of having a child with autism, and so longer duration of breastfeeding may serve as a preventative measure.

Further, ovulation inhibition is particularly important for both mother and infant following birth. Long birth intervals between children would have often been necessary—and in many places may still be necessary—for the survival of both mothers and infants. Pregnancy and nursing are energetically expensive (to the tune of an additional 600 to 700 calories a day), and our ancestors (and thus their offspring) would have been more likely to die if children were born too close together (McNeilly, 1997). In fact, it was not uncommon historically for mothers to lose teeth as they had more children due to the high nutritional depletion that results from breastfeeding accompanied by malnutrition (Hrdy, 1999). Moreover, if the nursing infant was weaned too quickly, it could die from lack of acceptable alternative foods and poor immunological development (McNeilly, 1997). In terms of reproductive success, it would not generally be adaptive for a mother to invest extensive energies in pregnancy and nursing only to lose that offspring due to premature weaning.

Furthermore, the infant itself is also agentic when it comes to breastfeeding: by stimulating its mother's breasts as much as possible, it can not only cause the production of milk, but also prevent the arrival of competition in the form of a sibling (McNeilly, 1997). Prieto, Cardenas, Salvatierra, Boza, Montes, and Croxatto (1996) measured the suckling patterns and milk release in children and nursing mothers. Interestingly, they found that the greatest milk release was present in the first breast; however, the infant suckled with equal pressure on both breasts. Given the equal sucking pressure applied, even though the second

breast released 58 percent less milk, it is likely that infants stimulate the second breast not just to feed, but partially to promote ovulation suppression. It is in the infant's best interests to monopolize the mother's attention and lactation for as long as it can in order to maximize its chances for survival by preventing the arrival of a sibling.

Thus, through a variety of mechanisms, an infant's stimulation of nipples leads to a temporary cessation of ovulation in the mother (McNeilly, 1996). This ovulation suppression is important for both the infant and mother to reduce birth interval length, and longer periods of breastfeeding lead to longer periods of amenorrhea (Howie & McNeilly, 1982). In addition to those reasons, some women who have recently given birth and neither wish to conceive again soon nor implement invasive or hormonal birth control methods could consider implementing more consistent breastfeeding for a longer duration to prevent ovulation and the risk of a new pregnancy.

Oxytocin

Beyond even these factors, the infant's stimulation of the nipples also leads to the release of oxytocin in the mother (Trevathan, 2010). Oxytocin serves a number of important roles related to breastfeeding, particularly in facilitating the release of milk and the let-down effect. However, it also has a number of other effects, such as the promotion of the mother-infant relationship via maternal behaviors, stress reduction, and pleasure.

At the touch of an infant and the reception of the sucking stimulus, the hypothalamus increases the synthesis of oxytocin, which signals to the pituitary that it should increase its secretion of the hormone (Trevathan, 2010). From there, the increased oxytocin levels cause

the contraction of cells in the breast which allow for the release of milk (Wambach & Riordan, 2016). Along with contracting parts of the breast, oxytocin also causes contractions of the uterus (Wambach & Riordan, 2016). The contractions of the uterus have a dual purpose of returning the uterus to its prepartum state and providing feelings of sensual pleasure to the mother during breastfeeding. Additionally, Saxton, Fahy, Rolfe, Skinner, and Hastie (2015) found that breastfeeding and skin to skin contact after the birth of an infant are crucial to reducing risks of postpartum bleeding. They found that women who do not have skin to skin contact and do not breastfeeding early after birth were twice as likely to have postpartum hemorrhage. Their research stresses the importance of breastfeeding not only for infant sustenance and immune support, but also for the mother's health immediately following delivery.

Some mothers might be startled at the sensual feelings that follow breastfeeding as a result of uterine contractions and physiological arousal similar to that of orgasm (Bartlett, 2005). The rise in oxytocin along with the positive feelings associated with it can help establish the act of breastfeeding as pleasurable and worth continuing, for reasons beyond the infants' immunological and nutritional needs. Nevertheless, it is not socially acceptable to acknowledge that breastfeeding can be a pleasurable endeavor and some new mothers may be alarmed at the feelings that come with nursing. Later sections in this thesis will address several of the social consequences for sensual pleasure during breastfeeding. In many ways, our society does not recognize that the sensual and maternal are not inherently separated.

Along with sexual pleasure, there is extensive evidence that oxytocin plays a significant role in promoting parental behavior (Olazábal, 2018). For instance, oxytocin is linked to mother infant bonding as early as late pregnancy (Levine, Zagoory-Sharon, Feldman, & Weller, 2007). Researchers found that mothers with oxytocin levels that tended to increase across trimesters had higher scores on mother-infant bonding measures over all (Levine et al., 2007). In examining the relationship between a triadic family of a mother, father, and a 6-month old infant, researchers found that higher oxytocin levels in both the mother and father are associated with higher levels of affectionate touch for both their infants and each other (Gordon, Zagoory-Sharon, Leckman, & Feldman, 2010b). Other research has suggested that high levels of oxytocin in mothers are correlated with higher levels of parenting behaviors such as “maternal gaze, positive affect, and affectionate touch” and high levels of oxytocin in fathers are associated with higher levels of “stimulatory, proprioceptive, and object-oriented style play” (Gordon, Zagoory-Sharon, Leckman, & Feldman, 2010a, p. 5). These findings suggest that oxytocin is involved to some degree in parenting behaviors. Moreover, it seems that both female and male parents have similar levels of oxytocin, with levels of the hormone that seem to rise significantly over the first 6 months of an infant’s life (Gordon et al., 2010a). This finding seems to indicate that oxytocin levels become more elevated as the relationship between parent and infant develops for both male and female parents (Gordon et al., 2010a).

Some researchers link the increased bonding between parents and infants to oxytocin’s association with stress reduction. It seems that increased activation in systems of

the brain that process oxytocin and prolactin are linked with reduced stress response, which not only allows mothers to act aggressively in defense of their infants, but also can also allow mothers to bond with them (Slattery & Neumann, 2008). In a study that randomly assigned breastfeeding women to either hold their infant without nursing or hold their infant with nursing during the presentation of a stressful stimulus, researchers found that the breastfeeding group had a temporarily suppressed stress response to the stressor (Heinrichs et al., 2001). These findings indicate that for a variety of reasons, through both promotion of maternal and paternal behavior and dampening of stress responses, oxytocin encourages bonding between parent and infant.

Bartels and Zeki (2004) further support findings that oxytocin is implicated in feelings of both maternal and romantic love through fMRI scans of mothers' brains while looking at images of their children, friends, and other important adults in their lives. When looking at those images, compared to neutral images, mothers' brains were activated in the brain's oxytocin-saturated reward systems. Even further, looking at the images of loved ones also reduced the activation of brain areas implicated in negative affect, negative judgments and assessments of others (Bartels & Zeki, 2004). Thus, oxytocin emerges as a major component of positive social bonding between mothers and infants. Breastfeeding, which causes increases in the pulsatile release of oxytocin, thereby can be an important mechanism through which social bonding occurs.

Breastfeeding and oxytocin also have numerous implications for the mother's mental health after birth. Yuen and colleagues (2014) found that low oxytocin levels, particularly in

women, are implicated in major depression. Thus, it is unsurprising to then find that oxytocin may also be a predictor of postpartum depression. Research has revealed a correlation between low oxytocin levels during pregnancy and increased risk for postpartum depression (Skrundz, Bolten, Nast, Hellhammer, & Meinschmidt, 2011). As a result, oxytocin may be a site of intervention in treatment of postpartum depression.

As noted previously, lactation is also not something that necessarily occurs automatically. Oxytocin has a critical role in the development of the let-down reflex through classical Pavlovian conditioning, an important factor in sustained breastfeeding. Classical conditioning starts with a natural stimulus that elicits some sort of unconditioned response (Domjan, 2005). In this case, a baby's suckling serves as a natural, unconditioned stimulus that results in the production and release of milk via prolactin and oxytocin (Domjan, 2005). However, a mother's body will begin to associate other stimuli, beyond an infant's suckling, with the production and release of milk (Domjan, 2005). Those stimuli, known as conditioned stimuli, can then produce the same response as the unconditioned stimulus. Therefore, conditioned stimuli, such as infants' cries, the smell of an infant, and even thinking of an infant, can result in the release of higher levels of prolactin and oxytocin, thereby causing the production and release of milk even when suckling is not present (Domjan, 2005).

Fuchs, Ayromlooi, and Rasmussen (1987) examined how oxytocin levels are linked to the release of milk without tactile stimulation and at the onset of conditioned stimuli. They found that in the first day after the birth of a lamb, a ewe's oxytocin levels did not

significantly rise with the introduction of stimuli such as the scent or sight of the lamb; however, on the second day and the subsequent 15 days after birth, the researchers found that spikes in oxytocin corresponded to the conditioned stimuli associated with the lamb and nursing. These findings suggest that the let-down reflex to an infants' stimuli is conditioned over a period of time, rather than being an innate process by which infant feeding occurs (Fuchs, Ayromlooi, & Rasmussen, 1987). Research in other animals, has also indicated that stimulation prior to nursing, and the corresponding increases in oxytocin levels are linked to shorter nursing sessions and increased milk flow (Gorewit, Wachs, Sagi, & Merrill, 1983). This finding could suggest that the development of the let-down reflex in response to conditioned stimuli may be advantageous in reducing nursing session times and easing the flow of milk (Fuchs, Ayromlooi, & Rasmussen, 1987; Gorewit et al., 1983).

In humans, McNeilly, Robinson, Houston, and Howie (1983) measured the oxytocin levels in 10 nursing women. All of the women in the study demonstrated increased oxytocin levels 3 to 10 minutes prior to the suckling stimulus. The oxytocin levels spiked in response to their babies' cries or restlessness, or in preparation of nursing. These findings reveal that oxytocin levels rise in preparation of breastfeeding, even before stimulation of the nipple, as a result of conditioning. It is worth noting that peak oxytocin levels did not always occur at the time of nipple stimulation, but rather before. Oxytocin increases prior to feeding may be a necessary component for the let-down reflex, even before an infant starts nursing. Consequently, conditioning this response is important in the maintenance of breastfeeding (McNeilly et al., 1983).

Taken together, the research on oxytocin reveals its importance to the maintenance of breastfeeding through conditioning effects (McNeilly et al., 1983), enticement to breastfeed through pleasurable sensations (Bartlett, 2005), mother-infant bonding (e.g., Levine et al., 2007), and maternal postpartum health (e.g., Saxton et al., 2015). Further, oxytocin release as a result of breastfeeding can seemingly influence social and maternal behaviors of a mother toward her infant (Gordon et al., 2010a; Gordon et al., 2010b). In this way, oxytocin and its effects demonstrate that breastfeeding goes well beyond infant nutrition.

The Adaptability of Breastmilk

In considering the biological and physiological characteristics of breastfeeding, it is important to acknowledge the unique and individual quality of breastmilk. Milk composition is not only different across mammal species, but also different across humans based on social class and the condition of the mother and the infant. This section will discuss the ways that breastmilk is a substance that is adaptable and variable depending on a variety of factors. It is partly breastmilk's adaptability that distinguishes it so powerfully from artificial substitutes.

Notably, human milk is not as nutrient-rich as other mammals' milks, considering it is about 85 percent water (Trevathan, 2010). For other mammals, such as rabbits, it is necessary to have milk richer in fat, protein, and carbohydrates because mothers may be away from their young often and cannot feed as frequently as other mammals. Humans, on the other hand, with milk that is less dense with nutrients, must feed their infants fairly frequently. This adaptation suggests that our ancestors were in highly frequent contact with their infants to nurse, sometimes as often as 4 or 5 times per hour in the months following birth

(Trevathan, 2010). By noting the composition of human breastmilk compared to other mammals' milk, we can challenge rhetoric that mother's milk is "not good enough" for infants and that properly feeding infants requires formula supplementation. When breastmilk is provided for an infant often, those feedings will provide the nutritional benefits a child needs in the early months following birth.

Also worth noting is that breastmilk, unlike formula, is not a one-size-fits-all substance; rather, mothers' milk is finely attuned to the condition of both the infant and the mother, based on a variety of factors (Trevathan, 2010). For example, breastmilk changes in composition depending on the age of the infant. In approximately the first 3 days following birth, colostrum, a substance packed with immunological factors, is produced and released to the infant (Ballard & Morrow, 2013). Yet by the fifth day, the breast begins producing transitional milk with many of the same immunological components as colostrum, but possessing greater nutritional components. Transitional milk assists the rapid growth of the infant, both in size and immunological function during this time. Then, between 4 to 6 weeks after birth, breastmilk is deemed mature, with minor shifts in composition from transitional milk to support further infant growth (Ballard & Morrow, 2013). Moreover, there are differences in milk fat composition not only at particular times of day, but also from the beginning of a breastfeeding session to the end of a breastfeeding session (Ballard & Morrow, 2013).

Additionally, colostrum in mothers who deliver preterm (30 to 37 weeks of gestation) babies tends to be richer in immunological agents than colostrum in mothers who deliver

babies at term (38 to 42 weeks of gestation)(Castellote et al., 2011). In this way, mothers milk may attempt to compensate for early delivery by conferring highly concentrated immunological agents to the infant (Castellote et al., 2011). Interestingly, the same study found that colostrum for babies born very prematurely (before 30 weeks of gestation) had the lowest concentration of certain immunological protections. In this way, the composition of mothers' milk plays a role in the parental investment process; mothers' bodies can compensate for early births but that adaptation may not extend to very preterm, unexpected births. Lower concentrations of immunological agents could suggest that a mothers' body is not prepared to offer extra immunological support to an infant born too early (Castellote et al., 2011).

