COMPLIANCE AND CONCORDANCE: PREVALENCE AND PREDICTORS OF BREASTFEEDING IN SURVIVORS OF CHILDHOOD ABUSE

by

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DEDICATION

For the patients who got me into this, and the nurses who got me out of it.

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ABSTRACT

Background Breastfeeding is a complex relational act that takes place within the context of women's lives and histories, which can include childhood maltreatment trauma (CMT) and its sequelae, including PTSD. Little is known about how a history of abuse affects breastfeeding outcomes. This study looks at breastfeeding outcomes using both public health and woman-centered outcome measures using a trauma-informed theoretical approach that incorporates any history of CMT and PTSD.

A second aim of the dissertation is to develop a woman-centered adjunct outcome measurement of breastfeeding success, called "concordance". This refers to the degree to which the woman's intended feeding method matches her actual feeding method. Traditional measurement of breastfeeding success assesses compliance with public health recommendations that include duration and exclusivity. While acknowledging the benefits of breastfeeding, concordance instead centers the woman and her decision about the optimal approach to feeding her infant and subsequent experience in following her intention. This acts as an opportunity for women to create ownership both of the breastfeeding experience, and of her success as a breastfeeding woman. Concordance (positive) was defined as whether the woman breastfed at least as much as intended.

Methods This study was a secondary analysis of 519 women, with data collected at three points in the perinatal year. Bivariate analyses compared whether the woman was breastfeeding at 6

weeks with each variable. These variables were entered into two hierarchical stepwise logistic regressions based on a trauma-informed theoretical framework, using both the traditional public health and concordance woman-centered outcome measures.

Findings Women with a history of CMT were more likely to intend to breastfeed than those without. Women with a history of CMT who did not have PTSD were more likely to breastfeed their infants than were other women. There were no significant differences in the woman-centered outcome between groups. Significantly, the majority of women did not have concordant outcomes.

In the regression analyses, eight variables accounted for 60.6% of the variance in the public health outcome measure, and three variables accounted for 19.1% of the variance in the woman-centered outcome measure. In the public health regression, both CMT and PTSD are predictive of breastfeeding outcomes – CMT is associated with a threefold increase in the likelihood of breastfeeding, and PTSD reduces the likelihood by half. Other variables that are positively associated with breastfeeding in the regression are having a partner and attending childbirth education classes. Variables that are negatively associated are low education, race, and history of major depressive disorder. In the woman-centered measure, neither CMT nor PTSD is predictive of breastfeeding outcomes. Reduced odds of concordance are associated with depression and African American race, while having a partner increases those odds.

Discussion Women with a history of both CMT and PTSD are significantly less likely to be breastfeeding their infants at 6 weeks, even though they are equally likely to intend to breastfeed. Women with a history of only CMT and not PTSD are more likely to be breastfeeding their infants, which suggests that PTSD, not abuse itself, is the salient factor. Concordance shows promise as a woman-centered measure of breastfeeding success, but has significant limitations

related to the nature of secondary analysis. More research is needed to explore a) the meaning of breastfeeding success, b) possible interventions to improve breastfeeding success, and c) best clinical practices for RNs and IBCLCs.

CHAPTER I: Breastfeeding and Childhood Trauma: a Review of the Literature

Introduction

I became interested in the possible interactions of trauma and breastfeeding while working as a labor nurse. When caring for laboring patients, I noticed that some women with a history of sexual abuse had very particular changes to their labors: they often dissociated (i.e., "went away"), or had elaborate birth plans, or had very specific providers they would or would not see, or had words that we were asked not to say in the room. The lactation consultants (IBCLCs) said they would see these women later, either in clinic or in the hospital, and they would often have equally characteristic findings: nipple pain that seemed disproportionate to the apparent tissue damage, pain with letdown, dissociation with feedings, poor supply. These same women were often very motivated to initiate and continue breastfeeding and the IBCLCs reported that they would be very frustrated and sad if they stopped or were not able to initiate feedings. It became apparent that something was happening between their intent to breastfeed and their outcomes, and was producing this syndromic presentation of breastfeeding challenges for some survivors of abuse. However, the overlapping experiences of these women, as both survivors of trauma and as breastfeeding women, has thus far not been fully addressed in the literature, and there was limited guidance for clinical practice.

In clinical practice, there are often phenomena noted by providers, but poorly described or understood in the literature. In these situations, each provider is left to cobble together the limited data available from similar phenomena, if any, and her clinical experience into a

hopefully coherent and appropriate approach and to plan care in collaboration with each client. Ideally, the clinician uses informed consent to indicate that the state of the science does not provide an evidence-base yet (Rice, 2011). Such tentativeness is warranted because, without a systematic review and guiding theory, experience-guided practice risks seeing patterns where there are none, or ascribing effects to what the clinician might erroneously deem the most likely cause. Publication of clinical case reports and expert opinions usually signal increasing attention to a problem and provide some guidance towards research inquiry and clinical need.

Breastfeeding in women who have experienced childhood maltreatment/trauma (CMT)[1] is one clinical problem to which researchers are paying increasing attention. Several qualitative studies and case studies have suggested that breastfeeding is vulnerable to trauma-specific concerns, including discomfort with the physical act of breastfeeding and feeling "overwhelmed" by pain or by the infant's needs (Beck, 2009; Coles, 2009; Kendall-Tackett, 1998; Klaus, 2010). Some quantitative work has examined the role of prior trauma in predicting breastfeeding behaviors, including intent, initiation, and continuation (Klingelhafer, 2007; Prentice, Lu, Lange, & Halfon, 2002; Wood & Van Esterik, 2010). Other work discussed below has examined the role of neuroendocrine dysregulation and/or PTSD in the effects of long-term health for abuse survivors (Porges, 2003; Schore, 2002; Seng, 2002; Seng, Clark, McCarthy, & Ronis, 2006; Teicher, Andersen, Polcari, Anderson, & Navalta, 2002). Given the growing evidence of clinical need in this field, further study is warranted.

I hypothesize that the clinically observed problems for survivors of abuse (lower breastfeeding rates despite high intent to breastfeed, pain with breastfeeding, and negative emotional/relational responses to breastfeeding) are related to neuroendocrine changes in

[1] "Childhood maltreatment trauma" refers to any maltreatment or abuse of a child, of whatever type or degree, often by the parents or other caregivers of that child.

survivors (Porges, 2001; Schore, 2001; Teicher et al., 2002), and/or to interpersonal or psychological factors for survivors (Coles, 2009; Klaus, 2010; Klingelhafer, 2007). However, no theory thus far has proposed an integrated model for understanding or studying breastfeeding outcomes in abuse survivors that includes physiological, psychological, and relational factors, nor has research differentiated between the breastfeeding experiences of women who are trauma-exposed and those who are symptomatic for PTSD.

The purpose of this dissertation project, is to begin to synthesize a comprehensive approach to breastfeeding patterns and problems in survivors of CMT. I first discuss the relevant psychosocial and neurobiological theories related to traumatic stress and breastfeeding, and then explore how these theories interrelate to create the syndromic presentation of breastfeeding problems in survivors: 1) severe nipple pain, often with letdown, without corresponding tissue damage; 2) dissociation or "going away" during feedings; and 3) inadequate milk supply. While historically literature reviews have been more closely limited to a single concept, Whittemore and Knafl (2005) suggest expanding the review to include a broader view of the phenomenon of interest, particularly in the case of complex or multifactorial phenomena. This review is foundational to trauma-informed empirical explorations that clarify the proposed relationships between early abuse and breastfeeding outcomes, and can guide future intervention research for this high-risk population.

Overview of Breastfeeding and Childhood Maltreatment/Trauma

Breastfeeding

The first step to a breastfeeding relationship in high-resource countries is the intent to breastfeed: the woman must make an active decision about how she will feed her infant. Without first deciding to breastfeed, breastfeeding will not occur; like any other complex psychomotor act, breastfeeding is a learned skill, and dependent on the willingness of both woman and infant to learn it. Intent, then, is the first step to breastfeeding success.

There are two major pathways by which intended breastfeeding can be interrupted: biological (hypoplastic breast tissue, Reynaud's, inverted nipples, low supply), and behavioral (inappropriate supplementation, not putting baby to breast enough). The survivors I was seeing who intended to breastfeed and were not successful were not having behavioral issues with breastfeeding — for the most part, they would follow the lactation consultant's recommendations closely, and the policies of the unit prohibited supplementation of breastfed babies without documentation of the reason, so supplementation happened very little. These women intended to breastfeed, and did "all the right things", but still presented with increased challenges.

This is congruent with earlier research that found that survivors of sexual abuse were as likely to intend to breastfeed as other women, but less likely to do so (Prentice). Other qualitative work had similar findings: survivors of abuse wanted to breastfeed, but reported significant challenges doing so (Beck, 2009; Coles, 2009; Kendall-Tackett, 1998c). This suggests a possible biological/psychological pathway to breastfeeding problems for survivors: since their behaviors seem not to be the issue and they are motivated to breastfeed, physiologic pathways are another possible explanation for the problem. At present, it is not clear what biological pathways might

be implicated, but both recent work exploring sequelae of CMT and breastfeeding physiology suggest a neuroendocrine dysregulation. In the next section, I will review breastfeeding physiology and what is known about neuroendocrine changes after CMT, and discuss possible routes by which these affect breastfeeding.

Because of limitations of secondary analysis, the primary focus of analysis for this dissertation will be on psychosocial factors, but it is important to remember that breastfeeding also is a biological process and the biology of breastfeeding and of PTSD may overlap in ways that will warrant attention. One hormone of interest in both PTSD and in breastfeeding is oxytocin. Because oxytocin is a major affiliative hormone in the peripartum period (Feldman, Weller, Zagoory-Sharon, & Levine, 2007; Insel, 1997; Lee, Macbeth, Pagani, & Young, 2009; Ross & Young, 2009), and because prior work on stress and hormonal responses suggests that oxytocin is dysregulated in women with PTSD (Munro et al., 2013; Seng et al., 2013), there are two potential oxytocin pathways by which stress may affect breastfeeding.

First, the affiliative/relational aspects of oxytocin may be compromised by its dysregulation, leading to a disordered or emotionally complicated relationship between the infant and mother or the mother and those around her, which may affect her breastfeeding experience. This is supported by recent work suggesting that elevated levels of oxytocin may be in response to desired but missing social bonds in mother-infant pairs (van Anders, Goldey, & Kuo, 2011).

Second, the disordered oxytocin may more directly affect breastfeeding by increased associated perceived pain or by limiting the milk-ejection reflex (MER), which is mediated by oxytocin. The MER involves the smooth muscle of the nipples and milk ducts and could reasonably be affected by dysregulated oxytocin, which is suggested to be central to other

smooth-muscle disorders like irritable bowel syndrome, chronic pelvic pain, and hyperemesis gravidarum (Seng et al., 2013).

Breastfeeding physiology

Breastfeeding is a complex learned skill, but it is also at its center a relatively straightforward physiologic process: Milk is produced in the lobular tissue of the breasts and fed to the woman's infant via the ductal tissue of the breasts. The more milk that is removed from the breast, the more that will be made, via a negative-feedback neuronal loop from the lobular tissue to the anterior pituitary, which releases prolactin in response. Conversely, when milk is not removed from the breast, the increased pressure causes baroreceptors in the lobular tissue to signal the brain to reduce prolactin release. While there are numerous ways this system can break down, the general physiology remains constant in a normal functioning state (Riordan, 1998; Uvnas-Moberg & Eriksson, 1996).

Barring relatively rare physical anomalies like hypoplastic breast tissue, breastfeeding is primarily dependent on two hormones for success: prolactin (the milk-maker) and oxytocin (the milk-pusher). Estrogen and progesterone are involved in breastfeeding success (chiefly the growth and maturation of the lobular and ductal tissue), but are not directly involved in milk production and removal. During pregnancy, estrogen and progesterone increase the size of the lobular and ductal tissue of the breast, and increase blood flow to the breasts; however, without adequate and appropriate release of prolactin and oxytocin, successful breastfeeding will not occur.

As noted above, clinical observations and a few case reports have suggested a cluster of symptoms that may be more common in women with a history of trauma, particularly early

trauma: 1) nipple pain that does not seem to be related to degree of tissue damage; 2) pain with letdown (MER); and 3) pathological engorgement (Beck, 2009; Klingelhafer, 2007; Wood & Van Esterik, 2010). Each of these may reflect a dysfunction of oxytocin release or use, similar to that seen in other smooth-muscle disorders like hyperemesis gravidarum (HG; Seng et al., 2013). This dissertation will consider dissociation as a proxy for oxytocin dysregulation, as I will discuss below.

Prolactin and oxytocin: Milk production and delivery

Prolactin. Prolactin can be viewed as the "milk maker": without prolactin, lactogenesis II will not occur. In response to high levels of progesterone during pregnancy and its continued release, prolactin is produced by the anterior pituitary and is stimulated by infant suckling. It is responsible both for lactogenesis II, when mature milk "comes in", and lactogenesis III, the continued production of this milk[2]. It is a peptide hormone closely related to human growth hormone, stimulates milk production and blocks dopamine reuptake, which may be responsible in part for the calming effect of breastfeeding (Riordan, 1998), since higher levels of dopamine are associated with mood stabilization. In women with insufficient prolactin, a full milk supply does not develop. In pregnancy, progesterone increases prolactin levels 10-20 fold, but inhibits this increased level from inducing lactation (Riordan, 1998).Therefore, low milk production can be secondary to retained products of conception after delivery, or to a new pregnancy while the woman is breastfeeding (both of which increase the amount of circulating progesterone suppressing prolactin effects), or from hypoprolactinemia. Prolactin levels, however, cannot

[2] Milk production in humans has three phases: lactogenesis I, when breasts reach full maturation during pregnancy and start to produce colostrum; lactogenesis II, the production of mature milk that occurs approximately 2-5 days postpartum; and lactogenesis III, which comprises the continued production of milk through weaning.

compensate for problems with oxytocin regulation, because once the milk is produced, oxytocin is needed to deliver it.

Oxytocin. Oxytocin has multiple effects, including social and affiliative functions, but its primary function in breastfeeding is to create the milk-ejection reflex (MER) during breastfeeding. While the infant is nursing, the smooth-muscle cells of the milk ducts contract to expel the milk ("let down"), while simultaneously the uterus also contracts in response to oxytocin. Nipple stimulation from the infant feeding activates a neuronal feedback loop to the hypothalamus, which releases more oxytocin, and the cycle continues until the end of the feeding.

Oxytocin is a peptide hormone whose regulation and/or dysregulation has broad implications, including affecting three functions salient to breastfeeding in women who have survived trauma, each of which have clinical implications: 1) affiliation, 2) dissociation, and 3) milk-ejection reflex. Oxytocin receptors are found on smooth muscle (muscle that is neither under voluntary control nor cardiac) throughout the body, including the uterus, milk ducts, and GI tract (Mechsner et al., 2010; Seng et al., 2013). Dysregulation of other smooth muscle (investigated primarily in the gut) is associated with dysregulation of oxytocin secondary to trauma in some preliminary types of studies—the exposure of early childhood relational trauma and maltreatment in particular, which is conceptualized as a trauma to the attachment system. While this work is early, it is congruent with Porges' polyvagal theory, which posits a "dampening" effect of oxytocin on the stress-induced responses of the sympathetic nervous system ("fight or flight") (Porges, 1995; 2003).

Affiliation. Oxytocin acts on the central nervous system to mediate social bonding behaviors, including pair bonding, mothering, and attachment (Carter, 1998; Feldman et al., 2007; Insel,

1997; Lee et al., 2009; Neumann, 2008).. Oxytocin's role as an affiliative hormone is well-studied (Bales, 2011; Campbell, 2010; Carter, 1998; Insel, 1997; Ross & Young, 2009). Recently, researchers have examined the effects of disruptive relational events on oxytocin levels (Feldman, Gordon, & Zagoory-Sharon, 2010; Munro et al., 2013), whether those events were experimental (Munro, 2013) or observational (e.g., Feldman, 2010).

However, this effect may not be benign, and oxytocin may serve to create an in-group/out-group dichotomy as part of the affiliation process, which may in turn be implicated in dysfunctional social structures like social exclusion (van Anders et al., 2011; van Anders, Goodson, & Kingsbury, 2013). This could have implications for trauma survivors, and whom they may view as "safe" (in-group) versus "unsafe" (out-group). Rather than being solely the "great facilitator of life" (Lee et al., 2009), oxytocin and its regulation may lead to either positive or negative consequences depending on social and hormonal contexts.

Dissociation. Dissociation describes a detachment from a physical and/or emotional experience, including depersonalization (a sense that one's self or one's body is unreal), and derealization (a sense that the world is unreal or separate; (American Psychiatric Association, 2000). Dissociation can manifest as mild alterations in consciousness for anyone, as "absorption" or "divided attention," for example. Its more extreme forms (e.g., amnesia, loss of time, depersonalization, derealization) occur in response to extreme stress (peritraumatically) or in response to triggers—reminders of past overwhelming emotional or physical experiences.

Dissociation is a relatively common experience for survivors of CMT (Bowman, Ryberg, & Becker, 2009; Nilsson, Gustafsson, & Svedin, 2012), and may represent a coping strategy in itself, by removing the patient's self from a world or experience that has caused them pain. Dissociation has recently been associated with adverse postpartum mental health and bonding

outcomes, whether it was a baseline characteristic of the woman or occurred in labor (Seng et al., 2013). Researchers have also begun to examine a possible association between oxytocin dysregulation and dissociation. Munro et al. (2013) exposed participants to a simulated stressor (watching a filmed scene of child abandonment) and found that oxytocin levels were significantly different in women with higher scores on dissociation and somatization scales. Seng et al. (2013) found that high oxytocin levels in women with hyperemesis gravidarum correlated with elevated dissociation scores. However, it is unclear whether oxytocin dysregulation leads to higher dissociation, or if the same trauma that led to dissociation also dysregulates an individual's oxytocin response.

Milk-ejection reflex. While the necessity for oxytocin in the MER is well-known, it is unknown what the effects of dysregulated oxytocin would be for physiologic lactation (Freund-Mercier et al., 1988; Jenkins & Nussey, 1991; Uvnas-Moberg & Eriksson, 1996). Oxytocin's function as a smooth-muscle stimulator is key to the function of the reflex, so logically any disruption or dysregulation of oxytocin would also disrupt the MER. This is supported by anecdote from lactation consultants, but has not been studied as of yet (Penny Simkin, personal communication, October 21, 2012; Michelle Fuehr, personal communication, November 22, 2012). Additionally, case reports of MER-related dysphoria and pain have started to emerge in the literature, suggesting that there may be a neuroendocrine aspect to MER issues (Heise & Wiessinger, 2011).

Trauma and neuroendocrine dysregulation

There is a growing evidence base about changes in the regulation of the hypothalamic-pituitary-adrenal (HPA) axis and potential effects on cortisol/oxytocin regulation (Bales, 2011;

Brand et al., 2010; Carter, 1998; 2003; Carter, Boone, Pournajafi-Nazarloo, & Bales, 2009; Gunnar & Quevedo, 2007; Neumann, 2008). For example, Brand, et al. (2010), found that a history of maternal child abuse was associated with anomalous maternal and infant cortisol responses to a standard laboratory social stressor. In this study, the baseline levels of cortisol were lower in the affected women, peaked higher, and fell more quickly, implying a less-regulated response to social stress for these women and their infants (Brand, Brennan, Newport, Smith, Weiss, & Stowe, 2010). Cortisol in turn is part of the oxytocin-cortisol mutually-regulatory feedback loop: as cortisol levels increase, oxytocin levels decrease (Liberzon & Young, 1997). Therefore, it would be expected that the HPA dysregulation provoked by a history of abuse would extend beyond its effects on cortisol, and would appear as dysregulation of oxytocin, and vice versa. This dysregulation could present as a physiologic phenomenon (smooth-muscle disorders like irritable bowel syndrome or hyperemesis gravidarum) or as a psychosocial phenomenon like dissociation.

The evidence for the oxytocin mechanism is further supported by a 2010 analysis by Seng and colleagues comparing a pregnant sample with a broad sample of US women, which found "detachment from others" was the most frequently-reported symptom of PTSD for pregnant women, but not for other women (OR 1.64, $p<.0001$; Seng et al., 2010). This suggests that for pregnant women, PTSD may have a different appearance than for non-pregnant women; in fact, it may represent a clinically distinct phenomenon, with symptom pattern affected by the childbearing context. Current evidence is too limited to make that claim definitively, and biological underpinnings for any differences have not yet been studied during pregnancy or the postpartum period, but this is an intriguing direction for future research.

Effects of stress on cortisol/oxytocin

Stress affects multiple response systems in more or less predictable ways: stress (from trauma, life stressors, illness, and other factors) increases output of the "stress hormones" cortisol and epinephrine/norepinephrine. Each of these is regulated by a feedback system that responds to external and internal stimuli to maintain appropriate levels, and the systems interact. Cortisol is managed by the hypothalamic-pituitary-adrenal axis (HPA), and epinephrine/norepinephrine by the parasympathetic/sympathetic systems. Chronic stress at critical developmental stages may result in adaptations that change the ability of a given system to respond appropriately and end response to stress (Teicher, Andersen, Polcari, Anderson, & Navalta, 2002). Additionally, as part of the sympathetic (HPA axis) and parasympathetic (oxytocin) balance, oxytocin and cortisol are mutually regulating. High cortisol levels have been inversely correlated with breastfeeding success in women with traumatic or stressful labor/birth experiences, suggesting that stressful experiences can negatively affect breastfeeding (Grajeda & Perez-Escamilla, 2002).

HPA axis. The HPA axis includes both catecholamines (which increase heart rate, blood pressure, and distance vision, and prepare the body for either retreat or battle) and the longer-term physiologic stress response of cortisol. Between the hypothalamus, pituitary, and adrenal glands are feedback loops that represent part of the sympathetic (HPA) axis [3]. Stressors (physiologic or psychological) stimulate both the release of catecholamines (epinephrine/norepinephrine) from the adrenals, and the release of corticotropin-releasing hormone (CRH) from the hypothalamus. CRH in turn signals the release of adrenocorticotropic hormone (ACTH) from the pituitary. Cortisol is released by the adrenal glands in response to ACTH, and reverses the body's physiologic responses to stress-induced catecholamine release

[3] The sympathetic nervous system also includes postganglionic neurons, which release norephinephrine in response to stress. This neurologic pathway is not relevant to a discussion of the HPA axis and is addressed here for clarification only.

via its effects on the immune, metabolic, and cardiovascular systems (Chang et al., 2009; Doornbos, 2009). These effects include immunosuppression, increased lipolysis and gluconeogenesis, and mood changes like depression. Cortisol also acts as the negative feedback response to the sympathetic (HPA) axis: as cortisol levels rise, catecholamine levels fall, ending the fight/flight response.

Moderation of the effects of the sympathetic axis (oxytocin). Oxytocin, apart from its role in parturition, lactation, and social affiliation, acts to dampen the effects of the sympathetic system by increasing tissue sensitivity to the parasympathetic effects, like decreased heart rate (Gamer & Büchel, 2012). As with cortisol, these effects are indirect, but serve an important role in moderating an otherwise potentially excessive sympathetic response.

Cortisol levels are inversely related to oxytocin levels (Ditzen et al., 2009; Handlin et al., 2009), and given the difficulties inherent in oxytocin measurement (peptide hormone, pulsatile release), it may be useful to suspect oxytocin dysregulation when cortisol dysregulation is present. Although findings in the PTSD and HPA-axis literature are mixed, low cortisol is sometimes observed in adults with child maltreatment history (Stoppelbein, Greening, & Fite, 2012; Yehuda & Bierer, 2008), so one effect of early or chronic stress may be to downregulate the hypothalamic/pituitary response to a stressor. There may also be a direct relationship between high or irregular levels of oxytocin and low cortisol, but this is not clear from the evidence.

Pathways to breastfeeding dysregulation. Because supply issues account for the majority of early weaning (Riordan, 1998), we need more work to understand the mechanisms underlying the role of a) prolactin and oxytocin in breastfeeding, and b) individual changes that promote dysregulation of these two hormones. Such changes could include behavioral factors like breastfeeding less often due to pain or “triggering”, or could include more global dysregulation,

secondary to trauma for example (Schore, 2001, 2002; Teicher et al., 2002; Teicher, Tomoda, & Andersen, 2006). In this section, we will consider possible pathways to breastfeeding dysregulation.

Dissociation: Bridging the psychobiological? One promising thread in research that may encompass both psychological and biological aspects of the syndrome in women involves dissociation, which is frequently seen in PTSD. Dissociation is defined as:

> Dissociation is a disruption of and/or discontinuity in the normal, subjective integration of one or more aspects of psychological functioning, including—but not limited to—memory, identity, consciousness, perception, and motor control. In essence, aspects of psychobiological functioning that should be associated, coordinated, and/or linked are not. (Spiegel et al., 2011, p.826)

The dissociative subtype of PTSD in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM 5) may better capture these women's experiences and enable researchers to differentiate more clearly between dissociative and non-dissociative PTSD (APA, 2013). There may be a clear development into two PTSD "pathways" in women. The first is an acute pathway, where HPA or sympathetic-parasympathetic axis dysregulation is primary and would be seen by dysregulation in cortisol and catecholamines (epinephrine and norepinephrine). This acute pathway PTSD might result from a discrete adult trauma exposure such as birth trauma or a natural disaster.

The second is a sub-acute pathway, where oxytocin dysregulation is primary. This latter would be found among women with childhood abuse or emotional maltreatment as the antecedent trauma exposure (Porges, 1995; 2001; 2007; Teicher et al., 2002; Teicher, Tomoda, & Andersen, 2006). While both pathways may end in similar symptom clusters, the frequency of these symptoms may differ, and suggest different underlying mechanisms.

Additionally, a woman with a history of chronic abuse/maltreatment may have ongoing PTSD symptoms and evidence of oxytocin dysregulation, while at the same time experience an acute stressor that activates the sympathetic or HPA pathways. An acute traumatic stressor can provoke "peritraumatic" dissociation, and in the immediate post-exposure period, (i.e., the time when the diagnosis would be "Acute PTSD," dissociation is a prominent symptom (APA, 2000). This sort of peritraumatic or acute dissociative posttraumatic reaction to a traumatic birth, for example, may play a role above and beyond the role of dissociation and maltreatment from childhood maltreatment history and pre-existing PTSD, which is our focus. The oxytocin and HPA axis systems are mutually regulating, so perturbations in one could increase risk for perturbations in the other. These are questions to keep in mind when considering the breastfeeding observational, theoretical, and empirical literature and in designing future research.

Experiencing trauma vs. Embodiment of trauma

Clinically and empirically, it is important to distinguish between women who have experienced abuse and women who have experienced sequelae of that abuse. Thus far, researchers investigating the effects of trauma on breastfeeding have not considered women who have experienced long-term distress and pervasive adaptations from their abuse/maltreatment experiences to be different from those who have experienced abuse, but have been resilient to the experience. Previous work with childbearing women has found PTSD to be associated with a greater risk of impaired or delayed postpartum maternal-infant bonding (Seng et al., 2013) than that of women who have experienced trauma but do not report PTSD symptoms. While focus on women with overt symptoms may have begun as a clinical convenience, there is support in the literature for these women representing a different level of risk in at least one significant

postpartum relationship task (bonding). What happens to women may be less significant than how these events affect them physiologically as well as psychologically, a distinction made in the DSM beginning in the third edition, which removed the requirement of "extreme trauma" for PTSD diagnosis (APA, 1986).

The developmental time in the life course when traumatic events occur may be significant in terms of the effects of trauma/maltreatment on breastfeeding. This empirical question has been neither raised nor answered. PTSD *per se* (PTSD that presents in women without a prior history of PTSD, in the aftermath of a single traumatic experience like childbirth) may be different from complex PTSD (PTSD that results from chronic abuse or maltreatment and that usually is long-standing or recurrent), and both may differ from acute stress disorder (within 1 month of the traumatic event). The limited research available has not differentiated these forms of PTSD. It may not be clinically significant: if interventions succeed for both groups, the timing and nature of the interpersonal violence may be less important. However, theories seeking to explain complex PTSD as a developmental trauma disorder suggest that oxytocin is dysregulated with early traumatic stress, but not necessarily with adult trauma exposure (Porges, 1995; Schore, 2001; Teicher et al., 2006). In adult traumatic stress, HPA axis dysregulation may predominate. Therefore, attending to patterns of developmental timing and nature of abuse exposure, PTSD symptomatology (i.e., diagnosis), and their underlying biology both may be important in relation to breastfeeding problems and outcomes.

Developmental timing and type of trauma matters when considering potential sequelae of abuse, but conflating kinds of abuse or focusing exclusively on childhood sexual abuse is a shortcoming in the literature. The limited research thus far has focused on sexual abuse survivors, which is a common experience for women in the United States, affecting

approximately one woman in five prior to age 18 (MacMillan, Tanaka, Duku, Vaillancourt, & Boyle, 2012). Sexual abuse trauma exposure was identified early on in women's health research because gynecological examinations are an obvious and frequently observed trigger. It is also relatively straightforward to assess for this history with behaviorally specific questions. Much more subtlety and subjective judgment are required to identify "early relational trauma" or "trauma to the attachment system." This has understandably shifted the focus towards the easily identifiable survivors of sexual abuse, and away from considering sexual abuse as only one type of abuse that may affect breastfeeding. This is a significant limitation in the extant literature.

PTSD

Characterized by three symptom clusters (hyperarousal, avoidance/dissociation, and intrusive re-experiencing of the trauma), PTSD is associated with poor maternal-infant emotional and physical regulation, increased risk of behavioral disorders in childhood, and poor perinatal outcomes (Bradford et al., 2012; Enlow et al., 2009; Grote et al., 2012; Schore, 2001; Seng et al., 2011; Seng et al., 2013)[4]. Additionally, PTSD risk increases with exposure to other factors that may exacerbate the risk of poor perinatal outcomes (e.g., socioeconomic status, chronic stress, polytraumatization, and maladaptive coping mechanisms like alcohol and drug use). These effects persist even when researchers control for socioeconomic risk (SER) and perinatal mood disorders like depression, suggesting that PTSD's independent effect on maternal and infant health and relationships requires more attention.

[4] The diagnostic criteria for PTSD have changed with the newly released DSM 5, in part to include a more comprehensive picture of how PTSD can present in various groups and factor-analysis research published since the DSM-IV was released. The diagnosis was moved from the anxiety disorders section into the new classification of trauma/stress disorders. The new symptom clusters are 1) intrusion, 2) avoidance, 3) negative alterations in cognition and mood, and 4) alterations in arousal and reactivity (Veterans Administration, 2013). Since the research reviewed was done prior to these changes, for the purposes of the literature review the discussion uses the DSM-IV definitions. For the theory development component, the DSM 5 changes are incorporated.

Effects of early relational trauma on the childbearing year: Two pathways

In addition to Porges, both Schore and Teicher discuss the dysregulation of the autonomic nervous system (including the sympathetic branch) and cortisol release secondary to childhood or recurrent traumatic stress. Schore in particular is concerned with the effects of early trauma on the child's developing nervous system, and he theorizes that this early trauma leaves the ANS and right hemisphere of the brain less able to self-regulate, and susceptible to sequelae like PTSD and difficulties with attachment (2001, 2002). Similarly, Teicher's cascade model of neurological changes secondary to early relational trauma/abuse includes changes to the ANS/self-regulation, and adds changes to the oxytocin-regulation system.

These changes are present in some survivors of acute and chronic trauma, including women in the perinatal period. Approximately 8% of US women meet full diagnostic criteria for PTSD in the perinatal year, and up to 30% experience some symptoms of PTSD postpartum (hyperarousal, intrusive memories, and avoidance; (Beck, Gable, Sakala, & Declerq, 2011; Loveland Cook et al., 2004; Moehler, Brunner, Wiebel, Reck, & Resch, 2006; Seng, Low, Sperlich, Ronis, & Liberzon, 2009; Soet, Brack, & DiIorio, 2003). These symptoms may represent acute trauma (many women report traumatization by medical providers, acutely traumatic labors and births, or other factors immediately related to childbearing) or reactivated or continuing symptomatology from previous trauma (Ayers, 2004; Beck, 2004; Creedy, Shochet, & Horsfall, 2000).

PTSD has implications beyond the immediate mental health of the woman. It extends to the risk of intergenerational transmission of trauma, biological and psychological regulation of both members of the breastfeeding dyad (including depression and other psychopathology), and

interpersonal relationships factors like bonding and attachment (Enlow et al., 2011; 2009; Forcada-Guex, Borghini, Pierrehumbert, Ansermet, & Muller-Nix, 2011; McDonald, Slade, Spiby, & Iles, 2011). These effects are similar to those found in women with depression, but trauma-specific research suggests that while depression is often comorbid with PTSD, it may not be the only salient factor. Enlow and colleagues (2009) found increased reactivity to a standard laboratory social-stress mechanism (the Still-Face Stressor) for 23 infants of women with trauma histories or traumatic peripartum experiences, even when controlling for depression and mood disorders in the women. A larger (*N*=52) 2011 study by the same authors found that PTSD symptomatology levels predicted infants' ability to self-regulate at 6 months of age when controlling for other mental health issues and socioeconomic factors. Forcada-Guex and colleagues (2011) found that PTSD symptomatology predicted disordered parenting in mothers of preterm infants, and that women without PTSD had more positive internal representations of their infants. Mothers with PTSD are at risk for their own mental and physical health and for that of their children.

These risks have historically been framed as exclusively psychosocial. For example, typical framing has been that a mother with limited positive parenting role models develops ineffective parenting techniques, or maternal depression makes her less responsive to her infant, which in turn leads to poor attachment. However, recent research focuses on physiological changes related to childhood abuse or maltreatment in an effort to capture both the psychosocial and biological pathways that may affect survivors as they parent. These pathways are detailed below.

Psychosocial pathway. Early exposure to dysfunctional parenting/family relationships may not give the child the ability to form secure attachments to important family members. Developed

by John Bowlby in the 1950s, attachment theory posits that without a secure attachment to at least one adult caregiver, the infant develops maladaptive responses to others and to stress that preclude "normal" relationships with others, including when they themselves parent (Benoit, 2004; Bowlby, 1977; Coffman, Levitt, & Guacci-Franco, 1995).

Attachment theory has been the dominant paradigm for child-parent relationship creation since its development, but has more recently been criticized for its use of war orphans as extreme examples of poor attachment, and by feminist theorists who argue that its emphasis on maternal-infant relationships encourages a biological-determinist model of mothering that requires women to fulfill all their children's emotional needs (Birns, 1999; Etelson, 2007; Franzblau, 2002; Liss & Erchull, 2012). This last critique has been addressed in part by including fathers as potential attachment options for the child, but this has not eliminated the critique of mother as the default attachment object (Franzblau, 2002). Despite these critiques, attachment theory remains a strong force in developmental theory, and attachment interruption is one possible consequence of early trauma/abuse/neglect: if the child learns that adults cannot be trusted to ensure their physical and emotional safety, they may not develop the ability to ensure safety for themselves or their children.

Neurobiological pathway. While attachment theory is useful in many circumstances, there is growing evidence that neurobiology (specifically the hormonal milieu of the developing brain) plays a simultaneous role an individual's affiliative abilities. Schore (2001, 2002) expanded on and clarified attachment theory by hypothesizing its key factor was developmental regulation of the right brain, which occurs in a strong maternal-infant attachment:

> In optimal early environments that promote secure attachments, a right lateralised regulatory system organises with a capacity to modulate, under stress, a flexible coping pattern of shifting out of autonomic balance into a coupled reciprocal autonomic mode of control in which homeostatic increases in the activity in one ANS division are associated

with decreases in the other. (Schore, 2001, p. 14)

In other words, in the context of a person with secure attachment, the autonomic nervous system's sympathetic and parasympathetic divisions would have hormone levels (e.g., cortisol and oxytocin) in mutually negative feedback to achieve homeostasis. Without the "optimal early environment" of secure attachment, the right brain, which manages the autonomic nervous system via the sympathetic response and hypothalamus, and its "fight/flight" response, will not be able to correctly gauge and respond to the stresses inherent in both daily life and in parenting. Instead, a pattern of overreaction (hyperarousal, anxiety) or underreaction (dissociation) can characterize both the woman's physical and mental states. Most significantly, this dysregulation may extend to oxytocin, one of the key hormones of breastfeeding.

Although most research on biological risk factors (or mechanisms) of posttraumatic psychiatric sequelae has been in relation to the ANA/SNS/HPA-axis, attention is now also being directed at the oxytocin system. By this emerging view, the significant factors in determining sequelae of CMT then would be a) dysregulation of the autonomic nervous system, making the sympathetic branch over-reactive to perceived danger; b) dysregulation of oxytocin, leading to smooth-muscle dysfunction; and c) dysregulation of oxytocin, leading to potential mental health changes like PTSD, dissociation, attachment difficulties. It is generally agreed that it is the body's response to the trauma, not the trauma itself, which is most relevant for long-term outcomes.