Other research has provided further evidence that breastmilk and breastfeeding play a crucial role in parental investment. Specifically, the fat composition in breastmilk and duration of breastfeeding may be partially dependent on the sex of the infant (Du & Mace, 2018; Fujita, Roth, Lo, Hurst, Vollner, & Kendell, 2012a; Fujita, Roth, Lo, Hurst, Vollner, & Kendall, 2012b). Depending on the social position of a family, having a son or daughter could increase a parent's likelihood of generational reproductive success. For wealthier families, sons have more resources to attain a mate or mates, whereas for poorer families, sons may not be as able to compete for mates (Fujita et al., 2012a). Thus, the Trivers-Willard hypothesis predicts that wealthier families will invest greater resources in sons and poorer families will invest greater resources in daughters to maximize reproductive success (Fujita et al., 2012a). Researchers have found support for this hypothesis in that poor mothers in

Northern Kenya affected by drought and low-vitamin-A had more fat-rich breastmilk for daughters than for sons and fed daughters longer than sons on average (Fujita et al., 2012a; Fujita et al., 2012b). This finding suggests that breastmilk, in addition to providing benefits to mother and infant, may also be implicitly influenced by optimal parental investment depending on social status and the sex of an infant. Further support for this finding has been discovered in Tibet: although poorer rural families tended to express a preference for sons, daughters were breastfed significantly longer than sons, and breastfed exclusively for significantly longer than sons (Du & Mace, 2018).

Therefore, it is apparent that the composition of breastmilk is uniquely attuned a variety of factors (Du & Mace; Fujita et al., 2012a; Fujita et al., 2012b). Unlike formula, breastmilk adapts to best suit the needs of each mother and infant pair (Castellote et al., 2011). The research on the variable composition of breastmilk provides greater evidence to support the claim that breastfeeding is not solely about nutrition and further distinguishes breastmilk from formula.

Weaning

Another significant aspect of breastfeeding directly related to evolution and parental investment is when mothers and infants choose to wean. As a basic principle, mothers and infants negotiate the amount of time a mother spends nursing: a mother will inherently want to invest the minimum amount of energy required for the infant to survive, whereas an infant will want the mother to invest as much as possible (Allen-Blevins, Sela, & Hunde, 2015). A delicate balance of these factors is necessary for the survival of both the infant and the

mother. Moreover, the mother must determine when the best time to wean is such that the infant can survive and the mother can resume ovulation and transfer resources to the next offspring (McNeilly, 1997). In this section, I will discuss the unique human adaptations for lactation and the way that weaning age is flexible depending on a variety of social and biological factors.

Compared to other great apes, humans wean much earlier, at around 1 to 3 years of age (Kennedy, 2005). In examining other apes' ages of weaning and tracking the development of human teeth and digestive tracts, one would tend to assume that humans, like other great apes, have weaning times around 5 to 6 years. At this time, infants begin the transition to adult teeth and their digestive tracts are more fully able to digest and absorb nutrients from nonmilk foods (Kennedy, 2005). Until around that age, humans have "digestive immaturity" and teeth that are delicate and prone to breakage compared to adult molars (Kennedy, 2005, p.131). Thus rather than body size or weight, dental development, or gastrointestinal development, early human weaning age can be best explained by the large amounts of energy needed to fuel brain development (Kennedy, 2005). In general, brains use extensive quantities of energy, yet for humans, and developing humans, the energy required is greatly increased (Kennedy, 2005). Although breastmilk contains many necessary components for infant growth, it is unable to keep up with the demands of developing brains. Therefore, many scientists hypothesize that human weaning age tends to be earlier than other apes because human infants must supplement breastmilk with other foods to maintain brain growth (Kennedy, 2005).

In this way, human weaning strategies are much different than other apes. As a species, we have developed such that we have early relative brain growth and weaning at the potential risk of increasing infants' exposure to food- and water- borne pathogens (Humphrey, 2010). In this way, large brain development and early weaning go hand in hand (Kennedy, 2005). The adaptive benefit of larger brains has, in our evolutionary past, outweighed the increased risk of potential infection.

There is, however, some flexibility with the age weaning, specifically based on maternal condition and the availability of digestible breastmilk alternatives. Sucrose , an important enzyme for food digestion, is implicated in weaning and its levels in infants vary depending on the condition of the mother. Gomendio, Cassinello, Smith, and Bateson (1995) found that when a nursing mother rat became pregnant, her pups began to increase their production of sucrose to prepare for weaning. They also found that when they restricted some mother rats food intake, they nursed their pups longer than the control group to compensate for nutritional deficits. Interestingly, in spite of weaning times, all of the rat pups had roughly the same body weight at weaning, thereby indicating that the weaning process can vary in length depending on the maternal condition, but can still supply infants with the necessary nutrients for normal development (Gomendio et al., 1995). Thus, weaning is somewhat of a cooperative negotiation between infant and mother.

Taken together, the research on weaning suggests that there is a delicate balance in the human weaning between infant health and brain development and the reallocation of resources to new potential offspring (Kennedy, 2005). That process is reliant on food

availability and the condition of the mother (Gomendio et al., 1995). Moreover, as our society has developed, including with the invention of breastmilk substitutes and social stigma around breastfeeding, age of weaning has become much more flexible and largely truncated (Eaton et al., 1994). Further sections will address several of the consequences, including developmental and health consequences, associated with early weaning.

Other Benefits of Breastfeeding

By examining several of the physiological aspects of breastfeeding, certain obvious benefits emerge: stress reduction, natural birth control, mother-infant bonding, positive affect, and protective feelings toward the infant. Other research further solidifies that breastfeeding is the indisputable best mode of infant feeding. Moreover, breastfeeding confers several health, emotional, and financial benefits to the mother as well—a fact that is often overlooked in public discourse on breastfeeding.

Benefits to the Infant

A common misconception is that breastfeeding is only about providing nutrition to infants. On the contrary, breastfeeding evolved primarily as an immunological defense (Ofstedal, 2012). In fact, several researchers have devoted extensive time and effort into researching the immunological benefits that breastfeeding provides to infants. For instance, colostrum and breastmilk lend protections to infants from respiratory and gastrointestinal infections. Alvarez and colleagues (2013) found that administering an immunological agent, immunoglobulin A, found abundantly in colostrum, to mice infected with tuberculosis significantly lowered the levels of lung tissue damage and the quantity of bacteria in the

lungs. Another study found that colostrum contains an immunological factor that can kill a common type of bacteria largely responsible for diarrhea in infants in economically developing countries (Honorio-França, Carvalho, Isaac, Trabulsi, & Carneiro-Sampaio, 1997). Thus, colostrum may provide protection against particular respiratory and digestive illnesses.

Even further, breastfeeding seems to help with the development of structures crucial to immune function, specifically the thymus. The thymus is known to prepare T cells for immunological competency (Hasselbalch, Jeppesen, Engelmann, Michaelsen, & Nielsen, 1996). Not only do exclusively breastfed infants tend to have larger, more developed thymuses (Hasselbalch et al., 1996), but infants breastfed past 10 months have still larger thymuses (Hasselbalch, Engelmann, Ersboll, Jeppesen, & Fleischer-Michaelsen, 1999). Therefore, infants who are formula-fed may not achieve “normal” immunological development of the thymus. Conversely, infants who are breastfed and breastfed for longer periods of time have stronger immune development and thus potentially greater resistance to infectious disease (Hasselbalch et al., 1999; Hasselbalch et al., 1996).

It is thus clear that breastfeeding is a crucial part of immunological development for infants. However, breastmilk does not only affect an infant, but also the development of crucial microorganisms in an infant’s body. In the early weeks and months following birth, infants’ bodies are hyper-responsive to unfamiliar bacteria, some of which are necessary for proper digestive processes (He, Liu, Leone, & Newburg, 2014). Breastmilk has been shown to affect that hyperreactivity and allow for the successful colonization of helpful bacteria and

the development of the gastrointestinal immune system (He et al., 2014). Moreover, breastfeeding may be important to prevent the development of allergies and autoimmune disorders by affecting immune responses (He et al., 2014; Munblit et al., 2017). Allen-Blevins, Sela, and Hunde (2015) expanded the research on breastfeeding and infants' microbiomes. They found that breastmilk, by "interacting" with an infant's microbiome, can potentially influence infant neurobiology and behavior by theoretically making infants less demanding and more lethargic, and establishing a more social and confident temperament to reduce the age of weaning by increasing reliance on allomothers, or other caregivers (Allen-Blevins, Sela, & Hunde, 2015, p.107). These behavioral changes benefit the mother by potentially reducing maternal investment, given that breastfeeding is a calorically expensive activity. In turn, by introducing other foods and diversifying gut microbiota, infants could partially counteract the effects of breastmilk (Allen-Blevins, Sela, & Hunde, 2015).

In addition to immunological development and behavioral regulation, breastmilk offers a myriad of other long-term benefits to infants. Long-term beneficial correlates of breastfeeding include, but are not limited to reduced risk for developing asthma (Dell & To, 2001), lower blood pressure later in life (Brion et al., 2011; Martin, Gunnell, & Smith, 2005), lower risk for childhood obesity (Brion et al., 2011), and potentially even higher IQ and increased upward mobility (although there may inevitably be confounding variables in these particular studies)(Brion et al., 2011; Martin, Goodall, Gunnell, & Smith, 2007). In taking into account all of this research, it becomes immediately apparent that breastmilk is a crucial component of infant development.

Benefits to the Mother

Often the focus of breastfeeding promotion is placed on infants such that good mothers should breastfeed only for the sake of their infants' wellbeing. Given this emphasis, it is necessary to acknowledge the health benefits for mothers as well. There are benefits to long term metabolic and cardiovascular health, reduced risks of certain breast and reproductive cancers, and financial benefits.

Perhaps the most immediate benefit of breastfeeding for mothers is the increased metabolic rate. Breastfeeding consumes hundreds of extra calories a day, and as such, mothers mobilize fat gained through pregnancy to make up for that caloric expense (Sámano, Martínez-Rojano, Martínez, Jiménez, Rodríguez, Zamora, & Casanueva, 2013). Because extensive weight gain can put women at greater risk for other health problems, it is important to consider that breastfeeding can help return women's bodies to their prepartum state. Moreover, increased metabolism during breastfeeding significantly reduces women's risk of type 2 diabetes (Stuebe, Rich-Edwards, Willett, Manson, & Michels, 2005). Other researchers also found that women who exclusively breastfed lost more weight than women who did not (Sámano et al., 2013).

In the long term, breastfeeding also offers reduced risk of cancer. Since the 1990s, literature has emerged illustrating the effects of earlier menarche (the onset of menstruation), lower levels of breastfeeding, and later menopause in many agriculturally and economically developed nations, all of which increase the number of ovulatory cycles a woman will experience in her lifetime (Eaton et al., 1994). In looking to hunter-gatherer societies, whose

lifestyles most closely match those of our ancestors, the average age of onset for menarche is around 16 years old and the average age of first birth around 19.5 years old. Women in these societies breastfed their children for almost 3 years on average and birth an average of around 6 children in their lifetimes (Eaton et al., 1994). Compared to hunter-gatherer women, on average, American women begin menstruating earlier, have children later and at fewer numbers, and tend to breastfeed for 3 months rather than 3 years. Consequently, American women who live to be 50 have approximately 450 ovulatory cycles and hunter-gatherer women have approximately 160 ovulatory cycles (Eaton et al., 1994). The greater numbers of ovulatory cycles significantly increase American women's risks of developing breast, endometrial, and ovarian cancers (Eaton et al., 1994). The greater number of ovulatory cycles means that women will have greater exposure to reproductive hormones, which are linked to several cancers (Strassman, 1999). Breastfeeding, which suppresses ovulation, reduces the number of exposures that women have to reproductive hormones and thus reduces risk of certain cancers (Rosenblatt, Thomas & The WHO Collaborative Study of Neoplasia and Steroid Contraceptives, 1995). For example, promising research by Rosenblatt and colleagues (1995) found an inverse relationship between long term breastfeeding and risk of endometrial cancer. Given this information, it is imperative that breastfeeding be an accessible choice for women, not just for the sake of their infants, but for their own long term health.

In taking into account many of the health implications, it is unsurprising that there are financial consequences associated with not breastfeeding, as choosing not to breastfeed can

have extensive healthcare costs on both individual and national levels. Even studies going back 20 years have revealed the economic consequences of Americans' low levels of breastfeeding. Given breastfeeding's ability to prevent or reduce respiratory tract infections, ear infections, and gastrointestinal illness, Ball and Wright (1999) found that infants exclusively breastfed for their first 3 months had lower numbers of doctor's office visits, hospitalizations, and prescriptions for medications treating those three illnesses. In terms of medical costs, infants who were never breastfed had individual medical expenses between \$331 and \$475 per year in the late 1990s (Ball & Wright, 1999).

Bartick and Reinhold (2010) also examined the economic effects of not breastfeeding via a cost analysis of infant and childhood illnesses tracked by the Agency for Healthcare Research and Quality (e.g., respiratory infections, SIDS, asthma, leukemia, and several more). The Agency for Healthcare Research and Quality established risk ratios that revealed greater risk for certain illnesses when breastfeeding recommendations are not met. They found that \$13 billion in infant healthcare costs could be saved if 90 percent of American families exclusively breastfed their infants for 6 months, as per physician guidelines. The study also found that over 900 infant deaths could potentially be saved from life-threatening illnesses by breastfeeding (Bartick & Reinhold, 2010).