Birth trauma: Retraumatization vs. new trauma

Trauma is considered to be any event during which the individual felt fear, helplessness, or horror, and that his/her life or safety was in danger (APA, 2000). As several investigators have noted, birth as experienced within the US medical system may meet that definition for several

reasons: perceived lack of control, lack of privacy, lack of agency, and lack of accurate knowledge about the physical risk to the woman and infant (Beck, 2004; Creedy et al., 2000; Elmir, Schmied, Wilkes, & Jackson, 2010; Soet et al., 2003).

Birth-related PTSD has been an important area of study in recent years, and it may have effects on breastfeeding. It is known that the burden of postpartum PTSD symptomatology ranges widely, from 2-30% (Ayers, 2004; Beck et al., 2011; Creedy et al., 2000; Olde, Vanderhart, Kleber, & Vanson, 2006), and that this wide range is due to how PTSD is defined (as full diagnostic criteria or as above a cutoff on a screening tool). It also depends on whether the investigator is concerned with new-onset (birth-related) PTSD, or with activation of pre-existing PTSD because of re-traumatization during the birth experience, or with PTSD that is chronic and unrelated to the birth experience. While this is a relatively new area of research (Schore first described right-brain changes in 2001), it is a promising one to explain why women with trauma histories, especially maltreatment histories, can have drastically different perinatal outcomes.

Previous research has distinguished between women with trauma and women with PTSD, and has found that PTSD is associated with "worse" outcomes (shorter gestation, increased risk of smoking) than is trauma alone. Beck (2011) found that 9% of 1373 postpartum women met full diagnostic criteria for PTSD, but points out that the researchers for the original sample studied did not evaluate prepregnancy PTSD symptoms or history. Seng and her colleagues (2013) assessed postpartum PTSD in 545 participants whose pre-existing PTSD had been measured prospectively, and found an incidence of 1.5% new-onset PTSD in previously asymptomatic women (n=9), and an overall rate of 6.0% (n=34). Previous trauma, abuse, depression, and lack of social support are known to be risk factors for postpartum PTSD (Ford,

Ayers, & Bradley, 2010; Keogh, Ayers, & Francis, 2002; Maggioni, Margola, & Filippi, 2006; Seng et al., 2009; Soet et al., 2003). While birth (and breastfeeding) may represent a triggering or retraumatizing event [5] in women whose neurohormonal regulation may already have been compromised by earlier trauma, it may be a new trauma for others.

This potential for birth to exacerbate existing PTSD symptomatology has implications for breastfeeding since early days are critical to success. Beck (2011) found that traumatic birth experiences can create either a "reinforcing loop," in which the woman experiences breastfeeding as a retraumatization and reminder of the violence of her child's birth, or a "balancing loop," in which the woman experiences breastfeeding as a positive "time out" from the symptoms of acute stress. Harris and Ayers (2012) reported that women with PTSD following birth trauma often reported "hot spots," or experiences that remained problematic for them after the birth, and that these hot spots were often interpersonal or relational challenges. With its intensely interpersonal and physically intimate nature, it follows that breastfeeding could be affected by the birth trauma some women report. However, research needs to be done to clarify the relationship, if any, between trauma (whether birth or otherwise), breastfeeding, and PTSD. At this point, we do not know where the connections are, but we know that PTSD increases risks of other adverse outcomes for the childbearing year, as noted above.

Embodied Trauma in Breastfeeding

Given the known dysregulation of oxytocin that can follow childhood maltreatment trauma (CMT), and the crucial role of oxytocin in breastfeeding, it is logical to assume that

[5] "Triggering" refers to a psychophysiologic response some survivors have to a reminder of the initial trauma. This response may include physiological hyperarousal (increased heart rate, increased respiratory rate, a sense of panic) and/or psychological responses that can include dissociation, fear, and/or anger. The trigger may be a word, an odor, a sensation, a place, an experience, or anything that re-stimulates the trauma response.

dysfunction of the milk ejection reflex (MER) (via dysregulation of oxytocin) can be included with Porges' polyvagal theory, and that PTSD interferes with breastfeeding via this neuroendocrine pathway. However, very little extant work addresses breastfeeding and survivors of trauma, and what exists a) focuses exclusively on sexual abuse, and b) does not differentiate between trauma and PTSD.

There are two major issues with the focus on sexual abuse survivors: women who experienced non-sexual CMT are vulnerable to the same neuroendocrine changes described above, and focusing exclusively on sexual abuse as an antecedent reifies the cultural assumption of breastfeeding as an inherently sexual act, as opposed to a relational one. This focus limits the generalizability of research and (inadvertently) shifts the focus away from breastfeeding as a dyadic biopsychological relationship and to one that perceives breastfeeding as inherently risky from a Freudian standpoint. Moving away from examining childhood sexual abuse effects solely reframes the central issue as childhood maltreatment or abuse (rather than the type of interpersonal violence experienced) and as the impact (which is persistent and embodied). This shift in thinking about breastfeeding may benefit childhood sexual abuse survivors, many of whom report desiring to breastfeed, but feel uncomfortable with using breasts (sexualized in Western culture) to feed an infant (Coles, 2009; Klaus, 2010), and ensures that other survivors can also be included in the findings from research and interventions. Furthermore, one type of abuse does not usually occur in isolation, so teasing out the effects of sexual abuse in particular from emotional abuse, for example, would be difficult and unlikely to be worthwhile. If traumatic stress causes characteristic changes to the ANS and the oxytocin/cortisol system, it should not matter whether that traumatic stress is related to sexual or non-sexual abuse.

Conclusion

The overlapping experiences of childhood abuse/maltreatment and PTSD have not been considered in the breastfeeding literature. Given the psychosocial and neuroendocrine implications of childhood abuse/trauma, and the common experience of abuse, we need to shift from the Cartesian mind/body split inherent in this approach, and instead move to a holistic model of breastfeeding within the context of a woman's life, including any history of trauma. This shift has significant potential implications for how we conceptualize and research breastfeeding, particularly how we develop interventions for breastfeeding promotion. To date, breastfeeding promotion has used an exclusively psychosocial model to explain both the intent to breastfeed and problems in the breastfeeding relationship. As we have seen above, the neurobiological nature of breastfeeding precludes this, and the trauma-mediated changes to cortisol and oxytocin regulation provide a potential pathway to understanding the interplay between early abuse/maltreatment and breastfeeding outcomes.

This shift has significant implications for a) measurement of breastfeeding success, and b) public health policy and interventions. Currently, breastfeeding is considered successful if it is congruent with the public-health recommendations for infant feeding, and breastfeeding promotion efforts reflect this (AAP, 2001; Haroon, Das, Salam, Imdad, & Bhutta, 2013; Work Group on Breastfeeding, 1997). As I discuss in the next chapter, the agency implications of exclusively using an externally-defined rather than woman-centered measure of breastfeeding success are potentially troubling, and include an overly narrow focus on adherence to those outside norms when designing intervention programs.

The focus has been on increasing the number of women who intend to breastfeed, with the assumption that given enough social support and motivation, success is inevitable. This is

not a trauma-informed approach, and it does not lead to the development of trauma-specific interventions.[6] Since we know that 1 in 5 women have a history of sexual abuse prior to age 18, and approximately 1 in 5 (who may or may not be the same women) report a history of other abuse (Pérez-Fuentes et al., 2012; Shi, 2013), it is essential to move from thinking of this group of women as having an unusual (e.g., low prevalence and idiosyncratic) problem to considering them a significant subpopulation whose physiology and psychology we must consider in care planning. This view allows us to use the prevalence of PTSD/PTSD symptoms or the qualitative research available on women with PTSD in the perinatal period for breastfeeding studies and clinical care of current research on either. Because PTSD is so common, and because breastfeeding has the potential for being both healing and/or re-traumatizing, there is a clear need for a trauma-informed model of the breastfeeding relationship.

In summary, breastfeeding seems to be affected by a history of abuse in very predictable ways, the most common of which are pain and dissociation. This knowledge is based in clinical practice (i.e., case-based, anecdotal) and qualitative inquiry at this point, because little quantitative research has examined breastfeeding for trauma survivors. Other work has identified early relational trauma as a cause of neuroendocrine dysregulation, including oxytocin dysregulation and PTSD, and this may be the source of the syndromic presentation of breastfeeding issues for survivors. To more fully explore the influence of early relational trauma, childhood maltreatment with potential for PTSD and the intersection with breastfeeding success, it is essentially to explore what constitutes breastfeeding success, within this context and then

[6] "Trauma-informed" approaches or systems consider existing or proposed systems/theories within the context of what is known about the effects of violence and allows services to be delivered in a way that does not re-traumatize survivors of violence (Jennings, 2004). "Trauma-specific" addresses the results of the abuse or violence directly (Jennings, 2004). For the purposes of this review and the proposed theoretical model, the intent is to be trauma-informed, rather than trauma-specific.

what should be factored into measures to assess what it means to succeed at this complex relational act.

CHAPTER II: Measuring Breastfeeding Success

Introduction to breastfeeding measurement

As discussed in the previous chapter, breastfeeding is a complex biological and relational process, learned over time and enacted within a specific context. This complexity makes using the current measurement of breastfeeding success (adherence to the public health recommendations) as the sole measure of success problematic. There are two major issues with this. First, using an externally defined measure to assess an intrinsically intimate act is incongruous with feminist analysis. Second, using a limited measure of success inherently limits our understanding of how best to promote breastfeeding and support women who want to breastfeed. This chapter presents an additional measure, *concordance*, which measures how closely a woman's infant feeding method follows her desired infant feeding method.

Currently, the standard measurement of breastfeeding success (and of the success of programs promoting breastfeeding success) is how closely women adhere to the public health recommendations for duration and exclusivity. In the measurement and promotion of breastfeeding, the focus is on compliance with those recommendations, and how best to create that compliance. These public health efforts have had some limited success in increasing breastfeeding rates (Kaunonen, Hannula, & Tarkka, 2012; Spiby et al., 2009; Wambach et al., 2011), and in the process may have created a new problem: feelings of guilt and lack of self-perceived parental competence when women do not breastfeed as much as they "should." (Cooke, Schmied, & Sheehan, 2007; Hauck & Irurita, 2003; Labbok, 2008)

The public health recommendations are supported by the literature showing specific health benefits to the woman and the infant, and overall health benefits to the community from breastfeeding, including lowered cost. These are valuable and important goals, and I do not propose that we eliminate the public-health measurement as a metric for progress at the macro (public policy) level. Instead, the definition of "breastfeeding success" needs to be expanded, especially for research at the clinical level, because of the above-mentioned issues. The intent of using *concordance* rather than *compliance* as a measure of breastfeeding success is to centralize the woman and her life in the measurement of an intensely personal experience.

Concordance is not intended to replace the public health model of measuring success, but rather to deepen it. The research is very clear that formula feeding has risks, and that on a population level, breastfeeding is the biological ideal (American College of Obstetricians and Gynecologists, 2007; Kaunonen et al., 2012; Kramer & Kakuma, 2004; AAP Work Group on Breastfeeding, 1997). Promoting this ideal is indicated from a public health perspective and potentially from an individual level. However, the continued focus on duration and exclusivity in both the majority of research and interventions has left little space for women to consider and name their own success. Use of concordance is intended to begin to address this issue, and to encourage further work that challenges the single-measure model for success.

Measuring success: Where are we now?

Breastfeeding success is an inherently complex concept to measure. "Success" is a word commonly used for those who excel in finance, for a sports win, or the positive outcome of a risky venture. "Breastfeeding" is likewise broadly understood by laypeople and clinicians alike to indicate the provision of human milk to an infant, although there is an interesting conflation

between providing calories of human milk and the physical act of nursing an infant. (A "breastfed" infant may never nurse directly at the breast, but instead receive pumped human milk.) Taken as a whole, "breastfeeding success" implies a woman who is "winning" at feeding her infant, or overcoming universal obstacles.

Whether epidemiological or intervention-focused, current breastfeeding research uses similar standards to identify successful breastfeeding: Breastfeeding is considered "successful" if the woman breastfeeds exclusively (no other foods or fluids) for 4-6 months, and continues breastfeeding for at least one year (2020, 2010; Kramer & Kakuma, 2004; Work Group on Breastfeeding, 1997; World Health Organization/UNICEF, 2003). This external standard is applied to all women with few exceptions (HIV-positive women living in the West, women with active TB, women taking medications contraindicated in lactation), because biologically, it is believed to be the ideal model for infant feeding (Kramer & Kakuma, 2004; US Department of Health and Human Services, 2011).

Using this model, the woman's perceived success or the concordance between her intended feeding style and her actual infant feeding are not measured. Instead, her breastfeeding – and by extension, her choices as a mother – is measured against an absolute standard. Use of this standard has led to rates of "successful breastfeeding" (exclusive breastfeeding) in the U.S. of 18.8% at six months (http://www.cdc.gov/breastfeeding/pdf/2014breastfeedingreportcard.pdf). This implies that by this metric, most women are not succeeding at the basic task of feeding their infant.

This metric for success is external to the woman's control and possibly inapplicable to her situation, but more importantly, potentially less simple and more fraught with trade-offs than its current position in research measurement and cultural trope implies. The simplified focus on

getting breastmilk to the infant ignores simultaneous, competing, and equally crucial maternal and relational goals to achieve in the critical days and weeks following the birth such as well-being and bonding. The question arises if defining "breastfeeding success" as adherence to prescribed norms centered on production and intake accurately assesses the breastfeeding relationship, and if it is measuring the relevant variables when evaluating interventions.

If the sole measure of breastfeeding success is exclusive breastfeeding to six months, and with supplemental foods for a minimum of one (AAP) or two (WHO) year(s), then what are the implications for the woman who does not plan exclusive breastfeeding, or who struggles to nurse her infant but is ultimately unable to do so? Women who stop breastfeeding "early" or otherwise "fail" at breastfeeding report an increased sense of distress and guilt (Cooke et al., 2007; Watkins, Meltzer-Brody, Zolnoun, & Stuebe, 2011); these effects may arise not directly from how success is measured, but instead from the resultant focus for interventions. These conditions are independently associated with reduced feelings of attachment and increased risk of depression (Akman, Kuscu, Yurdakul, Ozdemir, Solakoğlu, Orhon, Karabekiroğlu, & Ozek, 2008a; Watkins et al., 2011), which in turn place the infant at risk for impaired relationships, depression, poor growth, and attachment difficulties (Hipwell, Goossens, Melhuish, & Kumar, 2000; Lyons-Ruth, 2003; Schwerdtfeger & Goff, 2007). In seeking to improve infant health, we may have traded one risk for another.

There is substantial research showing that artificial baby milk (ABM) is not superior or even equivalent to human milk, including one paper that estimated the excess mortality of artificial baby milk use at over 900 infants/year in the United States (Bartick & Reinhold, 2010). The consequences of ABM in developing countries, where water supplies are unreliably clean and ABM represents a significant cost to the family, may be dire, and can include diarrheal illness

and death (Godfrey & Lawrence, 2010; Kramer & Kakuma, 2004). This reality makes the push to have women breastfeed logical, understandable, and worthwhile. However, the singular focus on the infant outcome and lack of attention to maternal and dyadic outcomes may come at an unexpected, unmeasured price. By framing breastfeeding as a contest to win or lose or as a litmus test for motherhood, the current definition of "breastfeeding success" does not recognize the relational and cultural matrix in which breastfeeding exists, and may not accurately measure alternate causes of the poorer outcomes in infants who are fed with ABM, which makes designing effective policy and interventions to address these outcomes more difficult.

Defining and measuring success in breastfeeding: A public health approach

The American Academy of Pediatrics (AAP), the National Institutes of Child Health and Development (NICHD), and the Centers for Disease Control and Prevention (CDC) all identify breastfeeding as a priority for health-interventions research and policy efforts (Committee, 2001; US Department of Health and Human Services, 2011; Work Group on Breastfeeding, 1997a). This focus on breastfeeding stems from its known physical benefits (Chung, Raman, Chew, & Magula, 2007; Godfrey & Lawrence, 2010; Kramer & Kakuma, 2004), including lowered childhood risk of allergy, gastrointestinal and respiratory infection, and lowered maternal risk of ovarian and breast cancer. However, this focus takes place in a social context that devalues the maternal-infant relationship while proclaiming its primacy, and places a moral value on breastfeeding while failing to recognize the role of both social structures (employment, social opprobrium, local norms, media portrayal) and individual decision-making (Crossley, 2009; Galtry, 1997; Meyer & de Oliveira, 2003; Rippeyoung & Noonan, 2012; Wall, 2001). The relational nature of breastfeeding and the context of the maternal-infant dyad are not addressed in

most promotions research.

One stumbling block to advancing breastfeeding research that would include considerations beyond the public health outcome of providing breastmilk to the infant is lack of conceptualization of and instruments for alternative outcomes. The public-health (infant-focused) outcome measure is useful in many ways, but is limited, and does not attend to a) particularities that we know are important (e.g., mental health conditions, pharmacologic therapies, cycles of abuse), or b) contexts that impinge on breastfeeding "as much as I should" (e.g., employment, poor latch, lack of social support).

Thus far, the approach to breastfeeding measurement from a public health standpoint has acknowledged social issues as risk factors for poor outcomes, but has not included them as intrinsic forces shaping those outcomes. Current breastfeeding policy and research done from this stance are becoming outdated, because eco-social models are now expected in researching public health phenomena. Therefore, the status quo not only falls short from a feminist and social perspective, but from a public health perspective as well. I believe that these critiques can be addressed at least in part by ideas in the literature, but that literature cannot be limited to the nursing/medical literature. Instead, concepts from public health, psychology, and law are also relevant, as we see below. Addressing an essentially interdisciplinary problem requires an interdisciplinary response.

Feminist analyses of breastfeeding measurement

There are three key issues to feminist analysis of breastfeeding measurement: lack of agency, breastfeeding as production, and technology vs. embodiment. For each critique, the concern is not that women should not breastfeed, or that breastfeeding is inherently oppressive (McCarter-Spaulding, 2008; Shulamith, 1970), but rather that the conceptualization of breastfeeding is problematic, or that the social and cultural forces and inequalities that affect feeding choices are missing from the measurement and promotion of breastfeeding as a behavior. I am not arguing that feminism inherently conflicts with breastfeeding, or that breastfeeding promotion is antifeminist. Rather, I am challenging how breastfeeding measurement and promotion have been enacted within the larger culture, and assessing how we might make needed changes to the status quo.

Overall, scholars have looked at intent to breastfeed as a predictor of success, rather than an intrinsic measurement of that success (e.g., (Bai, Wunderlich, & Fly, 2010a; Donath, Amir, ALSPAC Study Team, 2003; Lawton, Ashley, Dawson, Waiblinger, & Conner, 2012). Likewise, social factors (e.g., work status, socioeconomic status, education, race, marital status, partner, family, health care provider, hospital staff, and social network attitudes) are included as predictors of intent and success, but are viewed as "contexts" and not examined critically. Instead of evaluating success as an individual concept or a self-defined reality, researchers measure it against an expert-defined yardstick, even as we acknowledge that social realities affecting breastfeeding behaviors exist. Researchers have thus far rarely examined how systematic oppression (race, gender, class) interacts with those external standards in the context of breastfeeding to create a situation that opposes the behavior we are trying to promote, but such

examination is crucial not only for a woman-centered outcome, but for a truly holistic public health outcome.

Lack of agency

The second issue is a lack of individualization, which disempowers women by removing context from the intensely personal decision of infant feeding. Women are universally encouraged to breastfeed according to the public health recommendations without consideration of what that might mean in the context of their lives as individuals. An individual woman might have experiences or preferences that change whether or not she desires to breastfeed. For example, for a survivor of abuse, breastfeeding might be a trigger, and she might decide that the benefits of breastfeeding do not outweigh the anxiety and stress this creates or the distraction from bonding that would result for her. Under the public health outcome measure, there is no way for a woman who stops breastfeeding "too soon" to be considered a successful breastfeeder. Instead, I propose framing breastfeeding success as internally-defined. As such, every woman can define success in a way that is meaningful for her.

This conscious challenge to the status quo draws from Donna Haraway's rejection of a singular objective truth, and instead argue that women are each in a privileged position to identify their own truths: "We need the power of modern critical theories of how meanings and bodies get made, not in order to deny meanings and bodies, but in order to build meanings and bodies that have a chance for life" (Haraway, 1988). Haraway's use of feminist objectivity assumes situated knowledge, or that knowledge is inherently relative to the position of the knower. In the case of defining breastfeeding success, the woman can be the knower of her own body, by the fact of her position within it and her critical engagement with that positionality.

She becomes the expert, rather than the student, on what breastfeeding – and, indeed, mothering – means in the context of her life. By changing the goal from meeting an outside, expert-defined standard, to instead finding concordance between her imagined, desired, or planned feeding plan and the reality of how she feeds her infant, the woman take up an agentic rather than passive role.

This does not mean that public health definitions of breastfeeding success are meaningless or unimportant to these situated knowers. There are decades of research showing significant health benefits to breastfeeding for both mother and infant. As public health policy, there is no reason not to support breastfeeding via workplace regulations, early parental support, peer support, antenatal education, and other mechanisms that support and encourage women to breastfeed. Reconsidering the definition of successful breastfeeding repositions public health proponents as allies and resources for women, rather than as strangers assigning guilt or deciding the parameters of a mother-success competition. In turn, as women are more able to claim their chosen role as mothers regardless of feeding choices, the class divisions between "good" and "bad" mothering based on feeding choice become less insurmountable.

It also raises the issue of what – and who – should define "success" in breastfeeding. Currently, success is defined by the researcher, and generally includes how closely the breastfeeding behavior adheres to the public health recommendations of the US Department of Health and Human Services and the American Academy of Pediatrics (Kramer et al., 2008; US Department of Health and Human Services, 2011). This may be adequate, or even desirable, for public health research focusing on population physical health outcomes. From a clinical perspective, however, where biopsychosocial outcomes could be considered more holistically, a definition of breastfeeding success that incorporates the woman's desired duration and

exclusivity of breastfeeding is a more sensitive indicator of whether women who have experienced abuse are genuinely less "successful" at breastfeeding, or whether they define that success differently. For a woman who does not intend to exclusively breastfeed because she is returning to work, or for a woman who is planning to pump breastmilk but does not want to directly breastfeed, "success" may mean a day or two of colostrum, or breastfeeding once or twice a day, or bottle-feeding in the *en face* position and interacting with her infant, or any number of possible scenarios that incorporate the aspects of breastfeeding that the woman finds valuable and relevant.

Breastfeeding as production

A second issue is that of constructing a relational act like breastfeeding as a consumerist/production model. This forces focus away from the individual and instead frames breastfeeding as an act of production for consumption, with the focus on efficiency and maximization of result. While this could be seen initially as a neutral or even positive construction, it centralizes the "product" of breastfeeding (milk) and ignores the less tangible benefits of maternal-infant interactions with each other and with the world around them. If the focus is on the production of milk, it is not on the development of the woman as mother.

Breastfeeding is a singularly female act, enacted in a context of consumerism and performance. Women are taught to "watch the baby, not the clock," while at the same time exhorted to pay close attention to the time between feedings and not to allow them to be "too long" (Foss, 2010). Diaper contents are examined for evidence that the woman is breastfeeding "enough", while pediatricians plot infant growth on charts originally normed on the growth of formula-fed white infants in Cleveland, OH, in 1971 (Hamill, Drizd, Johnson, Reed, & Roche,

1977). In a Target store, a woman can buy a product claiming to scientifically measure the adequacy of her breast milk, in the same aisle where a mind-boggling array of color-coordinated feeding paraphernalia hangs in tidy rows. The Affordable Care Act mandates coverage of breast pumps and lactation consultants (http://www2.aap.org/breastfeeding/files/pdf/FederalSupportforBreastfeedingResource.pdf), prioritizing milk production for infants, but the federal government does little to enforce the right to workplace breaks or to use those breaks to pump. Women are almost invisible in this conception of breastfeeding, and instead become a means of production, with the goal of maximizing the amount of human milk the infant receives.

When asked about their breastfeeding experiences, women use a variety of words to describe what lactation is like: bonding, meaningful, special, magic, spiritual, overwhelming, satisfying, frightening, exhausting, painful, embarrassing (Knaak, 2010; Leff, Gagne, & Jefferis, 1994; Mahon-Daly & Andrews, 2002; Ryan, Todres, & Alexander, 2011; Schmied & Barclay, 1999). Women do not generally describe breastfeeding in terms of numerical quantity in the extant qualitative literature, except as whether they were meeting expectations. Likewise, when discussing their decision about whether to breastfeed, women often use hesitant terms like "try" or "want" or "plan" (Earle, 2002; Knaak, 2010; Schmied & Barclay, 1999), rather than assuming their own success. When less than 20% of American women "succeed" at breastfeeding, why are we surprised at the reluctance of others to fully commit to a process that has been framed exclusively as a win/lose scenario (Centers for Disease Control and Prevention, n.d.)? Absent in the breast/bottle dichotomy are the shades of gray in which most women find themselves. If 75% or 85% of all infants receive some breastmilk before hospital discharge, and only 18.8% are breastfed exclusively at 6 months

(http://www.cdc.gov/breastfeeding/pdf/2014breastfeedingreportcard.pdf), then most American mothers and infants find themselves in the blurred liminality of mixed breast/bottle feeding during infancy, and we lose an opportunity to understand and validate women's choices.

Breastfeeding is primarily conceptualized as a lactational effort in which the woman's task is to produce milk, which will then be fed to the infant directly from the breast or via tube or bottle. Educational programs for parents and for nurses emphasize the quantitative nature of lactation (supply and demand, catching up to baby's demand, oversupply, insufficient milk syndrome) and understandably skim over the relational aspects of breastfeeding. This reflects both the inherent difficulty of measuring highly subjective relationships and the prioritization of production in both health care and capitalism. It also reflects the emphasis on "maleness" (production, competition, quantity) present as part of a patriarchal society. This is not intentionally done: as the data on maternal mental health and attachment have become equally strong and compelling, they call for a more nuanced approach that optimize the maternal, infant, and dyadic outcomes by imagining an additional, alternative, or improved vision of positive outcomes and by studying it. Trauma-informed research with vulnerable women is an extremely important venue for doing this work because they have the most variance in outcomes (resilient to severely distressed and impaired), and their infants have the most to gain in terms of needing every advantage—for physical, emotional, and relational health. The language women use to describe their own experiences is strikingly absent from both medical and popular discourse, and the language "survivor moms" use is even more absent.

Instead, success and failure are external concepts, determined by outside authorities. This is consistent with the conceptualization of reproduction as industrial production Barbara Katz Rothman (Rothman, 2008) describes:

> The use of mechanical, industrial metaphors influences so many aspects of our lives: organizations working like "clockwork," people "programmed" to think in certain ways, bodily "plumbing." With changing times, the prototypes for the machines change, and along with it our fears and fantasies, from the runaway conveyor belt of a Charlie Chaplin film to HAL taking over in *2001: A Space Odyssey*.
>
> And all this shapes how we see ourselves and our children. The world and all that it contains, including our own bodies, ourselves and our children, become potential resources, something to *make something of*. We build our bodies, sharpen our wits, and work on our relationships – and on our children. Efficiency is a crucial value in such a system, and we apply our ideas about machines to people, asking them too to be more efficient, productive, rational, and controlled. (p. 2)

Fiona Dykes (Dykes, 2007) describes a similar phenomenon in breastfeeding:

> The promotion of infant formula clearly located infant feeding within the discourses of production and consumerism, these concepts being central to the market economy (p. 32)…the women's reference to the health benefits was often made in a very automatic way, as if giving me the required answer. Women appeared to see breastfeeding as the "correct" behavior, a standardized ideal and as a one-way, non-reciprocal transmission of health to their baby, via the medium of breast milk. (p.75)

Breastfeeding has been isolated from motherhood as a dyadic relationship and instead has become a task to accomplish as a 'good mother' (Dykes, 2005; Labbok, Hall Smith, & Taylor, 2008; Marshall, Godfrey, & Renfrew, 2007). Dykes and Flacking (2010) move beyond this industrial model and argue for breastfeeding as intrinsically relational, both between the woman and her infant and between the woman and the world around her. The World Health Organization's hierarchy of infant feeding choices also suggests this, placing human milk at the breast from another mother higher than human milk expressed from the infant's mother and fed in a bottle (World Health Organization and UNICEF, 2003). That cross-nursing is considered preferable to bottle-feeding with human milk implies recognition of the importance of human contact and relationships in breastfeeding outcomes. This holistic view of breastfeeding is more congruent with how women describe both the positive and negative aspects of their breastfeeding

experiences (Beck, 2009; Flacking, Ewald, Nyqvist, & Starrin, 2006; Wambach & Cohen, 2009; Kendall-Tackett, 1998; Marshall et al., 2007; Schmied & Barclay, 1999), and offers guidance for developing a theory that includes the woman's existing and desired relationships with both her infant and the world around her.

Technology vs. Embodiment

A final point, which is less clearly a critique and more a factor to consider, is how the tension between women as production agent and breastfeeding as relational and mothering exemplifies Donna Haraway's cyborg as metaphor. Haraway describes cyborgs as "…a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction." (Haraway, 2006) Breastfeeding women are a created social trope as much as they are a group of women; there are values placed on what they do with their bodies, assumptions made about their agency, policies built around transforming more mere women into Breastfeeding Women. We have taken a bodily event and an intimate relationship, and from it created a series of social norms that must be observed in order to qualify as a Breastfeeding Woman (breastfeeds only in private, despite all difficulty, solely as the source of superior nutrition for her infant, who can then take his place as superior member of the social body). While women who breastfeed may be technically not cyborgs in the sense that their bodies do not physically incorporate machinery, the experience of mothering and feeding one's infant has become irretrievably intertwined with measurement of intake and output, the machinery required to extract milk, the assumption that medical experts are needed to untangle this complex skill, while at the same time degrading women who do not breastfeed. Our opinions of her mothering have become intimately connected to that mothering. In essence, the social body is the cybernetic

organism creating the fiction of ideal mothering.

The second part of this metaphor is more specific to the concept of cyborg as intertwined machine/organism, and ties back to the question of breastfeeding as production. Are we layering technology and systems onto the breastfeeding body in our effort to maximize production and health benefit, and in the process losing the ability to respond to the breastfeeding dyad as humans? Is it still possible to separate machine (referring to reliance on formal expertise as well as to literal machines like breast pumps) from organism, and what could that look like?

While this touches back on the issue of production as focus, it encompasses the overall shift in perinatal care to incorporate more technology and more external evaluation. A woman whose pregnancy has been monitored by ultrasound and lab work, and whose birth has been measured and evaluated and augmented by ever-more interventive technology is then taught to regard her body as a possibly defective factory of milk, which requires more technology and more intervention to manage. In essence, this is the darker side of Shulamith Firestone's (2003) vision of technology as savior from biological essentialism: Instead of freedom and choice, the cybernetic breastfeeding experience has brought distance.

Potential Models for a New Approach to Success

Much as critiques of breastfeeding come from a number of disciplines, including some not usually involved in public health promotions research (women's studies and other humanities disciplines), there is diverse guidance for a possible new way to measure breastfeeding success. Here I address four potential sources of direction for a new approach: the ecological systems model widely used in health promotions research; intimate justice, a concept arising from social psychology; patient-centered outcomes research, which originated in medicine; and reproductive

justice, a model developed by women of color in response to what they experienced as a singular focus on maintaining legal access to abortion without examining the surrounding power structures that affect choices. While none of these is in itself a solution to the issues discussed above, each provides a part of a possible pathway towards a solution.

Ecological systems model

The ecological systems model (ESM) widely used in nursing research suggests that proximal relationships (individual-family or individual-individual) may be stronger predictors than more distant contexts (individual-society, individual-historical; (Bronfenbrenner, 1986)). The breastfeeding relationship is not usually considered as a context, even though it is more proximal, and thus potentially more powerful as a factor then the more remote contexts. The proposed concept (concordance) moves assessment and measurement closer to the woman and her infant, and in doing so may be used to design interventions that are more sensitive to interpersonal, historical, and psychosocial contexts.

Bronfenbrenner's ecological systems model provides a framework for understanding health promotion and health behaviors in context. Using this model, the woman exists in a series of concentric spheres, with herself at the center, and the spheres becoming progressively less individual as they become less proximal to her. With this model, the immediate family is considered more "central" to health than is the larger community, but both spheres influence the outcomes. This is a way to acknowledge the context in which women live, and to begin to develop health interventions that focus on factors that are more immediate, and, possibly, more personally relevant to the woman. There is an added advantage in that this model is now widely used in public health research.

However, because the breastfeeding dyad is a dyad and not an individual, I instead conceptualize the center of the Bronfenbrenner model as tripartite: the woman, the infant, and the maternal-infant dyadic relationship are all central to the system and to the outcome. Each of them in turn affects both of the other factors. Incorporating a) the concept of a tripartite center to the breastfeeding relationship, and b) the situation of that center within concentric spheres of influence suggests that, as in other health promotions research, breastfeeding success can be constructed as a multi-layered concept, incorporating social as well as individual factors. However, in other health promotions research, more proximal factors are considered to have a greater influence on outcome. Because breastfeeding exists as a social-relational as well as health behavior and is subject to restraint and pressure from larger social forces, however, it is helpful to consider the more distal factors as potentially stronger than is usually conceptualized. The ecological systems model was originally developed as a means to direct attention towards social systems and their effects, and recognizing that brings ESM closer to its original uses.

Breastfeeding and intimate justice

The second possible conceptual solution is that of intimate justice. This concept is newer (2010), and addresses the issue of how to measure sexual satisfaction in social psychology. The parallels with breastfeeding are interesting: 1) it is a heavily-gendered concept; 2) it is an intensely personal act; and 3) it is measured in an effort to improve health and/or outcomes for the individual. While sexual satisfaction is not a direct parallel, in both cases researchers seek to measure the quality of an inherently dyadic relationship.

The key aspect for intimate justice is consideration of measurement, and how to measure an individualized concept in research. For intimate justice, the "justice" component is that of

entitlement: how can we measure a concept that people may not feel entitled to embody or enjoy, or that may be defined differently according to that entitlement? Breastfeeding success is similar in that the question becomes how to measure a concept while respecting what the meaning of that concept may be to any individual participant. Comparing "success" across two different sets of expectations is unrealistic at best and oppressive at worst. While women may not be free to identify and claim their own desired outcome because of expectations from outside (including the public health outcome measure), using the concept of intimate justice is a first step towards reclaiming

One challenge with the current framing of breastfeeding and its promotion is its focus on the individual woman, rather than on the larger social contexts in which she lives, and on ensuring adherence to universal recommendations. This is a common perspective in public health work, where the focus is on improving the health of a population as a whole, and has been very effective in many situations, such as vaccination and smoking cessation. However, breastfeeding is different both in its intimacy and in its dyadic nature. It is more analogous to contraceptive use or sexually transmitted infection reduction efforts than to agreeing to an annual flu vaccine. Instead of balancing the competing interests of the individual and the community, breastfeeding women negotiate a balance between the interests of two individuals who are intimately connected, as well as between those interests and those of the larger community. Breastfeeding is, after all, beneficial to public health, and that benefit requires an active investment by both the woman and infant to be realized.

The challenge when promoting breastfeeding success then is not how to maximize uptake of a health behavior so much as it is to optimize the relationship between the members of the breastfeeding pair, and the relationships with the larger community. Dykes and Flacking (2010)

allude to these relationships, as we saw in the previous chapter, but stop short of recommending a different paradigm for success. Suggestions for such a paradigm instead come from psychology, where the concept of *intimate justice* offers guidance. McClelland (2010) describes intimate justice as:

> …[it]focuses our attention on how social and political inequities impact intimate experiences, affecting how individuals imagine, behave, and evaluate their intimate lives. Without explicitly pairing intimacy and justice, intimate matters are often examined at the individual level, using theories and methods that strip the social from view. After all, intimate matters are often seen as the ultimate expression of selfhood. Theoretical and methodological models are needed which allow us to consider the individual as social agent – even as they inhabit and enact intimate experiences. (p. 672)

McClelland examines the concept of sexual satisfaction as an individual and measurement construct (McClelland, 2010). Comparisons can be drawn between measuring breastfeeding success (an individual, choice-driven concept with implications for health care outcomes) and measuring sexual satisfaction, which shares the same characteristics. In both cases, researchers generally use concept definitions that do not include contextualization of an intensely personal and individual experience, and in doing so, lose the richness and depth of that experience. This limited concept is then used to define outcomes, which are in turn limited in their application by the limitations of the chosen metric.