On a micro level, by choosing to replace breastfeeding with formula can cost women and families thousands per year. For the sake of this example, let us say that a mother chooses to use a popular formula, Enfamil Enspire Infant Formula, which costs around \$0.28 per fluid ounce at Wal-Mart. Using Bonyata's (2019) infant formula cost calculator and

recommendations for formula feeding of a 6 to 9 month old infant, a parent's or family's expenses would be \$7.84 daily, \$54.88 weekly, \$235.20 monthly, and a steep \$2,861.60 yearly. Conversely, Bartick (2011) found that maintaining breastfeeding, which requires an additional 600 to 700 calories a day, with extra food intake is ultimately less expensive than the cost of formula for both families and the U.S. economy. In looking at the average formula cost per year in 2007 and taking into account the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), Bartick (2011) predicts that the U.S. spends approximately \$4.6 billion on infant formula per year. When comparing the costs of formula and medical care for health issues preventable by breastfeeding, they found that breastfeeding for less than 6 months costs the U.S. economy at minimum \$8.7 billion dollars. The cost of providing healthcare to non- or minimally breastfed infants plus the costs of formula dramatically outweighs the cost of additional food *and* breastfeeding support measures (Bartick, 2011).

Taken together, evolutionary and biological research have much to demonstrate in terms of the social and health benefits, as well as the physiological processes associated with breastfeeding. Breastfeeding is an important process for a significant number of reasons: infant immunological development (Alvarez et al., 2013; Hasselbalch et al., 1999; Hasselbalch et al., 1996), lower risk of certain diseases and illnesses for both mothers and infants (Honorio-França et al., 1997; Stuebe et al., 2005), improved metabolism and lower prevalence of obesity in both infants and mothers (Brion et al., 2011; Sámano et al., 2013), maternal stress reduction (Slattery & Neumann, 2008), higher positive affect and lower

depressive symptoms in mothers (Gordon et al., 2010a), mother-infant bonding (Levine et al., 2007), ovulation suppression (McNeilly, 1996), lower healthcare costs (Ball & Wright, 1999; Bartick & Reinhold, 2011) lower financial burdens compared to formula (Bartick, 2011) Thus, it is important that we examine how we can disseminate this research and convince women, families, companies, and governments that breastfeeding is a more than worthwhile endeavor. Nevertheless, that process is complicated, given several significant social constraints on women.

The Social Constraints of Breastfeeding & Policy Directions

In examining the benefits of breastfeeding, it is immediately clear that breastfeeding is not as “optional” as some people would tend to assume. Why then, don’t more women breastfeed in the United States? This is a loaded question. As with any issue, biology and evolution only offer a piece of the puzzle. To understand breastfeeding practices in the U.S., we must look to other important factors, namely economic and social values. For the sake of this thesis, I have chosen 3 major issues out of several that need improvement in order to make breastfeeding a real choice: marketing practices of infant formula, labor issues related to breastfeeding, and the sexualization of breasts. In addition to briefly examining those concerns, I will suggest directions for related policy improvements.

In many ways, American economic values have played a pivotal role in shaping attitudes and practice surrounding women’s breastfeeding. First, the formula industry, which the U.S. government has made few attempts to regulate, has employed unethical and dangerous marketing strategies since the early 1900s at the expense of women and children

that encourage embracing formula use, and subsequently early weaning (Johnston & Amico, 1986; Post, 1985). Second, workplace policies and attitudes surrounding motherhood have forced many women to work rather than breastfeed; a choice to breastfeed rarely exists for working class women and single mothers who must work to support their families (Gerstel & McGonagle, 1999). In this way, labor expectations and corporate environments—environments that predominantly only white, middle and upper class women have the ability to navigate—enforce a separation of breastfeeding and labor. In terms of social values, American culture emphasizes breasts as sexualized objects solely for the male gaze (Stearns, 1999). The sexualization of breasts has numerous implications for how women feel about breastfeeding, duration of breastfeeding, attitudes about public breastfeeding, and even language used in policy (e.g., Johnston-Robledo & Fred, 2008). The sexualization and shame related to breasts may also make women less likely to want to deal with initial discomfort that may accompany breastfeeding (e.g., Johnston-Robledo & Fred, 2008).

Thus, in the aim to make breastfeeding an accessible choice for all women, we must first acknowledge economic, social, and institutional barriers that impede women's ability and desire to breastfeed. The following sections will start by addressing many of these factors and then discuss several related policy directions to promote breastfeeding in a way that is not tone deaf to financial, racial, class, and sexualized barriers.

The Infant Formula Industry

Given the lengthy list of benefits associated with breastfeeding and the higher cost of formula, it is necessary to look at the way formula emerged as a seemingly equal substitute

for breastmilk. It is particularly important given that formula use can impede with breastfeeding ability. Johnston and Amico (1986) tracked oxytocin levels in lactating women to see if there were differences between women who breastfeed exclusively and women who supplemented breastmilk with formula. The women who breastfeed exclusively demonstrated oxytocin peaks that grew progressively higher up to 15 to 24 weeks after their infants' births, whereas mothers who supplemented their infants' diet with formula demonstrated significantly lower levels of oxytocin, with no significantly increasing peaks over that time frame. In addition, the researchers found that prolactin levels in women who supplemented their infants diet with formula decreased significantly compared to the women who breastfed exclusively (Johnston & Amico, 1986). It therefore becomes apparent that supplementing breastfeeding with formula could influence mothers' physiology and affect her ability to produce and release milk over time.

In spite of the international, widespread use of formula today, it did not emerge until the late 19th and early 20th century. The introduction of a breastmilk substitute was remarkable in that it initiated an ideological shift to conceiving of breastfeeding as "optional," or perhaps even undesirable given the alternatives (Hausman, 2003). Moreover, it allowed more equitable divisions of parenting labor and freed women to join the workforce to a greater degree (Hausman, 2003). Yet to convince mothers of the benefits of this shift in infant feeding, early formula creators purchased women's magazine advertisements to directly appeal to mothers. These advertisements misleadingly presented formula as a nutritionally equivalent substitute to breastmilk and even made implications that breastmilk

is inadequate for ideal infant development or too primitive (Kaplan & Graff, 2008). Yet fairly quickly after the development of formula, formula companies somewhat shifted their advertising techniques by working through physicians. Physicians, by serving as a middle man between formula companies and consumers, could profit from formula promotion and sample distribution as well as research and conference funding from the formula industry. Furthermore, they could also maintain scientific authority over women and infants and lend medical credibility to the promotion of infant formula (Kaplan & Graff, 2008).

Formula companies also implemented several other unethical and surreptitious ways of advertising. In addition to promotion by physicians, formula companies often posted advertisements through mediums such as posters in hospitals and baby books (Post, 1985). Formula companies also hired “milk nurses” to impersonate nurses in hospitals and persuade new mothers to feed their infants formula (Post, 1985). This technique is particularly unethical, given that bottle feeding can impede the development of the let-down reflex, and thereby result in premature cessation of breastfeeding (Post, 1985). By interfering with breastfeeding, formula companies could create new consumers reliant on breastmilk substitutes (Post, 1985).

In industrialized countries through the mid 19th century, birth rates began to drop. Consequently, the infant formula industry sought to expand their market into other countries where birth rates were high, particularly into economically developing nations (Baker, 1985). Because there was little information available as to the use of formulas in these countries, malnutrition and infant death rates were rampant for a variety of reasons. Given the expense

of formula, some parents diluted it to save money by extending the life of a supply, resulting in improper nutritional intake (Baker, 1985; Boyd, 2012). Additionally, water-borne pathogens could be passed along to infants if the water was not sterilized, on the basis of either lack of information or lack of access to clean water or means of sterilizing it (Baker, 1985; Boyd, 2012). As a result of what consumers, critics, and public action groups perceived to be exploitative marketing, companies were faced with negative responses from the public and calls to adjust and regulate marketing strategies (Baker, 1985; Kaplan & Graff, 2008).

When a pamphlet called “The Baby Killer” was written in 1974 by journalist Mike Muller critiquing the marketing the strategies of Nestlé and published by a British Charity, it was soon after republished in Switzerland under the title “Nestlé Kills Babies” (Post, 1985). Nestlé subsequently filed a libel suit, bringing about widespread international media attention to the issue of formula marketing (Post, 1985). Following the trial, Nestlé, along with several other companies, gathered to form the International Council of Infant Food Industries (ICIFI). ICIFI hoped to reduce the controversy surrounding the marketing issue by creating a code for ethical advertising. It involved three important stipulations: cessation of commission payments to milk nurses, requirement that milk nurses disclose themselves as members of ICIFI, and reduction of advertising (Post, 1985). Rather obviously, the code misses the mark in terms of preventing unethical marketing practices and did little to improve global advertising strategies.

In response to the shortcomings of the ICIFI's code and several political movements investigating formula marketing in the U.S. senate, the Infant Formula Action Coalition (INFACT) formed in 1975 to bring about a boycott of Nestlé products until significant change was established (Baker, 1985; Post, 1985). The boycott effort received extensive support and media attention, and resulted in efforts made by WHO to establish an international infant formula marketing regulation model, much to the chagrin of the Reagan administration, which saw the boycott as a threat to free market capitalism (Post, 1985).

In the midst of the boycott, WHO and UNICEF worked on creating the International Code of Marketing of Breastmilk Substitutes (Kaplan & Graff, 2008). The Code was designed to serve as a “model for minimum national guidelines” for regulating the marketing of infant formula (Baker, 1985, p. 185). It recommended that marketing include statements that formula use can eventually inhibit lactation as well as recommending that physicians not supply infant formula samples to new mothers (Baker, 1985). The Code also specified that governments should not allow for misleading advertisements, specifically marketing that creates a false equivalency between breastmilk and formula (Kaplan & Graff, 2008). The World Health Assembly accepted this code in 1981. The U.S. was the only nation to vote against it on the basis of preserving an economic free market model and circumventing efforts to regulate marketing of particular goods (Baker, 1985; Kaplan & Graff, 2008). Presumably, this dissent was also rooted in the lobbying efforts of the infant formula industry (Kaplan & Graff, 2008).

Unfortunately, there is almost no enforcement of this code, and several studies have revealed that most countries do not follow the code (Forsyth, 2013; Kaplan & Graff, 2008). In 2011, the International Baby Food Action Network (IBFAN), found that only about a third of Member states transformed the code into policy, and almost a fourth had no policy or regulation whatsoever. The remaining 43 percent of nations had inconsistent and incomplete policy and regulation based on the code's recommendations (Forsyth, 2013). Notably, the U.S. has made no effort to enforce the code and regulate marketing of breastmilk substitutes, and has been rather oppositional to efforts made to further regulate formula marketing strategies (Kaplan & Graff, 2008). In 2018, the World Health Assembly gathered once again to pass a resolution encouraging breastfeeding on the basis of the extensive research on its health benefits for both mothers and infants. It also urged countries to avoid promoting false information in formula campaigns. The U.S. met this resolution with hostility and threats: American delegates threatened that if Ecuador did not change the language in the resolution that asked countries to “protect, promote, and support breastfeeding” and reduce endorsements of breastmilk substitutes (which can be dangerous under certain environmental conditions), then Ecuador would face trade and military consequences from the U.S. (Jacobs, 2018). These threats may be linked to the \$70 billion baby food industry, which has seen declines in sales as wealthier nations have turned to breastfeeding in droves (Jacobs, 2018). Ultimately, the resolution was passed; however, the American delegates were successful in eliminating language that called for the cessation of “inappropriate promotion of food for infants and young children” (Jacobs, 2018).

Moreover, even though the American Medical Association has always communicated their disapproval of direct-to-consumer marketing of breastmilk substitutes, there has been continual direct-to-consumer advertisement of infant formula, as well as physical and hospital distribution of formula samples, coupons, etc. in the U.S. (Cutler & Wright, 2002; Kaplan & Graff, 2008). These promotional materials often present breastfeeding and formula as equivalent options (Hausman, 2003). For instance, there may be symmetrical cost-benefit analysis between the two, even when it is printed that breastmilk is the superior option for infants due to its immunological and social benefits. Thus, with pros such as “convenience” and misleading promises to quell gas and crying, formula may be perceived as an equal alternative to breastfeeding, when the research indicates that it most definitely is not (Hausman, 2003).

This promotion also has a direct impact on the duration of breastfeeding; in a study of almost 550 women, Howard, Howard, Lawrence, Andresen, DeBlieck, and Weitzman (2000) found that promotional materials from formula companies significantly increased the likelihood that women cease breastfeeding in the 2 weeks following the infant’s birth and also predicted decreased breastfeeding duration for women who were undecided about breastfeeding goals following birth. Although these marketing strategies for infant formula are undoubtedly unethical, it is unlikely to change unless serious steps are taken to improve policy (Cutler & Wright, 2002). As policy currently stands, it is almost impossible for formula companies to profit using ethical marketing techniques (Cutler & Wright, 2002). Thankfully, it seems that many U.S. hospitals from 2007 to 2010 significantly reduced their

distribution of infant formula samples (Sadacharan, Grossman, Sanchez, & Merewood, 2011).

Nevertheless, there is another huge reason that formula use is so rampant, especially among lower income women. The Special Supplemental Nutrition Program for Women Infants, and Children (WIC) is an important federal grant program created by the U.S. Department of Agriculture that helps low-income women and infants have access to formula. To be eligible for WIC, infants must be under 1 year of age and women must meet four requirements: categorical, residential, income, and nutritional risk (USDA, 2018). These requirements stipulate that women who receive these benefits must be pregnant, postpartum (up to 6 months) or breastfeeding, as well as being residents of the state in which they apply (USDA, 2018). Beyond those requirements, WIC income standards are set by individual states, but usually hover around the poverty line. The final requirement is that “applicants must be seen by a health professional...who must determine whether the individual is at nutrition risk” (USDA, 2018).