If we do not have a concept of breastfeeding success or of sexual satisfaction, both intensely personal experiences, that place the woman central to meaning, we cannot legitimately claim to have fully measured that experience or its outcome. Without understanding breastfeeding success, we cannot develop interventions intended to improve that success. McClelland's expansion of conceptualizing an intimate experience to include the context in which the individual exists is similar to Bronfenbrenner's ecological systems model (in which

the woman exists in the center of concentric layers of systems), but differs by adding *justice* as a value. Using intimate justice as a model, women have the right both to determine their desired outcome, and to be supported in reaching that outcome. It is an affirmation of the woman's choices, and in the responsibility of an intervention to meet those goals.

Sexual satisfaction differs from breastfeeding success in a crucial way: In measuring sexual satisfaction, researchers often directly ask participants how satisfied they are with their sex lives (McClelland, 2010). While the contextualization of satisfaction and what that means to the individual is missing, it is still a participant-measured outcome. By contrast, researchers generally measure breastfeeding success by how long and how exclusively a woman breastfeeds, and how those metrics compare to public health recommendations. The woman's assessment of her own breastfeeding success is irrelevant under this model, because success is framed as the transfer of milk to infant. How the woman felt about that transfer, what her expectations were, what her experience was, are all irrelevant under the public health model, whose definitions of health and target for interventions are all structured around the greatest-good paradigm. Including intimate justice when developing measurement supports the right of the woman to consider herself and her infant when making breastfeeding decisions, and opens the way for discussion about how to maximize the benefits of breastfeeding on a systems level while still attending to women on an individual level.

Patient-centered outcomes research (PCOR)

Next, we can look to health systems research for guidance on how to frame such a research question. The PCOR model seeks to re-center research questions on how the health issue or behavior in question affects the individual. For example, a key question in the PCOR

model is, “How can I expect this condition to affect me physically, emotionally, and personally, given my individual factors?”. Rather than researching or treating conditions or populations, PCOR seeks to insert the individual back into care. So a PCOR-type outcome question might be “How is this working for me?” or “Did this turn out the way I wanted to, given my situations and what I was hoping?”

The Patient-Centered Outcomes Research Initiative (PCORI) describes this approach as:

> This research answers patient-centered questions, such as:
> “Given my personal characteristics, conditions, and preferences, what should I expect will happen to me?”
> “What are my options, and what are the potential benefits and harms of those options?”
> “What can I do to improve the outcomes that are most important to me?”
> “How can clinicians and the care delivery systems they work in help me make the best decisions about my health and health care?”
> To answer these questions, PCOR:
> “Assesses the benefits and harms of preventive, diagnostic, therapeutic, palliative, or health delivery system interventions to inform decision making, highlighting comparisons and outcomes that matter to people;
> Is inclusive of an individual’s preferences, autonomy, and needs, focusing on outcomes that people notice and care about such as survival, function, symptoms, and health-related quality of life;
> Incorporates a wide variety of settings and diversity of participants to address individual differences and barriers to implementation and dissemination; and
> Investigates (or may investigate) optimizing outcomes while addressing burden to individuals, availability of services, technology, and personnel, and other stakeholder perspectives. (http://www.pcori.org/research-we-support/pcor/)

The benefits of using the PCOR model as one possible heuristic to arrive at better outcomes research are immediately evident from the above description: it is a person-centered model that incorporates the situation in which the person exists, while at the same time questioning how health care providers can best intervene to support the individual in his or her choices. Breastfeeding is an intensely personal choice and action, and the need to center evaluation and intervention on the individual breastfeeding dyad is clear. Where the public health model centers

the infant's physical health, the PCOR model centers the contextualized dyad holistic well-being. Rather than "instead of," PCOR offers an opportunity to research "as well as."

In this dissertation, I focus on a derivative of the first question above: "Given my personal characteristics, conditions, and preferences, what should I expect will happen to me?" (PCORI, 2014). This question recognizes that historical events, including the woman's family of origin and traumas she may have experienced, affect the reality of what may be involved in her breastfeeding relationship. By recognizing these events and this history, the choices the woman makes can be less externally measured and performance-driven. This question is relevant to the woman as a patient, in a provider-patient relationship. However, for breastfeeding generally, as a relational, social, personal, and medical act, the question might be better phrased, "Given my personal characteristics, conditions, and preferences, what do I want to happen for my baby, for myself, and for us as a dyad?" In this context, the salient question is not what is prescribed, but what is desired, and the role of the clinician is to maximize the woman's ability to meet that desired outcome. Evaluation of this concordance between desire and outcome is a crucial second outcomes measurement that will enable clinicians not only to promote the preferred public health goal of universal breastfeeding, but also to promote the woman's individualized goal, which may or may not be the same.

Reproductive Justice

Finally, attention needs to be paid to the intersections of privilege and oppression inherent in health care. For this, I turned to guidance from the reproductive justice (RJ) movement. RJ is usually used in the sense of expanding the role of reproductive rights to include not only a legalistic statement of a right (to abortion, for example), but also an affirmation of the right of

the individual to exercise that right (or not) in a context that allows it to truly be a right (Justice, n.d.). The example often used in RJ is that of economic constraints on choice: is it possible to freely choose to end a pregnancy if one does not have the economic and social supports to continue it?

The parallel construction for breastfeeding could be similar — is it possible to choose to breastfeed if work or other constraints make it difficult or impossible? — or conversely, is it possible to choose not to breastfeed if doing so is framed as being a substandard mother? While RJ is not a direct parallel for most breastfeeding issues, as it is heavily concerned with legal and contextual issues of access, its framework offers an important critical lens for examining any proposed woman-centered measure, and recognizing the limits of that measure.

There are significant problems with framing breastfeeding as a choice, if that choice is affected by access to resources and by the chronic stress inherent in living within an unjust social system. Labbok, Smith, and Taylor (2008) say, "It is important to re-orient the paradigm from the current view that breastfeeding is a 'lifestyle choice,' to a paradigm that views breastfeeding as a reproductive health, rights and social justice issue." This construction challenges the class issues inherent in breastfeeding in a setting where affluent women are more likely than poor women to have the structural support for breastfeeding (private offices in which to pump, the ability to afford to leave paid employment, lactation support not covered by insurance, postpartum doulas or other home help to ease the immediate transition to parenting) and then reap not only the physical but social rewards of following the "Good Mother" trope. As in other RJ issues, choice exists only in the ways that it is not limited by the systems surrounding it.

Breastfeeding and "survivor moms": Intergenerational effects of trauma on feeding

As with psychorelational outcomes for abuse survivors, breastfeeding has been historically examined as a health behavior, rather than as a relationship mediated by physical and psychological factors. The general health-promotion approach has been to increase education (often using the Theory of Planned Behavior; (Ajzen, 1991), and this approach has been effective at increasing women's intent to breastfeed (Lawton et al., 2012; Lumbiganon et al., 2011). Other research has shown that intent is one of the most significant factors influencing breastfeeding behavior (i.e., the infant receiving breast milk via any route; Bai, Wunderlich, & Fly, 2010; Donath et al., 2003; Persad & Mensinger, 2007), and from a public health perspective, this is a reasonable approach. However, studies with sexual abuse survivors and anecdotal evidence from lactation consultants imply that intent does not translate to outcome in the same way for these women (Beck, 2009; Coles, 2009; Kendall-Tackett, 1998), suggesting that current breastfeeding metrics are inadequate to explain or describe successful breastfeeding.

Women who have survived trauma or abuse often intend to breastfeed (Prentice and colleagues [2002] found initiation rates twice those of non-abused women), but continuation rates are 15% lower than for women without a history of abuse (Prentice et al.), contradicting the finding that greater intent leads to greater success with breastfeeding (Bai et al., 2010; Donath et al., 2003; Persad & Mensinger, 2007). Finally, an additional implication is that trauma-informed assistance and trauma-specific interventions may improve the public health goal attainment by helping more women attain this concordance when the initial desire is to breastfeed.

By including the concept of success in breastfeeding as perceived by the woman in the overall assessment both for both clinical and research purposes, two goals are met. First, the

definition of success is expanded to include a woman-centered definition, rather than solely an external one, which allows the woman the freedom and agency to determine what her breastfeeding goal is within her individual context. Instead of measuring how closely a woman adheres to universal, nonspecific recommendations, a woman-centered breastfeeding measurement allows her to determine her own goals, and measures her success against those. This addresses the issues described above, and gives a partial solution to the conflict between feminist (including issues of essentialism, intimate justice, and reproductive justice) and social (breastfeeding as production, body as cyborg) critiques and the very real public health benefits of breastfeeding for a population.

Using a self-defined measure of success recognizes the complexity of individual lives, in which breastfeeding is affected by personal and societal factors in different proportions. For research purposes, breastfeeding promotion outcomes must be measured in a way that is meaningful to the woman in order for those outcomes to have clinical and policy utility. The moral imperative of breastfeeding that is often presented as the only positive choice a woman can make creates a situation in which her life realities and choices are unimportant, and where breastfeeding is an all-or-nothing proposition. By measuring the concordance between a woman's desired breastfeeding pattern (exclusivity/duration) and her actual pattern, the researcher is better able to identify whether the woman is successful at breastfeeding as she envisions it.

The second goal that is met is incorporating the experiences of survivors and empowering them to make decisions that are congruent with their desires and their choices. Far from being a departure from the focus on traumatic stress and breastfeeding outcomes, considering alternative measures of success may be particularly salient in trauma-informed breastfeeding culture, care,

and research. Rather than another disempowering experience, as was the original maltreatment/abuse, breastfeeding can be reframed as an opportunity for the woman to make decisions about her parenting, her infant, and her body. However, in order to avoid reinforcing structural inequities by failing to challenge how those inequities are expressed and reinforced by cultural constraints and messages, it is crucial to critically assess the assumptions, norms, and expectations that are included in the concept of "choice". As both McClelland and RJ theorists have pointed out, decisions and options do not happen in a vacuum.

Like women without PTSD, many trauma survivors plan to breastfeed their infants, and may intend to breastfeed in higher rates than women without a history of trauma (Benedict, Paine, Paine, Brandt, & Stallings, 1999; Prentice et al., 2002). The reasons for this are not well understood, but qualitative work suggests that reasons include a strong desire to parent correctly, and/or to "do better" for the child than the woman herself experienced (Beck, 2009; Coles, 2009; Kendall-Tackett, 1998), but they appear to discontinue after initiation at higher rates as well (Benedict et al., 1999; Kendall-Tackett, 1998; Prentice et al., 2002). Because of intergenerational transmission of trauma concerns, promoting well-being in dyads with women who are maltreatment survivors is particularly important, as is fostering a sense of control over their bodies and ability to meet their own physical and emotional needs—and a sense of success in feeling bonded and in parenting. Thus, the push to breastfeed may need to be balanced with support to meet other equally critical outcomes of this relational, embodied act.

There are significant benefits to infants from breastfeeding, including reduced risk of diarrheal illness, respiratory illness, and death (Dieterich, Felice, O'Sullivan, & Rasmussen, 2013). There are significant maternal benefits to breastfeeding, including reduced risk of breast and ovarian cancer (Godfrey & Lawrence, 2010). There are significant public health benefits to

infants being breastfed if possible, by reducing the risk of costly illness and a small, though not absent, risk of death (Chen & Rogan, 2004). However, the benefits of human milk ingestion for the infant and production for the woman are not the only outcomes a survivor mother is trying to maximize. She is also likely attending to her own (potentially fragile) well-being postpartum and to the (potentially vulnerable) mother-infant relationship, and doing so within the context of family, social/employment, and cultural/structural contexts that may not be supportive.

Therefore, it may be particularly important for this sector of the population, but useful across the board, to discern and support more nuanced levels of desire and tenuousness in intent to breastfeed (e.g., "I will *try* it," or "Only if it doesn't make me have flashbacks") and to measure and credit more incremental achievements (e.g., "At least my baby got colostrum," or "At least I know I tried and I know the upset to me would have distracted me from focusing on my baby.") These are not breastfeeding "failures". They are different women's interpretations of the balance between their resources (emotional, physical, temporal, situational, social) and the needs of themselves, their infant, and their relationship with that infant.

Next Steps

At this time, I believe it is not possible to design or identify an "ideal" woman-centered, self-report measurement for breastfeeding. Instrument development work that is participatory would be a first step in that direction. However, within the context of a secondary analysis, even within the constraints of the data that were collected, there is an opportunity to take a first step at identifying such a measure and using it as an adjunct measurement.

As I noted above, the measure I will be using is the concordance between intent and outcome, which recognizes and respects some of the issues detailed above. Concordance is an

imperfect measure, mostly by virtue of its over-simplification of what is really a complex phenomenon and for the reasons outlined by reproductive justice theorists, but it is a start at addressing some of the need for a woman-centered measure of success for a woman-centered relationship. While not a perfect or ideal measure of woman-centered breastfeeding success, it is a step forward towards that measure.

This has several advantages. First, it utilizes the data that are available, not only in this data set, but in most datasets that ask about intent. Since intent is the single strongest predictor of breastfeeding, this is a common variable that will be available. Second, it has the advantage of being a woman-centered variable rather than an externally-determined one to the extent that it operationalizes, like the PCOR stance, the outcome in conjunction with what the woman's expressed desires were. Third, it is a start at addressing some of the shortcomings of the exclusively public-health-based measurements, and re-centering attention to the reality of women's lives, and to our agency within those lives. This will help breastfeeding research to focus on what we are measuring and why. Focusing on concordance when planning breastfeeding promotion interventions allows us to focus both on intent (how can we encourage more women to start breastfeeding?) as well as individualized approaches to common breastfeeding challenges that occur (anticipatory education about how to handle a drop in supply, or identifying specific ways for providers to support breastfeeding without shaming or blaming a woman who stops breastfeeding, or role-playing around negotiating interactions with family or the workplace that concern the woman). Finally, including concordance in measuring breastfeeding success enables us to look at women as whole people, with complex lives and pasts, with current and historical contexts to their freedom and their decisions. In the next chapter I discuss how I used the available data in a trauma-focused study a) using the customary

public health outcome of breastfeeding (exclusive, supplemented, or not at all), and b) exploring use of the concordance between what the woman desired and what actually occurred as a new, woman-centered outcome.

If our desire is for improved comprehensive social and health outcomes, we would be well served by taking the current gains from the "one message, one outcome" approach and building toward a more nuanced one. In order to do so, we need to start first with conceptualizing concordance (the match between intended and actual infant feeding method). For this dissertation, in the method section, I will operationalize it in a manner feasible within an existing dataset that used the public health outcome of feeding via "breast," "bottle," or "both." In the results section I present careful description of how it performed; in the discussion I consider its usefulness, limitations, and implications and make recommendations for clinical and research use going forward.

CHAPTER III: Methods

Background

In the previous chapters, I highlighted several knowledge gaps and research deficits; primary among them is lack of attention to trauma history and post-traumatic stress, but attention also is needed to lack of a woman-centered approach to measuring outcomes. I suggested that use of a woman-centered outcome is crucial to adequate measurement of a woman-centered experience, and that psychobiological differences between women with a history of abuse and those among them who also have PTSD may warrant a trauma-informed approach to evaluation of breastfeeding behaviors.

Breastfeeding is a complex relational act, but it has been most often studied from a population health standpoint. The literature has attended to the influence of numerous factors affecting initiation and discontinuation including socioeconomic status, body mass index, route of birth, pregnancy complications, parity, social support, intent, and knowledge about breastfeeding (Dewey, Nommsen-Rivers, Heinig, & Cohen, 2003; Donath et al., 2003; Heck et al., 2006; Labarere et al., 2012; Mehta, Siega-Riz, Herring, Adair, & Bentley, 2011; Newton, 2004; O'Brien, Buikstra, & Hegney, 2008; Santo, de Oliveira, & Giugliani, 2007; Swanson & Power, 2005; Uvnas-Moberg & Eriksson, 1996). Breastfeeding is a public health priority, with substantial resources committed to increasing rates in the United States (Brown, Bair, & Meier, 2003; US Department of Health and Human Services, 2011). The principal outcome studied is

duration and exclusivity because the Centers for Disease Control and Prevention (CDC), the US Department of Health and Human Services, the World Health Organization, and the American Academy of Pediatrics urge women to breastfeed exclusively for six months, and with additional foods for at least one year, or as long as is mutually desired (Kramer & Kakuma, 2004; Work Group on Breastfeeding, 1997; World Health Organization/UNICEF, 2003). In 2011, only 18.8% of infants were exclusively breastfed at 6 months of age despite 79.2% being breastfed at birth nationwide, with some state initiation rates as high as 92.8% (CDC, 2015), and this is the case despite more than a decade of concerted effort.

As discussed in previous chapters, woman-centered breastfeeding outcomes have rarely been operationalized and studied, which presents an opportunity to consider a new approach to studying this critical individual, dyadic, and population health outcome. Assessing how the woman wants or intends to feed the infant, how she does feed, and whether there is concordance between intended and actual feeding methods are alternative or additional ways to research breastfeeding. I propose to augment attention to the customary (public health) outcome of extent of breastfeeding (i.e., exclusive, mixed, or no breastfeeding) with the novel (woman-centered) outcome of extent of concordance with her intention (i.e., complete, partial, or no concordance).

The primary contribution of this project, however, is addressing the second gap in the literature: the lack of trauma-informed research on breastfeeding. If mental health morbidity impinges on breastfeeding, it may be more amenable to interventions than other factors previously associated with low breastfeeding intention, initiation, or continuation. Non-optimal breastfeeding (either not initiating or premature discontinuation) is linked to depression in women, although it is unclear whether the depression is a risk factor for or a result of breastfeeding challenges (Bogen, Hanusa, Moses-Kolko, & Wisner, 2010a; Kendall-Tackett,

Cong, & Hale, 2012; Stuebe, Grewen, Pedersen, Propper, & Meltzer-Brody, 2012; Watkins et al., 2011). There is reason to believe that perinatal mental health has been understudied as a risk factor and may be very important. Increasingly, researchers are focusing on trauma history (mostly childhood abuse) and PTSD in the perinatal period, and effects on both mental health of the mother-infant dyad and physical outcomes of that period (Bowman et al., 2009; Enlow et al., 2009; Grote et al., 2012; Humenick & Howell, 2003; Seng et al., 2013; Seng, 2002). However, the relationships between perinatal posttraumatic stress and outcomes specific to breastfeeding have not been studied adequately. As illustrated in Chapter 1, there are publications exploring this topic with expert opinion (Kendall-Tackett, 1998; Klingelhafer, 2007), qualitative studies (Beck, 2009; Beck & Watson, 2008; Coles, 2009), and small empirical projects (Prentice et al., 2002; Wood & Van Esterik, 2010). These studies tend to suggest that either trauma history or PTSD may adversely affect breastfeeding; however, these have included only survivors of sexual abuse or birth trauma, not other forms of abuse or other trauma exposures. We need strong preliminary work to test the hypothesis that trauma and/or PTSD adversely affect breastfeeding.