This assistance program is significant in that it makes formula an affordable and accessible option for working mothers who, for whatever reason, may not have the time or ability to breastfeed and struggle to afford breastmilk substitutes. Additionally, It is estimated that WIC provides supplemental nutrition to 53 percent of American infants (USDA, 2018). Yet although this policy is well-meaning and helps many Americans, it does not address major issues at the root of why many impoverished women cannot breastfeed their children or afford formula (reasons that I will address later in this thesis). Moreover, there are several

political and social consequences of this policy related to promotion of various infant formula companies.

Specifically, the U.S. government, which accounts for 50 percent of the U.S. market, is one of the largest buyers of infant formula (Kaplan & Graff, 2008). Formula companies have learned to take advantage of this fact by offering rebates in exchange for a deal with the state to only distribute the formula of that brand. Even further, the rebate to WIC may only be used to research issues related to the program, “thereby providing a broader consumer base of potential formula purchasers” (Kaplan & Graff, 2008, p. 497). Some formula companies will even designate their products as “WIC approved” or “WIC eligible” on the packaging against the USDA’s guidelines, in order to suggest government approval of their products. Thus, WIC becomes another promotional opportunity for the formula industry (Kaplan & Graff, 2008).

Kaplan and Graff (2008) also discuss several strategic levels of change to increase breastfeeding. On an individual level, they suggest that health providers, encouraged by local governments, increase education for health providers, thus providing more trained lactation coordinators and hospital staff and increase opportunities for women and families in areas with adverse health outcomes to learn about breastfeeding and have breastfeeding support. New York’s Department of Health and Mental Hygiene (DOHMH) hires individuals to make home visits to new mothers and infants after hospital release. They also have the largest Nurse-Family Partnership that has nurses make home visits for low income women who have given birth for the first time to support breastfeeding and the transition to motherhood

(Kaplan & Graff, 2008). At the institutional and community level, Kaplan and Graff (2008) suggest that communities distribute information for breastfeeding support, hospitals implement breastfeeding initiatives, and local governments implement lactation room and breast pump programs for workplaces. At the policy levels, they argue that there should be increased monetary support for WIC to promote breastfeeding.

In sum, one of the first aspects of breastfeeding advocacy is to challenge the way the formula industry has infiltrated research and medical institutions and unethically marketed breastmilk substitutes. The U.S. must adhere to WHO guidelines and pass legislation that regulates the marketing of formula. Furthermore, there must be greater educational and support programs surrounding breastfeeding so that new mothers do not go into breastfeeding blind and can learn about the positive (e.g., mother-infant bonding and health benefits) and negative implications (e.g., temporary discomfort with nipple cracking) of breastfeeding. Although formula has increased women's agency and ability to participate in the workforce, it comes at a cost to women and children. Addressing women's labor issues related to paid maternity leave, breast pumping support, and onsite childcare, are necessary to make breastfeeding a true choice.

Women's Labor

Another significant factor related to breastfeeding practice in the U.S. has to do with the need for women's labor. In many ways, the U.S. has policies that are quite unfriendly to breastfeeding mothers, especially low income women and women of color. There is no guaranteed paid maternity leave, only a conditional 12 weeks of unpaid leave, and there is no

guaranteed onsite childcare (Ingraham, 2018). These policies are unlike many other economically developed countries and efforts should be made to ensure paid maternity leave and begin transitioning to onsite childcare facilities.

In 1993, President Clinton, through the Family and Medical Leave Act (FMLA), ensured that women received 12 weeks of *unpaid* leave in companies of over 50 people that they have worked at for over a year (Gerstel & Armenia, 2009). Thus, American mothers are not guaranteed paid maternity leave. Additionally, employers may prevent workers in the top 10 percent of highest earnings “if they can show that giving leave would cause them considerable hardship” (Gerstel & Armenia, 2009, p.168). This American policy is shocking when compared to the paid maternity leave that other economically developed nations have offered to new mothers: Finland offers three years, Norway offers 91 weeks, The U.K. offers 39 weeks, and Canada offers a year of paid leave (Ingraham, 2018). In this way, American economic attitudes that prioritize the choice of companies on whether to provide paid leave, cause new families financial vulnerability and make it difficult for mothers to receive paid leave to breastfeed and care for new infants, particularly since only around 14 percent of civilian American workers have access to paid leave (Ferrante, 2019). Currently, only the states of California, New Jersey, New York, and Rhode Island have legislation guaranteeing paid family leave (Salam, 2019).

Moreover, the language in FMLA excludes several types of families explicitly or implicitly. In taking into account employers who do not fall under FMLA requirements and workers who are ineligible for FMLA, only about 47 percent of American workers are

eligible (Gerstel & Armenia, 2009). For instance, FMLA does not cover single-parent households or unmarried or cohabitating partners (Gerstel & Armenia, 2009). Troublingly, these exclusions often leave out families who most need to take leave for breastfeeding and childcare. Married couples, especially middle and upper class married couples, have more leeway to temporarily take unpaid leave than single-income households. Single mothers, by comparison are unlikely to be able to afford to take unpaid leave to breastfeed (Gerstel & Armenia, 2009). Given the high poverty rate among single parent households, policy surrounding leave needs to be changed, especially given that diminished breastfeeding in low income demographics can exacerbate poor health consequences and increase medical bills (Gerstel & Armenia, 2009; Bartick, 2011).

Given these constraints, Gerstel and McGonagle (1999) unsurprisingly found that although lower income women and black women were much more likely than other demographics to report that they needed maternity leave, they were much less likely to take a leave than higher income women and white women. In fact, they found that black women were half as likely to take maternity leave as white women (Gerstel & McGonagle, 1999). Thus, in order to improve policy surrounding family leave, it is critical to take into account factors such as family structure, race, and class.

It does seem that paid family leave is on its way to becoming a bipartisan effort (Salam, 2019). An act called the Family Act, which aims to change some aspects of FMLA, has been introduced every year in congress since 2013, and has recently been reintroduced. In February, democratic U.S. Senator Kirsten Gillibrand and U.S. Representative Rose

DeLauro re-proposed the Family Act. Under this legislation, Americans could receive “up to 12 weeks of paid leave at 66 percent of their monthly wages,” and even part-time and self-employed people would be eligible (Salam, 2019). It is also predicted that it will increase the amount of people eligible for leave benefits to around 60 percent of the workforce (Salam, 2019). Even the Trumps have voiced their support for paid leave; however, they advocate for 6, rather than 12 weeks of paid leave (Salam, 2019).

Ultimately, given that the government and medical professionals strongly recommend exclusive breastfeeding for at least 6 months, and most women have to return to work within 2 weeks of birth, it seems that if the government wants to advocate “breast is best,” it must make efforts to ensure that *all* women have the ability to breastfeed (Ferrante, 2019). As such, I, among several others, believe that the goal should be to attain 6 months of paid leave, on par with several other economically developed countries (Ferrante, 2019; Ingraham, 2018). Breastfeeding is a crucial aspect of maternal health, mental and physical, and infant health and social development. Given that length of maternal leave is positively correlated with lowered depressive symptoms (Dagher, McGovern, & Dowd, 2014), and breastfeeding is associated with lower depressive symptoms, uterine healing and recuperation, and even long term lowered risk of obesity and certain cancers (Heinig & Dewey, 1997), we should ensure that women, regardless of socioeconomic status, race, and class have the actual choice to breastfeed, not just for their infants, but for themselves.

One additional avenue to consider is onsite childcare and support for breast pumping at workplaces. At the end of any kind of maternity leave, if a mother would like to continue

to breastfeed her child, they should be able to. Currently, hourly workers are protected under the 2010 Break Time for Nursing Mothers Law in the Fair Labor Standards Act to take breaks to breast pump during shifts. They are guaranteed a private space to do so uninterrupted (Bonyata, 2018). In 2017, new legislation called the Supporting Working Moms Act was introduced by democratic U.S. Representative Carolyn Maloney to expand the protections to breastfeeding women who have salaries, rather than hourly wages, such as teachers (U.S. Congress, 2017). The act was referred to the House Committee on Education and the Workforce where it has been awaiting further action since July 2017 (U.S. Congress, 2017). A major goal of breastfeeding advocacy should be to push for this legislation and expand protections to around 12 million women (Bonyata, 2018).

Breast pumping protections are an immediate goal that breastfeeding advocates can and should push for; however, to maximize benefits of breastfeeding, it is worthwhile to look into onsite childcare at workplaces. If women were able to take breaks to breastfeed their onsite infants, they could maximize the benefits of breastfeeding while remaining productive at work. As it currently stands, American parents cover the significant majority of childcare costs, unlike other nations who cover childcare predominantly from corporate and government subsidies (Schulte, 2018). In the U.S. companies rarely offer childcare services and rarely help in shouldering the costs of childcare (Schulte, 2018). In considering optimal breastfeeding patterns, promoting onsite childcare can help alleviate not only breastfeeding conflicts and childcare expenses, but also help businesses retain female employees and promote employee productivity and loyalty. Through my research, I have discovered that the

Patagonia headquarters stands out as a prime example for how businesses compensate for several other issues by providing onsite childcare. Patagonia's CEO, Rose Marcario, has estimated a large return, around 91 percent, on Patagonia's investment into onsite childcare (Marcario, 2016).

First, the government offers financial incentives in order to promote onsite childcare. Not only can companies who provide onsite childcare receive a \$150 thousand tax credit, but they can also qualify for a 35 percent tax deduction of the total operating costs for their childcare program (Marcario, 2016). Patagonia estimates that it spends \$1 million per year on their childcare program, meaning they can deduct \$350 thousand each year, and thus receive a total of \$500 thousand in tax benefits. In tax benefits alone, Patagonia has a 50 percent reimbursement on their investment (Marcario, 2016).

Additionally, their childcare program helps them retain employees and maximize productivity, particularly from female employees who take maternity leave and mothers worried about childcare issues (Marcario, 2016). Although 20 to 35 percent of professional American mothers do not return to their jobs after maternity leave, *all* of the women from 2011 to 2016 who left Patagonia for maternity leave have returned. Patagonia largely credits onsite childcare for this return rate. They estimate that they save money, around 30 percent of what they pay on childcare services, by avoiding turnover costs of replacing employees, including "lost productivity while the position is vacant, plus recruitment, relocation, and training time" (Marcario, 2016). Moreover, another major issue with not providing onsite childcare is that parents are less engaged and worried about childcare. A Child Care Aware

(2017) report estimates childcare falling through costs U.S. businesses \$4.4 billion in productivity. Thus, by providing onsite childcare, Patagonia describes that their employees are much more engaged in their work, which improves customer interactions and profits (Marcario, 2016). By having more engaged employees who do not have to miss work because of inconsistent childcare, Patagonia almost completely recoups their investment. Furthermore, their CEO expresses satisfaction at being able to retain many women in management, employee loyalty, and a positive and family-oriented workplace (Marcario, 2016).

In sum, choosing formula over breastfeeding is not much of a choice—it is a necessity for many women who cannot afford to take unpaid leave. Campaigns such as “breast is best” ignore that choice to breastfeed is only available to a relatively small group of American women. Breastfeeding advocates must seek to make breastfeeding an accessible option by targeting leave policies, breast pumping rights in the workplace, and onsite childcare provisions.

The Sexualization of Breasts

In American culture today, breasts’ function is perceived as predominantly sexual; their presence is a symbol of femininity and heterosexuality (Stearns, 1999). Therefore, in this section, I will describe the way that the sexualization of breasts affects breastfeeding practice, including duration. Research on this problem also reveals that the sexualization of breasts also disproportionately affects women of color. After discussing the implications of

this phenomenon, I will describe current policy on public breastfeeding and where policy must still be improved.

The sexualization of breasts is such a dominant facet of American body expectations of women, that people will often attempt to enhance their breasts with clothes or surgeries (Stearns, 1999). As Stearns (1999) puts it, “the prominence of the sexualized breast poses a problem for breastfeeding women and their maternal bodies” (309). There is often a perception that mothers are not sexual, that they are completely separate from their sexuality while they are pregnant and breastfeeding. Thus, breastfeeding may be controversial because it blurs the line between the sexual and the maternal (Stearns, 1999). Although Hrdy argues that the maternal is the sexual, American cultural expectations are not quite on the same page. In fact, given the sensual sensations that accompany breastfeeding, there are cultural expectations on the perceived appropriateness of breastfeeding and breastfeeding duration. Karen Carter, in the early 1990s, was separated from her 2-year-old daughter for almost a year, when she admitted to feelings of “mild arousal” as she fed her daughter on a mothering help line (Bartlett, 2005). Prosecutors built their case by touting Carter’s supposedly excessive sex with men prior to her pregnancy and suggesting that she had some sort of pathological sexuality (Hausman, 2003).

More realistically, Carter was punished not for abnormal sexual experiences and urges, but for violating the constructed separation of motherhood from sexuality. Some theorists argue that the harsh punishment of maternal sexuality is a reflection of an androcentric, heterosexual model of sexuality, in which female sexuality outside of

heterosexual sex is socially illegitimate (Bartlett, 2005). Moreover, as breastfeeding is often perceived as an optional choice of infant nutrition and biosocial and physiological responses in both mothers and infants are often ignored, to make such a choice “represent[s] an inappropriate sexuality on the part of a mother toward her children” (Hausman, 2003, p. 83).

The sexualization of breasts may even contribute to women’s attitudes about breastfeeding and public breastfeeding. Johnston-Robledo and Fred (2008) examined the way that internalized sexual objectification of women affects low income pregnant women’s attitudes about breastfeeding and sexuality. They administered a self-objectification scale as well as scales that measured things such as infant feeding intents, comfort with public breastfeeding, and concerns about breastfeeding to a group of women sampled from a WIC enrollment list. Women who scored highly on the self-objectification scale were more likely to worry about their sexuality, bodies, and public breastfeeding than those who had scored lower (Johnston-Robledo & Fred, 2008). These findings suggest that the internalized sexualization of breasts may even influence some mothers’ feelings about breastfeeding overall and in public. Shame and embarrassment about breastfeeding in public could make some women less likely to do so (Johnston-Robledo & Fred, 2008). Consequently, avoidance of breastfeeding can have negative effects on both mothers and infants (e.g., Bartick, 2011).