Specific Aims

The specific aims of this dissertation are

1) To describe and compare the rates and patterns of feeding method intent and outcome among women characterized with respect to childhood maltreatment/trauma history (CMT) and lifetime post-traumatic stress diagnostic status (PTSD), and

2) To determine the extent to which CMT and PTSD are associated with the non-optimal breastfeeding outcomes as measured by public health and woman-centered outcomes in a theory-based model that includes multiple contextual factors.

3) Assuming positive results for the above aims, an additional, exploratory aim will be fulfilled by reflecting on the models and literature, and tentatively proposing a conceptual framework to guide future trauma-informed research on breastfeeding outcomes.

The research questions in relation to the primary focus on CMT and PTSD effects on breastfeeding outcomes are:

1. What are the effects of CMT on breastfeeding intent? (Aim 1)
2. What are the effects of PTSD on breastfeeding intent for survivors of CMT? (Aim 1)
3. What are the effects of CMT and PTSD on the public health and concordance outcomes, taking other known influences into account? (Aim 2)

Introduction to the Secondary Analysis Project

Early in the course of investigating a new hypothesis, preliminary types of research are warranted (Polit & Beck, 2004), including qualitative, especially theory-developing, approaches. Often, instrument development work is also needed. If an appropriate dataset can be found,

secondary analysis can be a particularly useful form of preliminary study. The Stress, Trauma, Anxiety, and the Childbearing Year (STACY) Project is an NIH-funded observational outcomes study completed in 2010 that provides an outstanding opportunity to conduct a preliminary study on the effects of trauma and PTSD on breastfeeding intent, initiation, and continuation to six weeks postpartum.

Before looking at how the relevant variables were created, we need to look at the parent study and what data are available.

Parent Study (STACY)

The parent study was the first large prospective cohort study looking at the relationships between early childhood maltreatment/trauma (CMT), post-traumatic stress disorder, and perinatal outcomes. The data were collected between 2005 and 2008 at three sites in the Midwest, and purposely selected diverse sites, in order to have sufficient power to examine low-frequency complications and to be able to identify possible reasons for the known increased risk of perinatal complications for African American women. The parent study enrolled into follow-up women who fit three cohort definitions: PTSD cases, trauma-exposed controls, and non-exposed controls. The features of the study are described in detail below.

Strengths and Limitations

The parent study has several strengths for this purpose. Its data collection was structured according to a conceptual framework that can be used in relation to any adverse outcome of childbearing, including those related to breastfeeding: lack of intent to breastfeed, non-initiation, or early discontinuation. Many co-variates considered to be important in the breastfeeding literature (e.g., BMI, social support) are included. The sample size is large enough to conduct

multivariate analyses with numerous co-variates. The trauma history and PTSD assessments are gold-standard epidemiological research measures. Depression was also measured with a gold-standard epidemiological measure, so it is possible to consider it an additional factor and to place this study in context with previous studies of depression and breastfeeding. There are medical records data to augment the survey data. The participants are sociodemographically diverse, such that results can be well generalized to US perinatal clients. All are expecting their first infant, so all experience the question of intent and the challenges of initiation and continuation within the context of first breastfeeding experience. The survey was conducted apart from the clinical setting, so social desirability in self-reporting breastfeeding intent and behavior is likely minimized. Finally, the data were collected prospectively, so "failure" to breastfeed or problems with initiation do not result in recall bias as they might in a retrospective study.

The STACY Project has a few limitations for this purpose, most of which are inherent in secondary analyses. The lack of detailed data about breastfeeding and the follow-up period that ends at six weeks postpartum when the ideal would be to know the outcome at six months or later are both limitations. Finally, some women with PTSD symptoms below the diagnostic threshold (i.e., partial PTSD) did not fit cohort definitions and so were not enrolled for follow-up. This artifact of the STACY Project three-cohort design (explained below) requires consideration.

The opportunity to use the STACY Project data to conduct a preliminary study provides the basis to address the following broad research question: To what extent are childhood maltreatment history and PTSD adversely affecting public health and woman-centered breastfeeding outcomes? In the rest of this chapter, I describe the project in detail, including salient features of the STACY Project (the "parent study" to distinguish it from the "secondary

analysis study”). I delineate two specific aims and a set of hypotheses and go on to provide the methods of the secondary analysis project. I use the Strengthening the Reporting of Observational Studies in Epidemiology Statement (STROBE) as a structure to frame the methods of the secondary analysis study (“The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies.,” 2007).

Next I will discuss 1) the theoretical structure used to organize this analysis; 2) the parent study for the secondary analysis (STACY); 3) the choices of measurement variables; and 4) the analytic choices made in the study.

STACY Theoretical Structure

The theoretical structure chosen for the study is a breastfeeding-specific modification of a trauma-informed theoretical framework previously used for multiple studies of this data set (Figure 3-2). The STACY theoretical framework essentially posits that PTSD acts as a mediator for adverse perinatal outcomes, and those outcomes may be moderated by modifiable risk factors, non-modifiable risk factors, and life event stressors. It accounts for behavioral and neuroendocrine changes that can affect outcomes. Figure 3-1 shows the original STACY framework, while Figure 3-2 summarizes the modified theoretical structure and lists below each component the variables used to operationalize each in the statistical analysis and the instruments used to measure each.

The modifications that were made removed the “injury” pathway for adverse outcomes (as physical injury rarely directly affects breastfeeding) and the neuroendocrine pathway. This was removed because of limitations of the dataset — I do not have the data to examine neuroendocrine changes that may be present. However, given the theoretical relationship

between dissociation and the neuroendocrine dysregulation presented in Porges, Teicher, Schore, and Seng's work, dissociation was considered as a proxy for some level of neuroendocrine dysfunction. It is an imperfect proxy and did not work in practice, but was worth exploring as part of a stepwise analysis, as explained below.

For this study, the salient trauma exposure is CMT and lifetime (DSM-IV) PTSD is the focal diagnosis. Other trauma exposures such as car accidents and disasters have not been seen as salient to breastfeeding outcomes and are not considered in the analyses.
Dissociation was considered an associated feature of PTSD under DSM-IV, and is a subtype specifier under DSM-5. Depression was considered a comorbidity under DSM-IV, and low mood is now a symptom of PTSD under DSM-5. Thus, I expected them to overlap with PTSD, and in the original framework they would be considered part of a traumatic stress spectrum of morbidity subsumed under PTSD. For purposes of this analysis, they were separated out in the stepwise regression model after PTSD itself was taken into account, so I could partial out their particular effects.

The time orientation of the framework and the project overall was based on when interventions based on the model are likely to be used: in this case, at the time of delivery or shortly afterward, with RNs and IBCLCs as the target audience. Therefore, factors that are outside the ability of the lactation-focused provider to change directly (like NICU and cesarean birth) were classed as "nonmodifiable". Modifiable risk factors include attendance at childbirth education and alliance with provider. Non-modifiable health care risk factors include NICU admission and cesarean birth. The "life-event stressor" was considered to be the pregnancy/birth for all participants. Before looking at how the relevant variables were created, we need to look at the parent study and what data are available.

Description of the Parent (STACY) Study

Parent Study Overview

The STACY Project (NIH R01 NR008767, PI Seng, "Psychobiology of PTSD & Adverse Outcomes of Childbearing") is a prospective, longitudinal, three-cohort study of the effects of PTSD on perinatal outcomes. The STACY team recruited nulliparous pregnant women from three health systems in the Midwest and interviewed them at three time points in the perinatal period. Additionally, there are medical records, microarray genotyping, and salivary cortisol data available for some of the participants. The data collected are almost exclusively quantitative, although some open-ended survey questions were included. It was the first large prospective study to look at relationships between trauma exposure, including childhood maltreatment/abuse, PTSD, and perinatal outcomes. To date over 20 reports have been published addressing the main study aims and ancillary questions.

Parent Study Sample

Following Institutional Review Board approvals, participants were recruited from eight clinic locations in three health systems in a Midwestern state. Clinic nurses recruited women who met the eligibility requirements (age 18 or over, having her first baby, proficient in English, and <28 weeks estimated gestational age at the time of the first interview), who were then invited to participate in the survey interview, which was conducted by a professional survey research company (DataStat, Ann Arbor, MI). Enrollment began in August 2005 and continued through October 2008. Each interviewer verified participant eligibility and obtained verbal informed

consent, including discussion of the standard Confidentiality Certificate provisions, and used a computer-assisted telephone interview (CATI) program to conduct a standardized psychiatric diagnostic interview. The interviewers analyzed the replies by a computerized algorithm using PTSD diagnostic criteria (Diagnostic and Statistical Manual of Mental Disorders, 4th Edition; American Psychiatric Association, 1994) to assign women to one of three cohorts in a design that is classic for PTSD studies where trauma-exposed controls are essential to verify the extent to which it is PTSD, rather than the exposure itself, that is associated with the adverse outcome. The three cohorts are PTSD cases (i.e., lifetime diagnosis, n=319), trauma exposed, resilient controls (n=380), and non-exposed controls (n=350). A subset of the initial sample (n=532) did not meet the criteria for these three cohorts; most of these women had some PTSD symptoms but did not meet criteria for Cohort 1. These women were not selected for follow-up, but they are included among the unselected first interview sample.

Parent Study Settings

Data were collected in three settings in the parent study: 1) the University of Michigan Health System in Ann Arbor, MI, a large academic medical center in a university town with many affluent families; 2) Detroit Medical Center's Hutzel Women's Hospital, a large academic medical center in Detroit, MI, serving a largely African American low-income population; and 3) Henry Ford Medical Center, a large academic medical center with locations in central and outlying areas of Detroit, serving a racially diverse population.

Overview Of Parent Study Survey Components

The data for this study were collected at three time points: on enrollment to the study (approximately 28 weeks EGA), in the third trimester (~35 weeks EGA), and 6 weeks postpartum. They included psychological measures, intent to breastfeed and whether or not the infant was breastfed at all and at 6 weeks, medical records data, and demographics. All women were having their first baby, were over the age of 18, and could speak English (*N*=1581). Note that in the parent study, the trauma exposure that resulted in the woman being in the study could be *any* of the 29 potentially traumatic events queried if they met the DSM-IV definition for a trauma exposure. However, for this secondary analysis, my focus was on the particular trauma exposure of CMT.

Wave 1: Baseline diagnostic status leading to cohort assignment

Lifetime trauma history, lifetime and past-month PTSD symptoms and diagnosis, past-year depression comorbidity, and current dissociation were all assessed in this standardized diagnostic interview. (Measures described below.) A computerized algorithm applied Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV; American Psychiatric Association, 1994) PTSD symptom diagnostic criteria and assigned women to one of the three cohorts for follow-up: PTSD-diagnosed cases, trauma-exposed but resilient controls, and non-exposed controls. Women who did not fit these cohort definitions (*n*=532), most of whom had partial PTSD, were dismissed from follow-up. At this interview, women were also asked demographic questions, previous and current mental health service use, and how they planned to feed their infants, using a nominal variable with response options of "breast", "bottle", or "both".

Wave 2: Interim trauma history and potential moderating factors

The second interview followed at approximately 35 weeks estimated gestational age. The primary purpose of this interview was to maintain contact for retention, so the data collected pertained mainly to potential moderating factors, consistent with the "life event stress" component of the framework. This included items such as family functioning, quality of life, discrimination, and interim trauma history and PTSD symptoms. Data related to the woman's experience of the health care system, including her relationship with her provider were also collected.

Wave 3: Birth trauma and outcomes

The third interview occurred at approximately 6 weeks postpartum. The questions at this interview included multiple research-validated instruments to assess postnatal depression, PTSD, mother-to-infant bonding, comfort with intimate aspects of parenting such as diapering, and parenting sense of competence. Additionally, the women were asked about their labor and birth, including an overall rating, their perceptions of the care they received, dissociation during labor, and whether they had experienced the birth as a traumatic event. They were also asked about any new traumatic events that had occurred since the initial interview, in order to identify which women had increased or new PTSD symptoms related to their birth or other trauma. Finally, they were asked a) "How are you feeding your baby now?", with the same possible nominal responses as in the initial interview, b) "Did you experience any problems breastfeeding?" and c) "What was helpful with these problems?". The responses to the last two questions were recorded verbatim as short-answer free responses.

Recruitment/IRB: Parent Study

Following approval by the institutional review boards (IRB) at the University of Michigan and each of the data collection sites, all women at the eight participating clinics who were a) able to speak English without an interpreter, b) 18 years or over, c) expecting their first child, and d) <28 weeks estimated gestational age, were invited to participate in a survey about "stressful things that happen to women, emotions, and pregnancy". Those eligible who wanted to learn more (*n*=2,689) were given written information about the study and asked for contact information. Counts were maintained of eligible women who gave contact information but were never reached by telephone, declined to participate, or were found not be eligible, but no data are available on any women who did not participate in the initial survey. Figure 1 depicts the sample sizes to be used for this secondary analysis from each data collection component.

Parent study measures

Most of the measures in the parent study were widely used diagnostic instruments and scales, validated in the literature for similar populations, and administered by professional surveyors via telephone. A few, including the breastfeeding and mental health treatment variables, are single-item questions. I examined psychometrics and variable creation information for the proposed variables of this dissertation included in the secondary analysis methods section, which follows this description of the parent study (see Table 3-1).

Parent study medical records data

Chart data were abstracted from the medical records (paper or electronic) in the postpartum period, using an abstraction instrument developed for the parent study. The interrater

agreement was very high (>90%, both initially and in random audits of 5% of the charts that occurred throughout the study) (Seng, Mugisha, & Miller, 2008). This is above the minimal accepted interrater reliability of 75% (Waltz, 2010).

Parent study analyses

The sample size of the parent study was calculated to power the study of low-frequency perinatal outcomes (e.g., hyperemesis at 2% prevalence). Because of this, the sample is more than adequate for study of the major outcomes of interest. The analyses of the parent study have been conducted primarily with stepwise regression models, which is consistent with the conceptual framework in Figure 4-1 (e.g.,Bell & Seng, 2013; Lopez, Konrath, & Seng, 2011; Seng, Low, Sperlich, Ronis, & Liberzon, 2011).

Attrition

Not all women participated in each step of data collection, but the samples remain similar across time points. Prior analyses have found that while the proportions of the cohort groups in the parent study did not differ between data collection between Waves 1 and 3 or between interview and medical record samples. Disadvantaged women were disproportionately likely to be lost to attrition, but this was anticipated, and over-sampling resulted in outcomes samples that still include adequate proportions of diverse women for generalizability (Bell & Seng, 2013; Seng et al., 2011b). See Figure 3-4 for sample sizes in each component.

Description of the Secondary Analysis Study Methods

The variables that were initially chosen were based on the breastfeeding literature and the modified STACY theoretical framework. Some were removed following the preliminary analyses or after the stepwise regression model showed their inclusion did not contribute to improved prediction either independently or by significantly influencing the association of other independent variables with the outcome.

The variables were organized into steps for theory-based modeling :

1. History of CMT (any sexual/physical/emotional abuse prior to age 16)
2. Lifetime diagnosis of PTSD
3. Associated features of PTSD (depression, interpersonal sensitivity, dissociation)
4. Health care:
    a) Modifiable risk factors: childbirth education, provider alliance;
    b) Medical risk factors (risks not modifiable by the lactation consultant or labor nurse): NICU admission, cesarean birth, BMI;
5. Parenting factors (parenting sense of competence, postpartum bonding, comfort with intimate aspects of parenting).

The measures for each of these were selected by the original research team because they were gold-standard instruments when such existed. There are a few other measures that were study-specific (e.g., the Health Care Alliance Questionnaire) or investigator-generated items (e.g., asking if the woman took a childbirth education course). These measures are summarized in Table 3-1.

Of the original 1581 women, 520 women had data from all three time points and medical records available. However, one woman was deleted from analyses because she stated she did

not know how she was feeding her infant (*N*=519). The concordance outcome variable requires that women have data on both intent and outcome. 21 women answered in the first prenatal interview that they did not yet know their intention. Rather than impute an intention, these 21 women were dropped from the concordance outcome analysis (*N*=498). These numbers are explained again below in the section on variable creation.

Although secondary analyses are inherently limited because they were not planned for in the original study design and measurement, the parent study is well-suited to this particular secondary analysis. The STACY study evaluated 1581 women who received prenatal care at three medical systems in southeast Michigan from 2005-2008. It is a complex dataset with numerous variables, collected at three time points (<28 weeks gestation, approximately 35 weeks gestation, and 6 weeks postpartum) via interview and medical records with prenatal and delivery information from a diverse sample of women (see Table 4-1 for demographic details). The scope provides a breadth and depth of data relevant to the research aims, and a sample size robust enough for stepwise modeling with multiple variables.

In this section, I present the secondary analysis methods in parallel with the elements of the parent study methods. I will begin by framing the aims and hypotheses, describing modifications to the conceptual framework, going into detail about the variables to be used, including their psychometrics, and outlining detailed steps for the planned analyses.

Secondary Analysis Major Concepts

In this dissertation, I examine several concepts that have common definitions or uses, as well as specific technical or medical ones. It is important to clarify how these terms are defined and operationalized within the dissertation.

Trauma. The definition of trauma used by the Substance Abuse and Mental Health Services Administration division of the Department of Health and Human Services is:

> Individual trauma results from an event, series of events, or set of circumstances that is experienced by an individual as physically or emotionally harmful or threatening and that has lasting adverse effects on the individual's functioning and physical, social, emotional, or spiritual well being. (APA, 1992)

Because trauma is specific to an individual, the perception of the event as traumatic is the salient characteristic, not the specifics of the traumatic event(s).

Childhood maltreatment/trauma. Childhood maltreatment/trauma refers to physical, emotional, and/or sexual abuse, maltreatment, or neglect that occurs prior to adulthood. I use the term "maltreatment" broadly for the spectrum of experiences that can occur in mild to violent forms. This differs from abuse trauma that occurs as an adult in several ways. Childhood maltreatment tends to occur over a period of time, and it tends to be perpetrated by trusted adults like a parent or family friend, so can adversely affect attachment, and it is associated with specific changes in later stress responses (Dutra, Bureau, Holmes, Lyubchik, & Lyons-Ruth, 2009; Herman, 1992; Schore, 2001; Teicher et al., 2002; 2006). In the parent study, childhood maltreatment/trauma was defined by five questions focusing on history of physical abuse, sexual abuse involving contact only, sexual abuse involving penetration, emotional abuse or neglect, or physical neglect that occurred prior to the age of 16, and I used the same definition in this dissertation. Variables were constructed from these questions that are a sum that can be treated as an interval-level indicator (0-5 types of exposure) or a dichotomous classification (positive or negative for childhood maltreatment/trauma history). For the purposes of this dissertation, presence of any history of childhood maltreatment/trauma placed the woman in the category "CMT-positive". This was a conscious choice to avoid privileging certain types of abuse or maltreatment over others.