There are also racial implications in the sexualization of breasts and breastfeeding. Necessarily, given the scope of this thesis, I cannot fully delve into the United States’ extensive legacy of stereotyping women of color as hypersexual; however, breastfeeding fits into that discourse well. In the U.S., both historically and today, women of color, particularly

black women, have been demeaned and abused because of their imagined hypersexuality. During the time of American slavery, African slave women were sexually abused and treated as primitive “breeders,” to increase the assets of a slave owner because they were perceived as inherently sexually excessive (Hobson, 2018); supposedly enlarged breasts and buttocks were a symbol of their “natural” hypersexuality to be displayed and examined in slave auctions (Hobson, 2018)

In several ways, this hypersexualized history has persisted into current times, and many black women feel pressure to engage in respectability politics, in which they actively attempt to defy harmful stereotypes about women of color (Blum, 1999; Hausman, 2003). With regard to breastfeeding, respectability politics tends to make black women less likely to breastfeed, given the sexualization of both breasts and women of color. As Hausman (2003) describes: “by breastfeeding in a work setting, black women would risk representing themselves as sexual, which they could ill afford to do” (p.45). At the same time, there are social consequences for *not* breastfeeding. Exclusive motherhood, or choosing to devote time to one’s infant rather than one’s career is often socially perceived as the most moral and selfless choice a mother could make. Not breastfeeding or staying home with one’s infant is frowned upon and scorned in many circles (Blum, 1999). Yet at the same time, exclusive motherhood and breastfeeding are a “white domestic ideal,” inaccessible not only to women of color, but also many working class women. (Blum, 1999, p.9). The history of these women’s labor as wetnurses and slaves and servants and caregivers reflects such a fact (Blum, 1999).

Thus, the choice to breastfeed emerges as a privilege for educated, middle and upper class white women who are able to do any combination of the following: take off work to breastfeed, have a workplace that accommodates breastfeeding or pumping, and afford to defy the sexualization of women's breasts. Given this privilege, it is irresponsible to promote "breast is best" rhetoric and shame women who do not breastfeed when many factors are in place to discourage it. Although breastfeeding is an issue related to women's health, it is also an issue irrevocably tied to race and class. In order to encourage breastfeeding, we must not only look to adjusting healthcare institutions, but also to challenging many social and institutional barriers outside of healthcare. As with many feminist issues, heterosexual middle class white women's experiences of motherhood and sexuality cannot be extrapolated and applied to all women. Acknowledging intersectionality is ultimately a necessary component of breastfeeding advocacy.

Furthermore, given the sexualized nature of breasts, it was not until the summer of 2018 that public breastfeeding was legalized in all fifty states, with Idaho and Utah finally getting on board with the rest of the U.S., Australia, and the UK (Archambault, 2018). The bill in Idaho was supported unanimously; however, the Utah legislation faced criticism for its wording, which said that public nursing would be allowed "irrespective of whether the woman's breast is uncovered during or incidental to the breastfeeding" (Davidson, 2018). A Republican representative, Curt Webb, announced that "This seems to say you don't have to cover up at all. I'm not comfortable with that, I'm just not. It's really in your face" (Davidson, 2018). The hesitation seemed to stem from fear that an uncovered breast for

breastfeeding would ignite widespread indecency with breastfeeding, and thus the controversial language was removed for the bill to pass (Davidson, 2018). Nevertheless, the passage of the bill ensured that breastfeeding is at the very least legal in all American public spaces.

In spite of the legalization of public breastfeeding nation-wide, many nursing women still face backlash. The laws themselves do not offer much protection to breastfeeding women, and there are several loopholes through which business owners can discriminate against nursing women, such as claiming the woman is a trespasser (Port). Jake Marcus, a specialist in breastfeeding law, describes that “the property rights of others override the breastfeeding right” (Port). There have been numerous documented incidents, even within the last year or so of the legalization of public breastfeeding, in which women were told to cease breastfeeding and go somewhere else. Moreover, some women may be subject to indecent exposure laws in certain states for failure to breastfeed “modestly,” as only 30 states and Washington D.C. excuse breastfeeding from public indecency laws (National Conference of State Legislatures, 2019). Searching online yields countless examples of how women face discrimination and even legal battles for public breastfeeding.

In July of 2018, a police officer told a breastfeeding woman at the Richmond Airport that she needed to breastfeed in the restroom or she would be charged with indecent exposure (Tyree, 2018). After filing a complaint, the airport issued a public apology and reaffirmed that the woman had not broken any laws (Tyree, 2018). At a Nebraska shopping mall in December of 2018, a nursing woman was confronted by a mall security guard who informed

her that there were nursing rooms available (Solé, 2018). After thanking the man and letting him know she had no intentions of moving, he expressed exasperation and detailed the complaints against her. After the woman wrote a Facebook response that garnered widespread attention, the shopping mall apologized (Solé, 2018). In New Jersey in August of 2018, a town worker approached a woman at a public pond and told her to breastfeed elsewhere (Eustachewich, 2018). When the woman refused, the worker called the police, who ultimately took the side of the breastfeeding mother (Eustachewich, 2018). Although these women were not charged with any crimes, they were negatively affected by social stigma around public breastfeeding.

Other women, after facing discrimination or legal consequences in response to breastfeeding turn to protest and legal action. After two breastfeeding mothers in Minnesota were asked to “cover up” or leave a public pool in the summer of 2018, they refused and the police were called to remove them. A few days later, dozens of mothers gathered outside the pool, with some women driving up to 90 miles to participate in the “nurse-in protest” (Campisi & Ahmed, 2018). The city then issued a weak apology promising its support for breastfeeding and its plan to look over policy and procedure (Campisi & Ahmed, 2018). The two breastfeeding women are planning to file a discrimination lawsuit against the city (Campisi & Ahmed, 2018).

A woman in Kentucky has similarly attempted to pursue legal action after being asked by a manager to cover up as she nursed her daughter in a Texas Roadhouse. Although it is legal for her to breastfeed her daughter uncovered, uncovered nursing is critically

important, as her daughter has a medical condition — already treated twice through surgery — that makes latching difficult during breastfeeding and impossible while covered (Stump, 2018). The woman received no initial apology from Texas Roadhouse until 50 members of La Leche League of Louisville protested via a “nurse-in” at the restaurant (Stump, 2018). Currently, the breastfeeding mother has filed a lawsuit with the goal of a financial settlement for “mental pain and suffering” (Stump, 2018). Thus, given the technical legality of breastfeeding, but the lag in social enforcement and acceptance of it, the experiences of all of these women reflect an urgent need for greater enforcement of breastfeeding laws and provisions that make it illegal to discriminate against or interfere with public breastfeeding.

Women in North Dakota attempted to do just that by changing and strengthening the legislation in their state earlier this year. The wording of the current state legislation reads: “If the woman acts in a discreet and modest manner, a woman may breastfeed her child in any location, public or private, where the individual and child are otherwise authorized to be” (Smith & Hoffman, 2019). Thus, the law is written in such a way that women can be charged with indecent exposure if they are not perceived as “discreet” or “modest” while breastfeeding (MacPherson, 2019). Consequently, the new bill was designed to eliminate the subjective and “outdated” language, and also make it illegal to impede a mother’s breastfeeding with a fine of up to \$1 thousand (MacPherson, 2019). The new bill reads: “an individual may breastfeed her child in any location, public or private the individual and child are otherwise authorized to be. It is an infraction to prohibit or attempt to prohibit an individual from breastfeeding as authorized under this section” (Smith & Hoffman, 2019).

Many legislators had adverse reactions to the bill, and North Dakota's judiciary chamber reflected those reactions by giving it an 11 to 3 "do not pass" recommendation (Smith & Hoffman, 2019). Of those 14 in the chamber, only 4 are women, and only one of those women did not approve of the bill (MacPherson, 2019). When the legislation went to a vote, it was struck down with a vote of 61 to 32 (it is also worth noting that the legislature of 141 people only consists of 30 women). Taken together, the fate of this bill and the reactions of people across the nation to breastfeeding suggest that the legal and social struggle for breastfeeding rights is far from over in the public arena.

That being said, some strides have been made to provide private spaces in public areas for women to breastfeed their infants. For instance, the Friendly Airports for Mothers Act (FAM), signed into law by President Trump in October, requires that all U.S. airports have designated "lactation areas" (outside of restrooms) in every terminal that are away from view and lockable. They must also be accessible for people with disabilities and have seating, a flat surface, and an electrical outlet on the inside (Praderio, 2018). Additionally, the government will provide grants to assist in covering the financial cost of making changes in accordance with FAM (Praderio, 2018). Still, this legislation does not do enough to tackle the stigma around breastfeeding and further enforces the idea that breastfeeding is something that requires privacy. The next important step with legislation on public breastfeeding is to both provide private spaces for women who wish to use them while also imposing fines and other consequences on those who interfere with public breastfeeding.

Therefore, lawmakers and women are unfortunately still deeply affected by sexualized perceptions of breasts. Although public breastfeeding is technically legal, laws must be strengthened to enforce women's right to breastfeed wherever and however they need to. Challenging depictions of breasts as heterosexual male playthings is necessary to reduce the stigma around breastfeeding.

Discussion

To conclude, our species, named for the ability of its female members to produce a nutritious and immunological substance, has a deep evolutionary history of lactation (Schiebinger, 1993). Originally evolved as a way to protect eggs from harmful microbiota (Ofstedal, 2012), lactation has shifted into a complex physiological and behavioral process that dramatically shapes the experience of female mammals and mammal young. At the onset of the suckling stimulus of young mammals, a cascade of hormones in the mother's body produce a variety of outcomes, and the infant takes an active role to maximize its own benefit from breastfeeding (Trevathan, 2010).

As I described earlier, 3 major hormones are implicated in the ability of mothers to breastfeed and all have a variety of adapted behavioral effects. Prolactin, which is necessary for the production of milk, is also implicated in maternal aggressive or hostile behaviors and lower levels of stress (Hahn-Holbrook et al., 2011). Thus, prolactin serves a dual purpose of allowing for the creation of milk and promoting protective behaviors to maximize the infant's survival chances (Svare & Gandleman, 1976). Luteinizing hormone suppresses ovulation to ensure that the mother cannot conceive again too soon after her last birth

(McNeilly, 1996). Greater levels of breastfeeding increase the amount of time that ovulation is suppressed and longer intervals between births ensure that the mother does not exhaust her energetic resources, and that the child survives long enough to wean to other, non-breastmilk foods (McNeilly, 1996). In order to prevent the arrival of another sibling, infants will stimulate the breasts as much as they can, even when not nursing (Prieto et al., 1996). Third, oxytocin, has many functions, including the release of breastmilk (Trevathan, 2010), the development of the let-down reflex (McNeilly et al., 1983), sensual pleasure in the mother during breastfeeding (Bartlett, 2005), positive affect (Gordon et al., 2010a), and mother-infant and familial bonding (Bartels & Zeki, 2003; Gordon et al., 2010b). Ultimately, understanding the roles of these hormones can allow us to better understand the experience of motherhood and challenge social and cultural norms that project an inaccurate image of motherhood as a non-sensual, nurturing time, devoid of aggression, hostility, and sexuality.

Moreover, unlike several popular conceptions of breastfeeding, breastmilk is not a one-sized fits all substance. It is specially tailored to suit the needs of each unique mother and infant pair, based on factors such as infant sex and maternal condition (Fujita et al., 2012a; Fujita et al., 2012b). For example, when a mother is pregnant or nutritionally deprived or an infant is born prematurely, the quality of milk changes to account for those factors (Castellote et al., 2011; Gomendio et al., 1995). Further, breast milk goes beyond infant feeding to become an important factor in the development of the immune system (Hasselbalch et al., 1999; Hasselbalch et al., 1996), infant temperament (Allen-Blevins, Sela, & Hunde, 2015), and as a preventative measure for a variety of ailments, including

gastrointestinal and respiratory infections (Alvarez et al., 2013; Honorio-França et al., 1997), high blood pressure (Brion et al., 2011; Martin, Gunnell, & Smith, 2005), and obesity (Brion et al., 2011). Breastfeeding also helps mothers reduce depressive symptoms, lose weight after pregnancy, and prevent health problems such as type 2 diabetes and various cancers (e.g., Heinig & Dewey, 1997), which are related to increased numbers of ovarian cycles (Eaton et al., 1994). Financially, breastfeeding is less expensive for individual families than formula use in terms of both healthcare costs, as breastfeeding protects from many infant illnesses, and the annual cost of formula (Ball & Wright, 1999; Bartick & Reinhold, 2010; Bonyata, 2019). On a macro-level, not breastfeeding has significant effects on U.S. healthcare expenditures, and formula costs the U.S. government, and thereby the tax payers, several billion dollars per year (Bartick, 2011).

Given these many benefits of breastfeeding, it seems like common sense to encourage women to breastfeed and ask that workplaces and the government craft policies to allow women to do so. Nevertheless, American breastfeeding rates are considerably low, stemming from historic rhetoric about breastfeeding being primitive and subpar compared to formula (Hausman, 2003; Post, 1985). It is thus necessary to examine the social, cultural, and economic factors that influence breastfeeding practices. In the U.S., the formula industry had a significant part in shaping the problematic misconceptions about breastfeeding (Kaplan & Graff, 2008). By employing unethical marketing techniques, it has suppressed breastfeeding rates, leading to a variety of health problems internationally and a dependence on infant formula (Baker, 1985; Boyd, 2012). Although formula use has in many ways offered greater

agency to women, it is not a perfect substitute for breastfeeding, and has had several adverse effects on women and children (Bartick, 2011). In order to address this factor, the obvious solution is to pass regulations on formula marketing and promote and subsidize educational opportunities that help inform and support breastfeeding women. Yet in the same breath, formula dependence can only be challenged by increasing opportunities for working women to breastfeed with financial and institutional support.

Currently, the U.S. federal government does not ensure access to paid family leave; only California, New Jersey, New York, and Rhode Island guarantee paid leave (Salam, 2019). Rather, the U.S. offers 12 weeks of unpaid leave (Ingraham, 2018). Rather obviously, this policy is problematic for working class women who cannot afford to take 12 weeks off without pay (Gerstel & Armenia, 2009). Working toward paid maternity leave is thus a necessary component of breastfeeding advocacy. Another goal should also be to extend breast pumping rights at work to women who hold salaried positions (Bonyata, 2018). Women should be able to pump breastmilk as they need to, in a private space, without being penalized. Further, if employers can be convinced to provide onsite childcare services, many issues related to mothering and breastfeeding can be alleviated while also providing several benefits to businesses, including tax breaks, female employee retention, and increased productivity (Marcario, 2016). It also allows women to breastfeed onsite, rather than pump. Labor issues must be addressed in order to prevent healthcare and financial consequences from compounding as a result of not breastfeeding for working class and impoverished

women, who already face steep healthcare and financial troubles (Gerstel & Armenia, 2009; Bartick, 2011).

Yet even still, these policy directions do not fully address the complicated issue of the sexualization of women's breasts. Breasts are publicly perceived as objects geared toward the satisfaction of heterosexual men; this perception has numerous implications for women of color and for public breastfeeding and public indecency laws (Blum, 1999; Stearns, 1999). Women are socially or even legally penalized for breastfeeding for too long and breastfeeding in public, as it defies social expectations that maternity and sexuality should be separate and private (Hausman, 2003; Stearns, 1999). Moreover, women of color, who are already hypersexualized, may avoid breastfeeding and thereby avoid further sexualization (Hausman, 2003). In order to promote breastfeeding, issues such as self-objectification and respectability politics must be considered (Hausman, 2003; Johnston-Robledo & Fred, 2008). Further, although public breastfeeding is technically legal, women may still be subject to public indecency laws and interruptions (National Conference of State Legislatures, 2019). Therefore, already existing laws must be strengthened in language to penalize those who impede women's right to breastfeed publicly and exempt breastfeeding women from public indecency laws entirely.

Taken together, I believe this thesis serves as an example for how different disciplines can come together to attempt to create a strong approach in improving women's and children's lives. It is often the case that differences between disciplines such as evolutionary biology and sociology prevent the synthesis and integration of findings and approaches. But

by bringing together many factors, we can have a multidimensional, and more complete approach to solutions. I would like to provide an example of how uni-dimensional methods are limited in seeking optimal solutions. In doing research for this thesis, I came across an article boldly titled “Breastfeed at your own risk” (Artis), published by the American Sociological Association in 2009. In this article, Artis (2009) makes several claims about the nature of breastfeeding as a “cultural imperative” (p.30). In fact, their argument emphasizes that breastfeeding is a culturally variable practice, with weak scientific evidence for its benefits to children. They further discuss the way that the “breast is best” rhetoric is ignorant of the social constraints placed on women of color and working class women, essentializes gender roles in caregiving, and prioritizes infants’ needs over mothers’ needs (Artis, 2009).

Artis is right in several ways: breastfeeding *is* significantly culturally influenced. That is why there is so much variability in breastfeeding practice within America and even between Americans and hunter-gatherers (Eaton et al., 1994). In the U.S., new mothers are often forced into culturally prescribed roles based on the intersection of identities related to gender, race, and class. “Breast is best” rhetoric, which emphasizes shaming rather than supporting, does little to acknowledge that exclusive breastfeeding for 6 months is absurdly unrealistic for many American women. Additionally, the promotion of breastfeeding often focuses on infants rather than mothers and undoubtedly leaves uncomfortable questions about gendered divisions of parenting labor in heterosexual relationships, several of which I will discuss in my afterword. Yet at the same time, Artis (2009) fundamentally and

erroneously undermines the complex dynamics of breastfeeding, socially and physiologically.

Breastfeeding is a part of a relationship, a process rather than a product. It is indeed a necessary component of infant immune development and nutrition (e.g., Hasselbalch et al., 1996); however, it is also undoubtedly important for women's postpartum health (e.g., Saxton et al., 2015). Moreover, breastfeeding represents a cooperative process of bonding and development, a process unique to each mother and infant pair depending on a variety of environmental factors (e.g., Gomendio et al., 1995). Although breastfeeding practices themselves vary by culture and social constraints, breastfeeding is not solely a cultural product. To deny its evolutionary origins and importance biologically is to prioritize the ego of a discipline over the actual wellbeing of women and children, just as to blindly promote the biological benefits of breastfeeding without acknowledging social limitations is to enforce an oppressive, simple essentialist notion of women.

In order to truly serve all mothers, we must consider the ways that race and class affect women and breastfeeding. To truly serve marginalized women, it is irresponsible to say that breastfeeding is merely a mode of infant feeding with weak scientific support. The dearth of research supporting the social, physiological, health, and economic benefits is astonishing. Ignoring such research and presenting formula use as an equivalent option does not serve women; rather, it can exacerbate health and economic consequences associated with poverty. When only privileged white women breastfeed, other demographics do not benefit from the fact that breastfeeding is less expensive than formula use, which can cost

well over \$1,500 per year, and that breastfeeding significantly reduces adverse healthcare outcomes and costs (Bartick, 2011; Bonyata, 2019). Artis (2009), in problematizing “breast is best,” failed to separate critiques of the campaign from the value of breastfeeding.

I have ultimately chosen to highlight this article as it perfectly demonstrates the need for an interdisciplinary examination of this topic, and many other topics related to women’s health. Only approaching this issue from an evolutionary or biological standpoint can ignore many social realities, as we have seen with the breast is best campaign; however, only approaching this this issue from a social constructionist perspective can negatively affect women and infants in terms of health and finance by making formula seem like an equivalent option. Therefore, by knowing the evolutionary origins and physiological mechanisms of breastfeeding, along with the sociological approaches to understanding gender, race, and class, allows us to more effectively approach this issue, with the ultimate goal of improving lives and increasing equity. Moreover, by adding additional layers of cultural and economic analysis, we can have a more well-rounded approach that emphasizes the benefits or drawbacks of having particular policies related to breastfeeding. Ultimately, all women, regardless of race or class, should have the ability to make an informed choice on whether to breastfeed their infants. Evolution and biology, incorporated with social sciences, can help us make informed policy decisions and goals around breastfeeding, just as Julie Seaman (2005) has used them to help make informed workplace policy directions about sexual harassment by understanding male behavioral patterns.

There are also several extensions of this thesis which are worth mentioning, even though they did not find their way into specific sections. One of the obvious applications of this thesis has to do with wet-nursing, which has historically reflected the exploitation of women's reproductive labor by other women (Hrdy, 1999). There are several physical and economic consequences associated with wet nursing. Historically and to this day, women have hired wet nurses to provide their children with all the benefits of breastfeeding, but without the corresponding ovulation suppression (Hrdy, 1999). Consequently, these elite women could maximize both fertility and infant survival. Yet for the wet nurses, who often left their own children in order to financially support their families, faced ovulation suppression and could not pay as much attention to their own infants. As a result, wet nurses experienced lowered fertility and lowered infant survival rates compared to the women who paid them (Hrdy, 1999). In this way, there is a direct connection between evolutionary tendencies and exploitation of marginalized women. Wealthy women exploited, and continue to exploit, the reproductive labor of poor women, women of color, and immigrants for the benefit of their own offspring, at the expense of marginalized groups.

Further, there are several other areas in which evolutionary approaches can be applied to modern medicine. By understanding the origins of particular biological tendencies and processes, we can better approach treatment. Moreover, evolutionary research can highlight mismatches between how our bodies have developed and how we live in our modern societies, as societies evolve much more quickly than our bodies. I would highly recommend reading further into this topic with Trevathan's (2010) *Ancient Bodies Modern Lives*, which

discusses evolutionary medicine in the context of female fertility and motherhood that goes beyond breastfeeding. I would also recommend Lieberman's (2013) *The Story of the Human Body*, which more generally describes the mismatches between our evolved tendencies and social and dietary practices.

In addition to these directions for other research, I will list a few more topics that involve interesting applications of evolutionary science and breastfeeding or problems that need further consideration. One of the more significant critiques I found in the feminist literature about breastfeeding promotion is that there is little acknowledgment of the transmission of HIV and environmental pollutants to infants via breastmilk (Artis, 2009). In places like the U.S., mothers with HIV are encouraged to use formula; however, in areas that lack safe water to mix with formula, mothers are encouraged to breastfeed to maximize their infants' survival chances (Artis, 2009). Although it is not a major focus of my thesis, breastfeeding advocates must also consider approaches for women who cannot or should not breastfeed, potentially in the form of breastmilk banks (Human Milk Banking Association of North America, 2019). Furthermore, it is foolish to think that infant formula would not also contain environmental pollutants and formula manufacturing and shipment would not also contribute to environmental pollution (Wolf, 2007).

Nevertheless, there are several other limitations of this thesis. When I began planning the outline, the scope could have easily encompassed several full length books. Although I significantly narrowed the topic down from where I began, breastfeeding literature across many disciplines is abundant and diverse with several interesting and noteworthy avenues for

examination and evaluation in order to inform policy direction. That being said, I had to choose certain elements to highlight over others for major policy directions. Moreover, I struggled with certain questions that arose regarding women's agency and biological essentialism, which I will address in the afterword.

Afterword

As I have written this thesis, I have had to grapple with several issues about gender. Breastfeeding is a unique ability of female mammals (for the most part) and comes with innumerable benefits to infants and mothers. What then, does breastfeeding mean for women? What does it mean for the gendered division of parenting labor that women are an integral part of infant development and that breastfeeding is important to women's health? What does breastfeeding research reveal about the nature of essentialism? I will further explore these questions in the remainder of this section.

According to McCarter-Spaulding (2008, p. 207), there is a "feminist problem of breastfeeding" that "arises because breastfeeding is sex-specific, and therefore challenges the feminist principle of gender-neutral childrearing." Given that this is the nature of breastfeeding, a necessary component of advocacy must acknowledge to some degree that there are biological differences between the sexes, and legal approaches that attempt to ignore or reduce those differences may not serve breastfeeding mothers. Rather, it may be necessary to consider special protections for breastfeeding parents, who have a unique, embodied role in motherhood (McCarter-Spaulding, 2008). At the same time, I am not sure

of how gendered divisions of parenting can be renegotiated to account for this biological difference.

Further, as a believer in women's right to choose what they do with their bodies, I found myself questioning what the evolutionary and biological research on breastfeeding means for women's freedom. There is always a danger of the naturalistic fallacy, in equating what is natural with what is morally right; however, the literature on breastfeeding is fairly unambiguous as to the benefits to mothers and children. What does it mean that mothers, that women, are an integral part of this process? How can we promote and encourage breastfeeding without limiting women's agency? Can we come up with other solutions to ensure mother and infant wellbeing that are not necessarily tied to our evolutionary past? Is there an option for infant development and the parent-infant relationship that is equivalent to breastfeeding and gender-neutral? I wish that I could resolve these questions, however, they remain an uncomfortable and currently unresolvable remnant of the conflict that arises from combining such different disciplines. They are questions that must be considered as breastfeeding rights are advanced. Nevertheless, given that the U.S. is not at a point where breastfeeding is even a choice for most women because of racial and socioeconomic inequality, the aim of my thesis is to hopefully provide policy directions that can provide greater numbers of people with the ability to make an informed choice in the first place.

Moreover, I frequently struggled with the tension between essentialism and feminism as I wrote. Historically, biological essentialism was simple, demeaning, and quite ignorant—blinded by prejudice invented by men to justify many forms of oppression. In fact, several

evolutionary theorists, even through the late 70s, used pseudo-evolutionary arguments as a tool to deny women agency. For a theorist like Donald Symons, for something like orgasm to have evolved for a reproductive advantage was absurd (1979). In his mind, women only orgasm because men do, making female orgasm akin to a bear riding a unicycle, able to do so, but not adapted to (Symons, 1979).

Yet Sarah Blaffer Hrdy, a feminist anthropologist, has really helped shift the conversation surrounding biology, evolution, and female reproductive agency. They reinforce the idea that women have an active role in sexual selection and are reproductive and sexual agents as much as men (Hrdy, 1999). Unlike what other evolutionary theorists have proposed, Hrdy emphasizes that women are not passive, inherently nurturing mothers and sexual recipients; rather, women and mothers make both unconscious biological choices and active, conscious choices to increase the likelihood of having and rearing successful offspring (Hrdy, 1999). Under this paradigm, aggression, ambition, and resource acquisition all fall under the umbrella of “maternal” behaviors. Therefore, those who argue that a mother’s place is solely in the home is sorely mistaken, as work in many ways is as maternal as breastfeeding for mothers. Hrdy (1999) ultimately makes a compelling case that subverts the rhetoric that work and sexuality are separate from motherhood:

To classify maternal sensations as ‘sexual,’ and therefore in puritanical minds to condemn them, is to privilege sexuality in a very nonpuritanical way, implying that sexual sensations are more important than equally powerful sensations that reward women for caring for babies. We might just as logically describe various orgasmic

contractions during lovemaking as ‘maternal.’ These responses by lactating mother mammal to her baby’s suckling long antedated sexual responsiveness to breast stimulation in heterosexual (or any type of intimate) contacts. Propaganda from androcentric sources like Playboy notwithstanding, the feelings we identify as sexual were originally maternal. This is why, even in contemporary women, it should not surprise us that erotic arousal in the mother during breast-feeding can be inseparably linked in ways that are not just true for paternity and male erotic experience” (p.538-39).