Posttraumatic stress disorder. PTSD is a disorder following a traumatic event, in which the survivor experiences a) re-experiencing the event, b) physiologic and psychological arousal, and/or c) avoidance of reminders of the event (APA, 1992). These symptoms must persist for at least a month and cause significant distress and impairment.

The DSM-5 (APA, 2013) makes significant changes to the definition of PTSD. Specifically, it removes the requirement that the traumatic event be one that caused fear of death or other substantial bodily harm, and reconfigures symptoms by adding several, grouping them into four clusters, and specifying a dissociative subtype. However, because all data were collected under the DSM-IV, and because all the instruments used to measure aspects of mental health, including PTSD, were validated using the DSM-IV definitions, these were the definitions that were used for this dissertation.

Associated features. PTSD rarely occurs in isolation, and depression is the most common comorbid condition (Brady, Killeen, Brewerton, & Lucerini, 2000). In the STACY project, major depressive episode within the past year was measured, permitting this secondary analysis to attend to the independent and combined effects of depression on breastfeeding outcomes. This is particularly significant given that postpartum depression is a well-known risk factor for non-optimal breastfeeding outcomes (Akman, Kuscu, Yurdakul, Ozdemir, Solakoğlu, Orhon, Karabekiroğlu, & Ozek, 2008; Bogen, Hanusa, Moses-Kolko, & Wisner, 2010; Kendall-Tackett, 2007; Watkins et al., 2011).

Dissociation. As discussed in Chapter 1, dissociation can include both adaptive and maladaptive responses to stress. The key finding for dissociation is a sense of being separate from oneself or being an observer on one's life. Because of the potential for benign or adaptive uses of dissociation, it is important to distinguish between maladaptive and adaptive forms of

dissociation. In the STACY study, dissociation was measured using the Dissociative Experiences Scale-Taxon (DES-T), which separates pathological dissociative experiences from nonpathological or adaptive experiences using an 8-question scale (Waller, Putnam, & Carlson, 1996).

Breastfeeding. The literature on breastfeeding's health benefits does not consistently identify whether benefits are derived from the infant directly nursing, or from expressed human milk fed to the infant in another way, such as via bottle or cup. Research on the relational aspects of breastfeeding, by contrast, specifically refers to the infant directly nursing from the mother (Dykes & Flacking, 2010). The World Health Organization distinguishes between milk from the infant's mother and from another mother in its taxonomy of preferred infant feeding, but does not specify how that milk is consumed (World Health Organization/UNICEF, 2003). However, the common meaning of the term "breastfeeding" is the infant directly nursing from the woman, and the number of women who exclusively pump and then feed human milk to their infant is anecdotally small. There is no way to determine from the existing data what the definition used by any given woman was. Therefore, for the purposes of this dissertation, "breastfeeding" refers to a woman who answers "breast" or "both" to the questions about how she intends to or is actually feeding her baby, without requiring any particular method.

Secondary Analysis Description

The design of the parent study and attrition over follow-up affected the sample available for this analysis. Figure 3-1 depicts the number of women who participated in the initial survey (*N*=1581), who were enrolled for follow-up (*n*=1049), who participated in the late gestation survey (*n*=647), the postpartum survey (*n*=566), and whose medical records could be obtained for abstraction (*n*=839). For purpose of this analysis, I had data about "intent" from the 1581 initial survey completers. (Two women who responded "don't know" to the question of intended feeding method were dropped from analysis.) There were data about medical complications from those 839 for whom I had medical record data. I also had the feeding method outcome data for the 566 who completed the 6-week postpartum survey. The Venn diagram (Figure 3-3) depicts how these samples overlap.

When components of medical record data are combined with survey data, the sample size was slightly decreased because the STACY team was not able to obtain medical records for 46 of the 566 women who completed the postpartum survey. Additionally, one woman responded "don't know" to the question of how she was feeding her newborn, and was dropped from analysis. There were therefore 519 women in my final sample, who have data from all three surveys and medical records, including the breastfeeding main outcome variable. Of these 519, 498 had an intended feeding method and could be used for analyses that required knowing intent to breastfeed (*concordance* and both regression analyses). This sample size is large for a prospective clinical study, and allowed analysis of multifactorial outcomes such as breastfeeding.

Secondary Analysis Setting

As described above, the settings for the parent study included diverse patient populations. The racial distribution of the three sites varied significantly, from 92.5% African American at Detroit Medical Center's Hutzel Women's Hospital to 9.0% African American at the University of Michigan Health System, which reflects the racial makeup of the surrounding communities. The diversity of these sites allowed close examination of the potential role of race and class in breastfeeding outcomes for women with PTSD. Both race and class are known to affect initiation and continuation rates of breastfeeding; African American women are less likely to initiate and continue breastfeeding, as are poor women (Bai, Wunderlich, & Fly, 2010; Shealy, Scanlon, Labiner-Wolfe, Fein, & Grummer-Strawn, 2008). The oversampling of African American participants (29.9% in the subsample used for this secondary analysis) relative to the US population as a whole (12.3%; US Census Bureau, 2000; http://www.census.gov/population/www/cen2000/briefs/phc-t1/tables/tab03.pdf) permitted a robust analysis of the relative importance of race when compared to class and other variables.

Secondary Analysis Measures

Of the independent variables available in this dataset, there are four types to describe: demographic items (based on the PRAMS standard items used by the CDC; CDC, 2014, retrieved from http://www.cdc.gov/prams/questionnaire.htm), research-validated standardized multi-item instruments from three waves of interviews, investigator generated single items, and abstracted medical records data (described above).

Demographics. Because demographics are associated with differential outcomes, I included data from standard items in the PRAMS item pool. Because of the inverse relationship between

cortisol and oxytocin discussed in chapter 1, I used sociodemographic status as a proxy for chronic stress that may be affecting breastfeeding success. STACY uses the standardized self-report demographic items from the Centers for Disease Control and Prevention (CDC) Prenatal Risk Assessment and Monitoring survey (PRAMS). Prior analyses using the parent study have used an index of five sociodemographic factors known to be associated with PTSD (Seng et al., 2009):

1. teen status (18-20 years old at the time of delivery)
2. African American racial identity
3. less than college education
4. poverty (<$15,000/annual income)
5. residence in a high-crime neighborhood (excluded from this analysis due to a lack of literature support for its inclusion)
6. (Added for this analysis) partner status

These neighborhoods were identified using the Federal Bureau of Investigation's 2000 Uniform Crime Report, cross-referenced by the woman's zip code. Each factor counted as one point if present, and previous analyses have considered a woman high risk if her total score was 2 or greater (Bell & Seng, 2013; Seng et al., 2009; 2011; Seng, Low, Sparbel, & Killion, 2004). Because there is no precedent for inclusion of high-crime neighborhood status in the breastfeeding literature, this variable was not included in analysis. While these earlier analyses used the risk index, I used individual risk factors in order to better identify which factors were specifically associated with breastfeeding outcomes.

Employment status is significant in the breastfeeding literature (Earle, 2002), but the data available do not allow analysis by type of employment (full or part-time) or by occupation, which can affect the woman's access to private space and time to pump to maintain her milk

supply. Because of this limitation, employment was not included in the analysis.

In order to capture a description of partnership status rather than the relationship title, women were asked about living arrangements instead of legal relationships. Women could identify as living alone, with a husband, with a male domestic partner, with a female domestic partner, with parents, with other relatives, or with a housemate. (Because same-sex marriage did not legally exist in the state at the time of the study, women were not asked about this.) If questioned, the interviewer clarified "domestic partner" as "adult with whom you share a sexual and economic partnership, even though you are not married". For this analysis, women who reported living with a husband, a male domestic partner, or a female domestic partner, were considered to be "partnered".

Life Stressor Checklist. Childhood maltreatment group assignment used the Life Stressor Checklist (LSC; (Wolfe, Kimerling, Brown, & Chrestman, n.d.)), modified for telephone interviews to assess 29 potential traumas. This measure includes a number of potentially traumatic events that are inherently gendered, such as pregnancy loss and care of very ill relatives (Cusack, Falsetti, & de Arellano, 2002), and is considered the most sensitive measure for assessment of traumatic events in women's lives. As explained above, if a woman disclosed physical, sexual, or emotional abuse, or physical neglect prior to age 16, she was considered to have a history of childhood maltreatment or trauma (CMT).

National Women's Study PTSD Module (NWS-PTSD). The NWS-PTSD Module was developed specifically to study epidemiology of PTSD in the civilian population (Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993), and was later validated in the largest epidemiologic study of women with PTSD to date (Kilpatrick et al., 2013). In Resnick's study, the measure performed well (sensitivity 0.99, specificity 0.79) when compared to the standard clinical tool

(Structured Clinical Interview for DSM Disorders [SCID]; Resnick et al., 1993). The instrument assesses both current and lifetime PTSD symptoms. For the purposes of this analysis, I focused on lifetime symptoms as a dimensional variable (0-17 count) and lifetime diagnosis as a dichotomous variable (PTSD yes/no).

Composite International Diagnostic Interview (University of Michigan version: UM-CIDI). The UM-CIDI is a structured diagnostic interview intended to be used by nonclinical interviewers to identify anxiety and depression (Wittchen, Kessler, Zhao, & Abelson, 1995). It is derived from a similar interview tool developed by the World Health Organization, whose purpose was to correctly categorize psychological disorders without requiring the use of costly clinical personnel to do so. The interview tool consists of questions that are read verbatim by the interviewers; extemporaneous questions are not allowed. Women identified as having an anxiety or depressive disorder using the UM-CIDI are considered to have that disorder for the purposes of this analysis.

Dissociative Experiences Scale-Taxon. This is a modification of the Dissociative Experiences Scale, a 28-item self-report measure that describes the frequency (but not intensity) of a series of dissociative experiences, including depersonalization and derealization (Bernstein & Putnam, 1986). Eight items from the scale were chosen as a measure of pathological dissociative symptoms most associated with psychiatric diagnosis of dissociative disorders (Waller et al., 1996).

Health Care Alliance. This is a 16-item Likert-type scale intended to measure the degree to which the woman feels valued by and connected to her health care provider (Roosevelt, Holland, Hiser, & Seng, 2013). In factor analysis it had a Crohnbach's alpha (internal consistency reliability) of .933, which is excellent, and other psychometrics were likewise acceptable to

establish its instrumental validity. It has not been widely used, however, outside the parent study and subsequent secondary analyses. Higher scores indicate higher alliance with provider.

Parenting Sense of Competence Scale (PSOC). The version of the PSOC used was modified from the original (Gibaud-Wallston & Wandersman, 2001) by Watson and colleagues to use fewer items and a lower reading level for use in studies where it is a co-variate rather than the outcome of interest (personal communication, Daphne Watson to Julia Seng, 2009).

Postpartum Bonding Questionnaire. In its original form, the PBQ was a 25-item questionnaire intended to be used to identify women who were at risk of impaired bonding or violence towards their children (Brockington, Fraser, & Wilson, 2006). The positive statements (e.g., "I enjoy playing with my baby") are scored from 0 (always) to 5 (never); negative statements are scored in the reverse. Therefore, higher scores indicate a higher possibility of impaired bonding. There are two questions that ask directly about child abuse; these were dropped from the version administered in the parent study due to concerns about conflicts between confidentiality and mandatory reporting. The findings of the PBQ were correlated with a standard diagnostic interview at the time of initial development (Brockington, 2001).

Intimate Aspects of Parenting. Based on Picton's (1990) questionnaire, this measure contains 11 items that assess the woman's comfort with aspects of physical care and showing affection. The items are repeated twice, once for the youngest son, once for the youngest daughter, and the woman has the option of making comments at the end of the measure. Higher scores indicate more anxiety.

Secondary Analysis Major Constructed Variables

There are two key variables for this analysis that are constructed from data available in the parent study. The first is the trauma and PTSD grouping variable; the second is the woman-centered breastfeeding outcome variable.

I derived three groups of women by grouping the sample as a whole into two groups: those with a history of CMT and those without. Next, I divided the CMT-positive group by history of PTSD diagnosis, yielding three groups in total. To be succinct and adequately descriptive, groups are referred to as CMT-PTSD (positive for both CMT and PTSD); CMT-resilient (positive for CMT, but negative for PTSD), and non-CMT (no history of CMT).

The decision was made to use these three cohort assignments, which are similar to those used in previous STACY analyses, rather than creating a fourth cohort (PTSD-positive, CMT-negative). The primary rationale for separating PTSD from other trauma from PTSD from CMT would be to distinguish between women likely to have neuroendocrine-mediated breastfeeding challenges (CMT-PTSD) from those whose PTSD may be creating primarily behavioral challenges. There are two reasons not to do so at this point in the research into possible relationships between CMT and breastfeeding challenges. First, the proposed relationship that is specific to CMT-PTSD rather than other PTSD is hypothesized to be oxytocin-mediated, which is not measurable with this dataset, although dissociation will be tested as a possible proxy for this. Second, having a history of CMT-PTSD places a woman at elevated risk of future PTSD onset that may not be related specifically to the early trauma (Johnson, Pike, & Chard, 2001; Maggioni et al., 2006). Essentially, being traumatized as a child may set the stage for future traumatization, and it may not be possible to distinguish between women who developed PTSD

that is not specifically due to having experienced CMT, but that they might not have been as likely to develop without the prior experience of CMT.

One way to begin to address the limitations above is to explore the association of dissociation symptoms with outcomes. As I described in Chapter 1, dissociation is, under the DSM-IV definitions, an associated feature of PTSD, and may be a more common PTSD symptom among women in pregnancy (Seng et al., 2013). It is also a clinical marker for complex PTSD, which is associated with repeated, chronic traumas, as would occur for a child experiencing CMT. Therefore, in the absence of direct neuroendocrine data, dissociation is a reasonable proxy to explore in this study.

As noted in Chapter 2, there are significant limitations to using the AAP/WHO guidelines as the sole measure of breastfeeding success. The major limitation is that the external guidelines are not a woman-centered measure, and cannot take into account factors both in the woman's life and in the larger social milieu that affect breastfeeding's desirability or possibility. For women who work in jobs without private spaces or time to pump, breastfeeding to age two may not be an option, as her milk supply will quickly dwindle if she cannot express milk at work. For a woman with a history of sexual abuse, breastfeeding her child despite the anxiety and triggering of recall of traumatic events it causes her may not benefit the woman, her child, or their relationship (Beck, 2009; Coles, 2009; Wood & Van Esterik, 2010). Finally, as multiple feminist writers have pointed out, breastfeeding is an inherently gendered act, and there are ethical issues with compelling anyone to partake in an activity that has costs as well as benefits, simply because she is a woman (Galtry, 1997; McCarter-Spaulding & Gore, 2009; Shaw, 2004; 2007; Van Esterik, 1994). However, breastfeeding is biologically optimal for most mother/infant dyads, and the public health implications of low breastfeeding rates are well-known to include

including decreased risk of allergy, diarrheal illness, and death for the infant, and depression, anxiety, and breast cancer in the woman (Chen & Rogan, 2004; Danforth et al., 2007; Godfrey & Lawrence, 2010; Kendall-Tackett, Cong, & Hale, 2013; Kramer et al., 2008). Therefore, "breastfeeding success" is operationalized as *both* a) whether the woman breastfeeds according to the public health recommendations as of the six-week postnatal timepoint, and b) whether her actual breastfeeding outcome is concordant with her intended breastfeeding outcome

Secondary Analysis Primary Outcome Measures

1. Breastfeeding (of any amount) at 6 weeks.
2. Concordance at 6 weeks with reported prenatal intention.

Public health outcome measure. The first constructed variable was "public health breastfeeding", with two classifications: Breastfeeding, which includes exclusive breastfeeding (no other food or drink at the 6 week interview) and mixed feeding (human milk and formula, in any proportion/frequency); and formula feeding (no human milk at all). While an ordinal ranking would reflect the known dose-dependent benefits of breastfeeding for woman and infant, there is not a way given the extant data to distinguish between the infant who receives an occasional bottle of formula from those who may breastfeed once a day. Therefore, a dichotomous variable is a more consistent choice: an infant either receives breastmilk (in any quantity) or she does not.

Concordance outcomes measure. The second constructed variable was "breastfeeding concordance". Using this outcome variable, a woman who intended to feed both breastmilk and formula and who did so would be considered to have a concordant (i.e., successful) outcome, because her intent and outcome matched. A woman who had intended to breastfeed but was unable to do so would be considered to be discordant, because she was unable to create her

desired breastfeeding relationship. I created the outcome variable by cross-tabulating the intention and outcome variables, creating the 3 x 3 matrix. The diagonal cells represent concordance, the other cells are not concordant. (See Table 4-2). These 9 cells were reduced to the final outcome variable, which was nominal: concordant (breastfeeding at least as much as desired) or not.

Secondary Analysis Conceptual Framework: The STACY Framework

The conceptual framework for this dissertation is a modification of Seng's 2002 model of the effects of early trauma on perinatal outcomes (see Figure 3-1). It is useful at this point to recall that this framework was used to guide the analyses, but that I did not presume it is the best model for theorizing the relationships that affect breastfeeding. The third aim of this project is to reconsider theoretical depictions in light of the empirically supported relationships found in the secondary analysis. This conceptual framework guides the analysis overall. It posits that early abuse potentially changes the psychobiological response to both extraordinary and everyday stressors, which changes in turn are associated with adverse outcomes. The particular adverse outcome can vary across studies. So far, the STACY project has demonstrated adverse outcomes including reduced length of gestation, lower birth weight, increased postnatal depression and delayed or impaired bonding (Seng et al., 2011; Seng et al., 2013).