In many ways, Hrdy’s (1999) descriptions of mothers is empowering and contrary to the way many scholars have historically denied mothers agency and ambition. Despite the way that her work has led me personally to find empowerment in evolutionary science—especially with her descriptions of the evolutionary origins of other biological mechanisms like orgasm (because I have not had any children)—she still argues for a form of essentialism of motherhood. Her idea of essentialism massively expands definitions of maternal behavior, but it is essentialism nonetheless. When lactation is a defining feature of one sex of our class of animals, breastfeeding thus lends itself to the meta-conflict of examining evolution and biology in conjunction with other social sciences, a tension between essentialism and agency.

Undoubtedly, the simple essentialism that projects an image of mothers as passive reproductive objects with no agency is wrong, morally and scientifically. Yet what about a complex essentialism that credits women with agency, power, and ambition? Can complex essentialism be empowering in that it argues that women are inherently agentic? Or is

essentialism inherently wrong? I am not sure that I will ever have the answers, yet these questions are worth asking.

It is my hope that by bringing evolution and biology and sociology and women and gender studies together, that we can thoughtfully consider these questions. Although their implications can be uncomfortable and challenging, they bring up the essence of the conflict between such disciplines. In addressing them, we can move toward a greater synthesis of and communication between disciplines, as a multidimensional approach is vital to making informed policy decisions that have more power to improve the lives of women and children.

Works Cited

- Allen-Blevins, C. R., Sela, D. A., & Hinde, K. (2015). Milk bioactives may manipulate microbes to mediate parent-offspring conflict. *Evolution, Medicine, and Public Health*, 106-121. doi:10.1093/emph/eov007
- Alvarez, N., Otero, O., Camacho, F., Borrero, R., Tirado, Y., Puig, A., ... Acosta, A. (2013). Passive administration of purified secretory IgA from human colostrum induces protection against *Mycobacterium tuberculosis* in a murine model of progressive pulmonary infection. *BMC Immunology*, 14(53), 1-4.
- Archambault, A. (2018). Breastfeeding in public is now legal in all 50 states—and people say it’s about time. *Insider*. Retrieved from <https://www.thisisinsider.com/public-breastfeeding-legal-in-50-states-2018-7>
- Artis, J. E. (2009). Breastfeed at your own risk. *Contexts*, 8(4), 28-34.
doi: 10.1525/ctx.2009.8.4.28.
- Baker, J. C. (1985). The international infant formula controversy: a dilemma in corporate social responsibility. *Journal of Business Ethics*, 4(3), 181-190.
- Ball, T. M., & Wright, A. L. (1999). Health care costs of formula-feeding in the first year of life. *Pediatrics*, 103(4), 870-876.
- Bartels, A., & Zeki, S. (2004). The neural correlates of maternal and romantic love. *NeuroImage*, 21, 1155-1166. doi:10.1016/j.neuroimage.2003.11.003
- Bartick, M. (2011). Breastfeeding and the U.S. economy. *Breastfeeding Medicine*, 6(5), 313-318. doi: 10.1089/bfm.2011.0057

- Bartick, M., & Reinhold, A. (2010). The burden of suboptimal breastfeeding in the United States: a pediatric cost analysis. *Pediatrics*, e1048-e1056. doi: 10.1542/peds.2009-1616
- Bartlett, A. (2005). Maternal sexuality and breastfeeding. *Sex Education*, 5, 67-77.
<https://doi.org/10.1080/146818142000301894>
- Belkhir, J. (1994). Race, sex, class & “intelligence”: scientific racism, sexism, & classism. *Race, Sex & Class*, 1(2), 53-83.
- Blum, L. M. (1999). *At the Breast: Ideologies of Breastfeeding and Motherhood in the Contemporary United States*. Boston, MA: Beacon Press.
- Bonyata, K. (2018). Your rights as a breastfeeding employee. *Kelly Mom*. Retrieved from <https://kellymom.com/bf/pumpingmoms/employed-moms/your-rights-as-a-breastfeeding-employee/>
- Bonyata, K. (2019). Financial costs of not breastfeeding. *Kelly Mom*. Retrieved from <https://kellymom.com/pregnancy/bf-prep/bfcostbenefits/#table2>
- Boyd, C. (2012). The Nestlé infant formula controversy and a strange web of subsequent business scandals. *Journal of Business Ethics*, 106, 283-293.
doi 10.1007/s10551-011-0995-6
- Brion, M. A., Lawlor, D. A., Matijasevich, A., Horta, B., Anselmi, L., Araújo, C. L., ... & Smith, G. D. (2011). What are the causal effects of breastfeeding on IQ, obesity and blood pressure? Evidence from comparing high-income with middle-income cohorts. *International Journal of Epidemiology*, 40, 670-680. doi:10.1093/ije/dyr020

- Cacchioni, T. (2009). Heterosexuality and 'the labour of love': a contribution to recent debates on female sexual dysfunction. *Sexualities, 10*(3), 299-320.
doi: 10.1177/13634607078320
- Campisi, J., & Ahmed, S. (2018). 2 moms were scolded for breastfeeding at a pool. More than a dozen others joined them in protest. *CNN*. Retrieved from <https://www.cnn.com/2018/07/24/health/breastfeeding-moms-pool-protest-trnd/index.html>
- Castellote, C., Casillas, R., Ramírez-Santana, C., Pérez-Cano, F. J., Castell, M., Moretones, M. G., ... Franch, A. (2011). Premature delivery influence the immunological composition of colostrum and transitional and mature human milk. *The Journal of Nutrition, 141*(6), 1181-1187.
- Child Care Aware. (2017). Parents and the high cost of child care. *Child Care Aware of America, 2017 Report*, 1-36.
- Chokshi, N. (2019). Ohio's fetal heartbeat abortion ban is latest front in fight over Roe v. Wade. *The New York Times*. Retrieved from <https://www.nytimes.com/2019/04/12/us/ohio-abortion.html>
- Cutler, B. D., & Wright, R. F. (2002). The U.S. infant formula industry: is direct-to-consumer advertising unethical or inevitable? *Health Marketing Quarterly, 19*(3), 39-55.

- Dagher, R. K., McGovern, P. M., & Dowd, B. E. (2014). Maternity leave duration and postpartum mental and physical health: implications for leave policies. *Journal of Health, Politics, Policy, and Law*, 39(2), 369-416. doi: 10.1215/03616878-2416247
- Davidson, L. (2018). Protection of breastfeeding in public will go into law after signed by governor. *The Salt Lake Tribune*. Retrieved from <https://www.sltrib.com/news/politics/2018/01/23/bill-seeks-to-clearly-allow-breastfeeding-in-public/>
- Dell, S., & To, T. (2001). Breastfeeding and asthma in young children. *Archives of Pediatrics and Adolescent Medicine*, 155, 1261-1265.
- Domjan, M. (2005). Pavlovian conditioning: a functional perspective. *Annual Review of Psychology*, 56, 179-206.
- Du, J., & Mace, R. (2018). Parental investment in Tibetan populations does not reflect stated cultural norms. *Behavioral Ecology*, 29(1), 106-116. doi:10.1093/beheco/arx134
- Eaton, B., Pike, M. C., Short, R. V., Lee, N. C., R Trussell, J., Hatcher, R. A.,... & Hurtado, A. M. (1994). Women's reproductive cancers in evolutionary context. *The Quarterly Review of Biology*, 69(3), 353-367.
- Eustachewich, L. (2018). Town worker calls cops on woman breastfeeding daughter. *New York Post*. Retrieved from <https://nypost.com/2018/08/03/town-worker-calls-cops-on-woman-breastfeeding-daughter/>
- Farmer, B., & Fortier, J. (2019). Republican state lawmakers split over anti-abortion strategy. *NPR*. Retrieved from https://www.npr.org/sections/healthshots/2019/04/12/712501336/republican-state-lawmakers-split-over-their-anti-abortion-strategies?utm_

source=facebook.com&utm_medium=social&utm_campaign=npr&utm_term=nprnews&utm_content=20190412&fbclid=IwAR2IMCppejjWVSSQ0dtuLkw-xgFGT7ubGezwEzbTGUR6OPdJt1Wfd3RjYHA

Ferrante, M. B. (2019). In the fight for paid parental leave, 6 months should be the minimum.

Forbes. Retrieved from <https://www.forbes.com/sites/marybethferrante/2019/01/10/in-the-fight-for-paid-parental-leave-6-months-should-be-the-minimum/#47529ade2073>

Fleming, A. S., Ruble, D. N., Flett, G. L., & Shaul, D. L. (1988). Postpartum adjustment in first-time mothers: relations between mood, maternal attitudes, and mother-infant interactions. *Developmental Psychology, 24*(1), 71-81.

Forsyth, S. (2013). Non-compliance with the International Code of Marketing of Breast Milk Substitutes is not confined to the infant formula industry. *Journal of Public Health, 35*(2), 185-190. doi:10.1093/pubmed/fds084

Fuchs, A. R., Ayromlooi, J., & Rasmussen, A. B. (1987). Oxytocin response to conditioned and nonconditioned stimuli in lactating ewes. *Biology of Reproduction, 37*, 301-305.

Fujita, M., Roth, E., Lo, Y., Hurst, C., Vollner, J., & Kendell, A. (2012a). In poor families, mother's milk is richer for daughters than sons: a test of Trivers-Willard hypothesis in agropastoral settlements in Northern Kenya. *American Journal of Physical Anthropology, 49*, 53-59. doi: 10.1002/ajpa.22092

Fujita, M., Roth, E. A., Lo, Y., Hurst, C., Vollner, J., & Kendell, A. (2012b). Low serum vitamin A mothers breastfeed daughters more often than sons in drought-ridden

- northern Kenya: a test of the Trivers-Willard hypothesis. *Evolution and Human Behavior*, 33, 357-364. doi:10.1016/j.evolhumbehav.2011.11.006
- Gallup, G. G., & Hobbs, D. R. (2011). Evolutionary medicine: bottle feeding, birth spacing, and autism. *Medical Hypotheses*, 77, 345-346.
- Gerstel, N. & Armenia, A. (2009). Giving and taking family leaves: right or privilege? *Yale Journal of Law & Feminism*, 21(1), 161-184.
- Gerstel, N. & McGonagle, K. (1999). Job leaves and the limits of the family and medical leave act: the effects of gender, race, and family. *Work and Occupations*, 26(4), 510-534.
- Gomendio, M., Cassinello, J., Smith, M. W., & Bateson, P. (1995). Maternal state affects intestinal changes of rat pups at weaning. *Behavioral Ecology and Sociobiology*, 37(2), 71-80.
- Gordon, I., Zagoory-Sharon, O., Leckman, J. F., & Feldman, R. (2010a). Oxytocin and the development of parenting in humans. *Biological Psychiatry*, 68(4), 377-382.
doi:10.1016/j.biopsych.2010.02.005
- Gordon, I., Zagoory-Sharon, O., Leckman, J. F., & Feldman, R. (2010b). Oxytocin, cortisol, and triadic family interactions. *Physiology & Behavior*, 101, 679-684.
doi:10.1016/j.physbeh.2010.08.008
- Gorewit, R. C., Wachs, E. A., Sagi, R., & Merrill, W. G. (1983). Current concepts on the role of oxytocin in milk ejection. *Journal of Dairy Sciences*, 66, 2236-2250.

- Hahn-Holbrook, J., Holt-Lunstad, J., Holbrook, C., Coyne, S. M., & Lawson, E. T. (2011). Maternal defense: breast feeding increases aggression by reducing stress. *Psychological Science, 22*(10), 1288-1295. doi: 10.1177/0956797611420729
- Harmon, A. (2018). Why white supremacists are chugging milk (and why geneticists are alarmed). *The New York Times*. Retrieved from <https://www.nytimes.com/2018/10/17/us/white-supremacists-science-dna.html>
- Hasselbalch, H., Engelmann, M. D. M., Ersboll, A. K., Jeppesen, D. L., & Fleischer-Michaelsen, K. (1999). Breast-feeding influences thymic size in late infancy. *European Journal of Pediatrics, 158*, 964-967.
- Hasselbalch, H., Jeppesen, D. L., Engelmann, M. D. M., Michaelsen, K. F., & Neilsen, M. B. (1996). Decreased thymus size in formula-fed infants compared with breastfed infants. *Acta Paediatrica, 85*, 1029-1032.
- Hausman, B. L. (2003). *Mother's Milk: Breastfeeding Controversies in American Culture*. New York, NY: Routledge.
- He, Y., Liu, S., Leone, S., & Newburg, D. S. (2014). Human colostrum oligosaccharides modulate major immunologic pathways of immature human intestine. *Nature, 7*(6), 1326-1339. doi:10.1038/mi.2014.20
- Heinig, J. M., & Dewey, K. G. (1997). Health effects of breast feeding for mothers: a critical review. *Nutrition Research Reviews, 10*, 35-56.
- Heinrichs, M., Meinschmidt, G., Neumann, I., Wagner, S., Kirschbaum, C., Ehlert, U., & Hellhammer, D. H. (2001). Effects of suckling on hypothalamic-pituitary-adrenal axis

- responses to psychosocial stress in postpartum lactating women. *The Journal of Clinical Endocrinology & Metabolism*, 86(10), 4798-4804.
- Heise, S. & Lippke, J. (1997). Role of female aggression in prevention of infanticidal behavior in male common voles, *Microtus arvalis* (Pallas, 1779). *Aggressive Behavior*, 23, 293-298.
- Hobson, J. (2018). Remnants of Venus: signifying black beauty and sexuality. *Women's Studies Quarterly*, 46(1), 105-120. <https://doi.org/10.1353/wsq.2018.0015>
- Honorio-França, A. C., Carvalho, M. P. S. M., Isaac, L., Trabulsi, L. R., & Carneiro-Sampaio, M. M. S. (1997). Colostral mononuclear phagocytes are able to kill enteropathogenic *Escherichia coli* opsonized with colostral IgA. *Scandinavian Journal of Immunology*, 46, 59-66.
- Howard, C., Howard, F., Lawrence, R., Andresen, E., DeBlieck, E., & Weitzman, M. (2000). Office prenatal formula advertising and its effect on breast-feeding patterns. *Obstetrics & Gynecology*, 95(2), 296-303.
- Howie, P. W., & McNeilly, A. S. (1982). Effect of breast-feeding patterns on human birth intervals. *Journal of Reproduction and Fertility*, 65, 545-557.
- Hrdy, S. B. (1999). *Mother Nature: Maternal Instincts and How They Shape the Human Species*. New York, NY: Ballantine Books.
- Human Milk Banking Association of North America. (2019). About: mission and vision. *Human Milk Banking Association of North America*. Retrieved from <https://www.hmbana.org/about-us/mission.html>

- Humphrey, L. T. (2010). Weaning behavior in human evolution. *Seminars in Cell & Developmental Biology*, 21, 453-461. doi:10.1016/j.semcdb.2009.11.003
- Ingraham, C. (2018). The world's richest countries guarantee mothers more than a year of paid maternity leave. The U.S. guarantees nothing. *The Washington Post*. Retrieved from https://www.washingtonpost.com/news/wonk/wp/2018/02/05/the-worlds-richest-countries-guarantee-mothers-more-than-a-year-of-paid-maternity-leave-the-u-s-guarantees-them-nothing/?utm_term=.86105d3ee12b
- Jacobs, A. (2018). Opposition to breast-feeding resolution by U.S. stuns world health officials. *The New York Times*. Retrieved from <https://www.nytimes.com/2018/07/08/health/world-health-breastfeeding-ecuador-trump.html>
- Johnston-Robledo, I., & Fred, V. (2008). Self-objectification and lower income pregnant women's breastfeeding attitudes. *Journal of Applied Social Psychology*, 38(1), 1-21.
- Johnston, J. M. & Amico, J. A. (1986). A prospective longitudinal study of the release of oxytocin and prolactin in response to infant suckling in long term lactation. *Journal of Clinical Endocrinology and Metabolism*, 62(4), 653-657.
- Kaplan, D. L., & Graff, K. M. (2008). Marketing breastfeeding—reversing corporate influence on infant feeding practices. *Journal of Urban Health*, 85(4), 486-504. doi:10.1007/s11524-008-9279-6
- Kennedy, G. E. (2005). From the ape's dilemma to the weanling's dilemma: early weaning and its evolutionary context. *Journal of Human Evolution*, 48, 123-145. doi:10.1016/j.jhevol.2004.09.005

- Kinz, T. H., & Hosken, D. J. (2008). Male lactation: why, why not and is it care? *Trends in Ecology and Evolution*, 24(2), 80-85.
- Ledesma, J. A., De Luis, J. M., Montejo, A. L., Llorca, G., & Perez-Urdaniz, A. (1988). Maternal aggression in human beings. *New Trends in Experimental and Clinical Psychiatry*, 4(4), 223-228.
- Levine, A., Zagoory-Sharon, O., Feldman, R., & Weller, A. (2007). Oxytocin during pregnancy and early postpartum: individual patterns and maternal-fetal attachment. *Peptides*, 28, 1162-1169. doi:10.1016/j.peptides.2007.04.016
- Lieberman, D. (2013). *The Story of the Human Body: Evolution, Health, and Disease*. New York, NY: Pantheon Books.
- MacPherson, J. (2019). Mothers lobby to change North Dakota breastfeeding law they call outdated. *Rapid City Journal*. Retrieved from https://rapidcityjournal.com/news/local/govt-and-politics/mothers-lobby-to-change-north-dakota-breastfeeding-law-they-call/article_141cada4-ddcb-50ad-8a38-9c9b39450f2f.html
- Maestriperi, D., & D'Amato, F. R. (1991). Anxiety and maternal aggression in house mice (*Mus musculus*): a look at interindividual variability. *Journal of Comparative Psychology*, 105(3), 295-301.
- Maines, R. P. (1999). *The Technology of Orgasm: "Hysteria," the Vibrator, and Women's Sexual Satisfaction*. Baltimore, MD: The Johns Hopkins University Press.

- Marcario, R. (2016). Patagonia's CEO explains how to make on-site child care pay for itself. *Fast Company*. Retrieved from <https://www.fastcompany.com/3062792/patagonias-ceo-explains-how-to-make-onsite-child-care-pay-for-itself>
- Martin, R. M., Gunnell, D., & Smith, G. D. (2005). Breastfeeding in infancy and blood pressure later in life: systematic review and meta-analysis. *American Journal of Epidemiology*, *161*(1), 15-26. doi: 10.1093/aje/kwh338
- Mastrogiacamo, I., Fava, M., Fava, G. A., Kellner, R., Grismondi, G., & Cetera, C. (1982-83). Postpartum hostility and prolactin. *International Journal of Psychiatry in Medicine*, *12*(4), 289-294. doi: 10.2190/6K03-E32R-NJA4-9C3F
- McCarter-Spaulling, D. (2008). Is breastfeeding fair? Tensions in feminist perspectives on breastfeeding and the family. *Journal of Human Lactation*, *24*(2), 206-212. doi: 10.1177/0890334408316076
- McNeilly, A. S. (1996). Breastfeeding and the suppression of fertility. *Food and Nutrition Bulletin*, *17*(4), 1-6.
- McNeilly, A. S. (1997). Lactation and fertility. *Journal of Mammary Gland Biology and Neoplasia*, *2*(3), 291-298.
- McNeilly, A. S., Robinson, I. C. A. F., Houston, M. J., & Howie, P. W. (1983). Release of oxytocin and prolactin in response to suckling. *British Medical Journal*, *286*, 257-259.

- National Conference of State Legislatures. (2019). Breastfeeding state laws. *National Conference of State Legislatures*. Retrieved from <http://www.ncsl.org/research/health/breastfeeding-state-laws.aspx>
- Oftedal, O. T. (2012). The evolution of milk secretion and its ancient origins. *Animal*, 6(3), 355-368.
- Olazábal, D. E. (2018). Role of oxytocin in parental behavior. *Journal of Neuroendocrinology*, 1-13. doi: 10.1111/jne.12594
- Port. Breastfeeding in public: know your legal rights. *Parents*. Retrieved from <https://www.parents.com/baby/breastfeeding/basics/breastfeeding-in-public-know-your-legal-rights/>
- Post, J. E. (1985). Assessing the Nestlé boycott: corporate accountability and human rights. *California Management Review*, 27(2), 113-131.
- Praderio, C. (2018). Breastfeeding rooms are now required in all major U.S. airports, thanks to a new law. *Insider*. Retrieved from <https://www.thisinsider.com/breastfeeding-rooms-required-major-us-airports-law-2018-10>
- Prieto, C. R., Cardenas, H., Salvatierra, A. M., Boza, C., Montes, C. G., & Croxatto, H. B. (1996). Sucking pressure and its relationship to milk transfer during breastfeeding in humans. *Journal of Reproduction and Fertility*, 108, 69-74.
- Rosenblatt, K. A., Thomas, D. B., & The Who Collaborative Study of Neoplasia and Steroid Contraceptives. (1995). Prolonged lactation and endometrial cancer. *International Journal of Epidemiology*, 24(3), 499-503.

- Sadacharan, R., Grossman, X., Sanchez, E., & Merewood, A. (2011). Trends in hospital distribution of industry-sponsored infant formula sample packs. *Pediatrics*, *128*(4), 702-705. doi: 10.1542/peds.2011-0983
- Salam, M. (2019). Could the U.S. get paid family leave? It's looking better than ever. *The New York Times*. Retrieved from <https://www.nytimes.com/2019/02/15/us/paid-family-leave.html>
- Sámamo, R., Martínez-Rojano, H., Martínez, E. G., Jiménez, B. S., Rodríguez, G. P. V., Zamora, J. P., & Casanueva, E. (2013). Effects of breastfeeding on weight loss and recovery or pregestational weight in adolescent and adult mothers. *Food and Nutrition Bulletin*, *34*(2), 123-130.
- Saxton, A., Fahy, K., Rolfe, M., Skinner, V., & Hastie, C. (2015). Does skin-to-skin contact and breast feeding at birth affect the rate of primary postpartum haemorrhage: results of a cohort study. *Midwifery*, *31*, 1110-1117.
<http://dx.doi.org/10.1016/j.midw.2015.07.008>
- Schiebinger, L. (1993). Why mammals are called mammals: gender politics in eighteenth-century natural history. *The American Historical Review*, *98*(2), 382-411.
- Schino, G., D'Amatao, F. R., & Troisi, A. (2004). Maternal aggression in lactation female Japanese macaques: time course and interindividual variation. *Canadian Journal of Zoology*, *82*, 1975-1979. doi: 10.1139/Z04-183
- Schulte, B. (2018). The corporate case for childcare. *Slate*. <https://slate.com/human-interest/2018/02/the-corporate-case-for-childcare.html>

- Seaman, J. A. (2005). Form and (dys)function in sexual harassment law: biology, culture, and the spandrels of Title VII. *Arizona State Law Journal*, 321-433.
- Skrundz, M., Bolten, M., Nast, I., Hellhammer, D. H., & Meinlschmidt, G. (2011). Plasma oxytocin concentration during pregnancy is associated with development of postpartum depression. *Neuropsychopharmacology*, 36, 1886-1893.
doi:10.1038/npp.2011.74
- Slattery, D. A., & Neumann, I. D. (2008). No stress please! Mechanisms of stress hyporesponsiveness of the maternal brain. *Journal of Physiology*, 586(2), 377-385.
doi: 10.1113/jphysiol.2007.145896
- Smith, R., & Hoffman, M. (2019). Update: house says no to passing breastfeeding bill. *West Dakota Fox*. Retrieved from <https://www.kfyrtv.com/content/news/Breast-Feeding-Bill--505693641.html>
- Solé, E. (2018). Mom stopped by mall security guard for public breastfeeding says critics should 'get over it.' *Yahoo*. Retrieved from <https://www.yahoo.com/lifestyle/mom-stopped-mall-security-guard-public-breastfeeding-says-critics-get-125804566.html>
- Stearns, C. A. (1999). Breastfeeding and the good maternal body. *Gender & Society*, 13(3), 308-325.
- Stracqualursi, V. (2019). Texas legislators considering making abortion potentially punishable by death. *CNN*. Retrieved from <https://www.cnn.com/2019/04/10/politics/texas-legislature-abortion-bill/index.html>

- Strassman, B. I. (1999). Menstrual cycling and breast cancer: an evolutionary perspective. *Journal of Women's Health, 8*(2), 193-202.
- Stuebe, A. M., Rich-Edwards, J. W., Willett, W. C., Manson, J. E., & Michels, K. B. (2005). Duration of lactation and incidence of type 2 diabetes. *Journal of the American Medical Association, 23*, 2601-2610.
- Stump, S. (2018). Mom suing Texas Roadhouse over public breastfeeding incident. *Today*. Retrieved from <https://www.today.com/parents/mom-suing-texas-roadhouse-over-public-breastfeeding-incident-t144220>
- Svare, B. & Gandleman, R. (1976). Suckling stimulation induces aggression in virgin female mice. *Nature, 260*(5552), 606-608.
- Symons, D. (1979). The female orgasm: adaptation or artifact? In *The Evolution of Human Sexuality*, 75-95. New York, NY: Oxford University Press.
- Trevathan, W. (2010). *Ancient Bodies, Modern Lives: How Evolution Has Shaped Women's Health*. New York, NY: Oxford University Press.
- Trivers, R. L. (1972). Parental investment and sexual selection. In Bernard Campbell (Ed.), *Sexual Selection in the Descent of Man* (pp.136-179). Chicago, IL: Aldine Publishing Company.
- Tyree, E. (2018). Richmond airport apologizes after breastfeeding mom asked to stop, move somewhere discreet. *ABC 13 News*. Retrieved from <https://wset.com/news/local/richmond-airport-apologizes-after-breastfeeding-mom-asked-to-stop-move-somewhere-discreet>

U.S. Congress. (2017). H.R.3255- Supporting Working Moms Act of 2017. *Library of Congress*. Retrieved from <https://www.congress.gov/bill/115th-congress/house-bill/3255>

United States Department of Agriculture. (2015). Women, Infants, and Children (WIC). *United States Department of Agriculture*. Retrieved from <https://www.fns.usda.gov/wic/about-wic-wic-glance>

Wambach, K., & Riordan, J. (2016). *Breastfeeding and Human Lactation* (5th ed.). Burlington, MA: Jones & Bartlett Learning.

Wolf, J. B. (2007). Is breast really best? Risk and total motherhood in the national breastfeeding awareness campaign. *Journal of Health Politics, Policy and Law*, 32(4), 595-636. doi: 10.1215/03616878-2007-018

Yuen, K. W., Garner, J. P., Carson, D. S., Keller, J., Lembke, A., Hyde, S. A., ...& Parker, K. J. (2014). *Journal of Psychiatric Research*, 51, 30-36.
<http://dx.doi.org/10.1016/j.jpsychires.2013.12.012>