There are three theoretical pathways by which abuse can affect health outcomes in this model: 1) injury related to the abuse directly affects outcomes; 2) behavioral changes related to the abuse affect outcomes; and 3) neuroendocrine changes related to the abuse affect outcomes. For the purposes of this dissertation, focus is on the psychosocial pathways by which PTSD is theorized to affect perinatal outcomes. The injury pathway is not considered, as physical injury

resulting from abuse is rarely directly a cause of breastfeeding problems. The neuroendocrine pathway cannot be assessed with the available data, although oxytocin dysregulation presents an intriguing possible cause of the syndromic breastfeeding pain without apparent physical cause that lactation consultants report in women with PTSD (Penny Simkin, personal communication, 2012; Michelle Fuehr, personal communication, 2013). Seng has more recently proposed a new theory which might be germane, but which cannot be sufficiently operationalized with the STACY data (Seng et al., 2013). This posttraumatic oxytocin dysregulation disorder (PODD) theory explicitly connects early relational trauma (e.g., CMT) to long-term dysregulation of oxytocin and stress-response systems. This is exciting work that suggests new mechanisms by which trauma could adversely affect breastfeeding and early parenting, and fits closely with the work being done examining the relationship of early trauma with intergenerational transmission of trauma and self-regulation issues in both woman and infant. As evidence for this theory develops, there will be opportunities to explore breastfeeding in survivors, but the STACY project did not adequately measure early relational trauma and did not collect oxytocin data. The older conceptual framework has been used successfully in multiple analyses, and also has the benefit of placing the woman within the context of her life and situation. This is a significant factor in its suitability for breastfeeding research, since as a relational act, breastfeeding always occurs within a context rather than in isolation.

Analysis

The analyses were as follows:

1. Describe the sample characteristics as a whole and compare between breastfeeding and non-breastfeeding women (*N*=519);

2. Describe and compare the rates of breastfeeding intent based on 1) history of CMT, and 2) PTSD diagnosis, using chi-squared ($\chi 2$) comparisons. (Aim 1)

3. Describe and compare both continuation and concordance at the final interview (Wave 3) by 1) history of CMT and 2) history of PTSD (Aim 1);

4. For Aim 2a and 2b, perform stepwise logistic regressions using the variables that are known in the literature to affect breastfeeding outcomes organized according to the conceptual framework assessing which, if any, of them have a significant relationship with the continuation and concordance breastfeeding outcomes (see Figure 3-2).

5. Aim 3 is addressed in the discussion.

Preliminary steps

Preliminary analytical decisions included cohort creation, outcome variable creation, and bivariate analyses of intent (at 28 weeks EGA), feeding method and concordance (both at 6 weeks postpartum). I chose to perform bivariate analyses 1) comparing outcomes between the CMT-PTSD, CMT-resilient, and non-CMT groups (Aim 1, 2a and 2b), and 2) comparing each variable between a) women breastfeeding (any amount) at 6 weeks, and b) women not

breastfeeding at 6 weeks.

Preliminary analyses assess variable distribution and the extent to which continuous variables meet the assumption of normality. Since the outcome variables are dichotomous, I used the standardized residuals of the logistic regression models to verify that error variance is normally distributed. Preliminary analyses customarily also consider missing data, but the only variable with missing data was the one women who answered "I don't know" for the outcome of how she was feeding her infant, and this was managed by deleting her case from the outcomes analyses.

Variables included in analysis

The initial analyses contained the following variables chosen based on the literature and to operationalize the modified theoretical framework from the STACY project[7]. (See also Figure 3-2):

a. Intent to breastfeed
b. CMT history
c. PTSD history
d. Major depressive disorder
e. Dissociation
f. Ante-, intra-, and postpartum complications
g. NICU admission
h. Cesarean birth
i. Provider alliance
j. Attendance at childbirth education classes
k. Parenting sense of competence
l. Postpartum maternal-infant bonding
m. Comfort with intimate aspects of parenting
n. Race
o. Poverty
p. Educational status
q. Teen status
r. Partner/marital status

[7] BMI is associated with breastfeeding issues in the literature (Mehta et al., 2011; Wojcicki, 2011) and was significant in the bivariate analyses (as shown in Chapter 4). However, there was significant missing data (*n*=403 with BMI data) and so it was dropped from analysis a priori.

Several variables were not independently significant. These were not dropped only because of lack of independent significance. I also considered the extent to which keeping a variable that was not an independent predictor affected (i.e., adjusted or modified) the association of previous predictors in the model with the outcome. Thus some non-significant predictors in each final model are retained even though others are not retained. Rationales for each of these decisions will be in the results chapter, to show more clearly what the effects of that were at each point, and why the data supported that decision.

The decisions about which variables to include as independent variables in the final models were made both after the preliminary analysis and after early versions of the regression models. Variables that were significant in a bivariate relationship but were not significant in the regression model were dropped or retained based on Greenland's (Greenland, 1989) rule of thumb. This suggests that co-variates that change the coefficients of other variables by >10%, even if they are not independently associated with the outcome, should be retained because they are having an effect, and likely add explained variance. They also are adjusting or modifying the associations of the other variables with the outcome. Because the regressions here are theory-based, I entered variables in a step-wise manner and only considered adjustments to coefficients in the same or preceding steps. Decisions to eliminate variables before the regression analyses were based on a lack of support in the literature (e.g., crime rate), or significant missing data (BMI). Some variables that were not independently predictive in the regression model are nonetheless so strongly supported in the literature (e.g., NICU admission, cesarean birth) that they were retained in the final model. (See Table 4-6 for further details.)

Organization of Variables Within the Steps of the Models

These steps are outlined in Tables 4-7 and 4-8, and are intended to track tightly onto the modified Seng theoretical model and concept map (Figure 3-2). In each step, the R^2 and the ΔR^2 is assessed to determine a) the total variance explained by the model thus far, and b) the amount of variance explained by the new variable(s) added in that step. For all steps, the minimum p-value for significance is .05. The variables described below are the ones entered into the regression analyses.

Step 1: Intent. Research consistently suggests that intent to breastfeed is the strongest predictor of breastfeeding outcomes (Bai, Wunderlich, & Fly, 2010; Chertok, Luo, Culp, & Mullett, 2011; Donath et al., 2003; Lee, Rubio, Elo, & McCollum, 2005), and this intent is consistent with the Theory of Planned Behavior discussed in Chapter 2 (Ajzen, 1991; Lawton et al., 2012), which is used in interventions research to guide intervention development.

Step 2: CMT. It is not yet known whether it is CMT, PTSD, or both that affects breastfeeding outcomes, nor is it known whether these two variables separately or together explain more variance. Because of this uncertainty, I used CMT as the second step of the stepwise regression, in order to separate effects of CMT from those of PTSD.

Step 3: PTSD. For this step, I used a dichotomous lifetime variable reflecting diagnosis by DSM-IV criteria.

Step 4: Associated factors of PTSD. Step 4 examines the mental health aspects of maternal health that may affect the breastfeeding relationship. In this step, I added in whether the woman had a history of major depressive disorder and whether they experienced significant dissociation, although the latter was not retained in the final model. Dissociation, as discussed above, is an

intriguing possibility to measure oxytocin dysregulation using a psychological proxy. Because of this, dissociation was examined in the bivariate analyses and included in early versions of the multivariate analyses. It was not retained in the final analysis; because this was a data-driven decision, the reasoning for this is addressed in Chapter 4. (See also Table 4-6 for details.)

In the literature, depression is consistently associated with poorer public health breastfeeding outcomes (e.g., Akman, Kuscu, Yurdakul, Ozdemir, Solakoğlu, Orhon, Karabekiroğlu, & Ozek, 2008; Kendall-Tackett et al., 2012; Watkins et al., 2011), but the directionality of this relationship has been at times unclear. In the parent study, past-year depression was measured in wave 1, so it is possible to assess the impact on outcomes of pre-existing depression prospectively measured. The high rate of comorbidity with PTSD requires that the analysis account for what proportion of outcome differences are due to PTSD, rather than the frequently-comorbid depression (Brunello et al., 2001; Johnson et al., 2001). Kruse and colleagues (2015) found that impaired postpartum bonding predicts an increased risk of postpartum depression, which suggests that relational issues may be significant in predicting depression, rather than resulting from it.

Because so little research exists, and because few distinctions are made in the literature between the mental-health effects of breastfeeding issues and the relational aspects of breastfeeding, either using solely depression or adding a variable more specific to interpersonal relationships would be reasonable. The increase in depression could be an outcome of non-concordance, but given the data, this is not possible to measure. In this case, I used pre-existing prenatal depression, which makes depression a predictor, which was then considered alongside PTSD and dissociation. In an effort to incorporate the interpersonal aspects of breastfeeding,

parenting sense of competence – essentially, how well the woman feels she is doing at parenting her child – was chosen as the variable, and was added as a separate step.

Step 5: Medical risk/Healthcare system. Some women are unable to breastfeed for medical reasons (standard estimates are <5%; Riordan, 1998), and more are subject to increased risk of breastfeeding difficulty related to medical complications, including cesarean birth, NICU admission, and other ante-, intra-, and postpartum complications (Dewey et al., 2003; Jonas et al., 2009; Laanterä, Pölkki, & Pietilä, 2011). Because these complications are complexly related to physiology, medicolegal issues, practice guidelines, and other factors, they are not considered modifiable by providers who see survivors in the postpartum period, although they may be modifiable earlier. These complications are used as dichotomous variables (yes/no cesarean birth, NICU admission, ante-, intra-, and postpartum complications). The variables for this step come from abstracted medical records, essentially eliminating the risk of recall bias that could arise from instead using the open-ended questions about problems with birth or with the baby's health. The dichotomous variables were collapsed into three categories: antepartum, intrapartum, and postpartum complications. Antepartum, intrapartum, and postpartum complications were dropped from the final models, as discussed in Chapter IV.

NICU admission and cesarean birth were handled differently. While cesarean birth was not significantly associated in the bivariate analyses or in the regression with the outcome measures, the literature has previously linked cesarean birth with a decreased likelihood of breastfeeding in multiple studies (e.g., Dewey et al., 2003; do Espírito Santo, de Oliveira, & Giugliani, 2007; Thompson, Kildea, Barclay, & Kruske, 2011) and so it was retained. NICU admission was significant in the bivariate analyses and the regressions, and was retained. Had it not been significant, however, it would still have been retained in the final regression models

because of the consistent association in the literature with reduced rates of breastfeeding (Laanterä et al., 2011; Newton, 2004) (Table 4-6).

Some of the known factors influencing breastfeeding outcomes are within the ability of the healthcare system to moderate. Prenatal education, which frequently has a breastfeeding-education component, is evaluated in the STACY dataset using a series of questions about whether the woman attended prenatal education, how many classes, and if she attended all classes. Because the number of prenatal classes required to effect change in breastfeeding behavior is not clear in the literature, these questions are instead converted to a dichotomous variable: Prenatal education: yes/no (Chezem, 2003; Lumbiganon, 2011).

Provider alliance, or the connection the woman feels with her prenatal/birth care provider, has not been studied as a factor in breastfeeding outcomes. However, a key factor in the Theory of Planned Behavior is the recognition of the desired behavior as normative, and several studies have examined the effects of primary care and other providers' attitudes and education about breastfeeding, and concluded that such providers can have a positive effect on the intent to breastfeed (Andaya, Bonuck, Barnett, & Lischewski-Goel, 2012; Loiselle, Semenic, & Côté, 2005). Therefore, provider alliance, by measuring the degree to which the patient feels allied (and thus accepts the provider's norms as their own) to their provider, may prove to play a significant role in the intent establishment and perceived self-efficacy required under the TPB (Ajzen, 1991). The variable performed poorly in the model, and as it is a new variable that has been used in one prior study and does not have specific literature-based reasons to retain it, it was dropped from the stepwise regression.

Step 6: Parenting. The maternal-infant relationship, while not directly measured as a mental-health issue, is known to have significant effects on maternal and infant mental health, and on

breastfeeding outcomes (Else-Quest, Hyde, & Clark, 2003; Lima, Mello, & Mari, 2010; Tharner et al., 2012). Bonding/relational function can be measured with a) perceived parental competence, b) bonding, and c) comfort with intimate aspects of parenting.[8]

As noted above, there are theory-based and empirical reasons to incorporate the relational aspects of parenting into the model. Three measures (Parenting Sense of Competence [PSC], Postpartum Bonding Questionnaire [PBQ], and Intimate Aspects of Parenting [IAP]) were available to assess these aspects. While all three were significant in the bivariate analyses, there were reasons to remove the PBQ and the IAP from the final models. These were data-driven decisions and as such are detailed in Chapter 4, and summarized in Table 4-6. The three measures likely overlap in concept, and so are not independent of each other. Therefore, one measure (Parenting Sense of Competence [PSOC]) was retained. As discussed in Chapter 4, the IAP did not perform well and is not a well-established measure; the PBQ was intended to measure clinically significant bonding disorder, so the distribution is skewed. Therefore, the best choice if the three was the PSOC.

Step 7: Demographic factors. Some of the most significant risk factors for nonoptimal breastfeeding outcomes (as measured by public-health outcome measures) are demographic: race, age, education level, poverty, and employment (Dewey et al., 2003; Earle, 2002; Kong, 2004; Santo et al., 2007). While not routinely used as a demographic risk factor, the use of an SES risk index, as previous STACY analyses have done, allows the inclusion of chronic stress

[8] There were several possible options for the variable for this, and the decision about which to use to measure this outcome was data-driven. The three measures used were the Postpartum Bonding Questionnaire (PBQ), the Parental Sense of Competence (PSOC), and the Intimate Aspects of Parenting (IAP). None had been used in the context of breastfeeding research with survivors of trauma, and all performed poorly in the model, in part because none are intended to measure parenting factors related to breastfeeding, with the exception of the IAP, which has two questions about the woman's comfort with breastfeeding-related activities. Because the PSOC measures self-perceived parenting competence, which is an issue in some breastfeeding research, it was chosen as the final measure used. While a more specific measure of the maternal-infant dyad would be very helpful in clarifying relationships, such a measure does not as yet exist.

related to overlapping structural oppressions to be included in the model. Crime rate is not a traditional demographic variable, but it acts as a proxy for chronic stress and limited access to resources. However, there is no support in the breastfeeding literature for its use, and it was not significant in preliminary analyses. Therefore, the PRAMS risk factors included in this step are a) age, defined as teen (18-20 years of age), and not-teen (all other women); b) poverty (household income <$15,000 annually; c) low education (high school or less); d) race (African American or not); and e) partnered or not. The decision was made to leave the factors discrete rather than creating an SES risk index in order to identify which specific factors were significant; as shown in the results chapter, this was a decision supported by the data.

Summary

In summary, this project was a breastfeeding-focused secondary analysis of a parent study intended to look at perinatal effects of CMT and PTSD, and includes data from three time points and medical records. The theoretical framework used is trauma-informed and places PTSD as a mediator for adverse perinatal outcomes, which are then potentially moderated by other modifiable and non-modifiable factors. The data were analyzed using bivariate analyses and logistic stepwise regression to answer the research questions above, and to identify any empirical support for the use of the theoretical framework in the context of breastfeeding research. In the next chapter, I present the results of those analyses.

CHAPTER IV: Results

Introduction

As noted in the previous chapter, I performed several separate analyses for this dataset. First, I examined the relevant demographics of the dataset as a whole and for each of the three groups (comparison, CMT-PTSD, and CMT-resilient). Second, I looked at the prevalence patterns for each of the three groups for a) intent to breastfeed at the initial visit, b) whether the infant ever received any breastmilk, and c) breastfeeding at least part-time at the 6-week postpartum interview. Finally, I performed stepwise regression analyses mapped onto the STACY theoretical framework (Seng, 2002)to identify outcome predictors, once using the public health outcome measure (is the infant still breastfeeding at 6 weeks?) and once using the concordance outcome measure (did the woman's intent and outcome for breastfeeding match?).

In this chapter, I discuss the statistical tests used to analyze the data, results of the data analysis, and the significant findings of the research study for each of the three research questions. The analysis includes data collected from 2006-2008 from 1581 women in three health care settings (two academic medical centers and one large urban public hospital) in a large Midwestern state, over three time points; 519 women had complete data, including medical records, for all three time points for the public-health outcome, and 498 had complete data, including medical records, for all three time points for the concordance outcome (see Figure 3-

4). The loss for the concordance outcome reflects the impossibility of evaluating concordance for women who did not know how they intended to feed their babies. Because intent is included in the regression analysis as the first step, the regression sample size for both the public health and the concordance outcomes is 498.

While it is not conventional to explicate the research decisions in the results chapter, as this was a data-driven analysis guided by the limited research available, I have included rationales for decision points during the analysis at the relevant point. This is done in the interests of transparency and to clarify the reasoning behind analytical choices. The analysis involved two parts: first, the bivariate analyses involving overall description of the sample's profile on all salient characteristics as a whole, then comparing those who were breastfeeding at 6 weeks with those where were not, then examining intent and outcome both by group (CMT-PTSD, CMT-resilient, and all others with no CMT history, which I refer to as "not-CMT" to be succinct) and by factor (CMT and/or PTSD); and second, two logistic stepwise regressions to 1) identify predictors of breastfeeding, 2) to identify predictors of concordance, and 3) to explore whether there is empirical support for using the theoretical framework discussed in Chapter 3.

Statistical Tests

I used SPSS, Version 22.0 (IBM, 2013) to analyze all the data in this dissertation. The specific statistical tests used include the following: descriptive analysis and frequencies; Pearson's chi-squared (χ^2) test of independent samples; analysis of variance (ANOVA); Hosmer-Lemeshow goodness-of-fit; and logistic stepwise regression, attending to odds ratios and the change in variance explained as variables were added and removed using Nagelkirke's R^2. Each statistical test and its significance is discussed within the text of its respective section.

Preliminary Analyses

Salient missing data

The decisions around sample choice are described in chapter 3. For the public-health outcome bivariate analyses (whether a woman is breastfeeding at 6 weeks postpartum), *N*=519; for the concordance bivariate analysis *N*=498. In the regression analyses, *N*=498 (the number of women who had a response for the question about intent). This number was used for both the concordance and the public health regression models.

The other missing data were in the medical records, which were not always completely filled out by the provider. I chose to use the medical documentation norm of "if it's not charted, it didn't happen", as charting by exception is common in many sites and is considered a standard for documentation. Therefore, any missing medical records data was counted as "no" in the relevant variable (e.g., if there is no notation about transferring the infant to the NICU, then it was assumed that no such transfer occurred and the variable was coded as "no" or "0").

Much of the preliminary work has been previously detailed in this dissertation. Descriptions of the variables and the validation work supporting scales and other measures used are in Chapter 3, Table 3-1. A complete table of variables is available in Appendix B.

Preliminary validation analysis also verified that there was no collinearity between the selected variables in the regression model, and that the error variance distribution was overall acceptable because it approximated a normal distribution. This sample met the standard error variance acceptability for logistic regression, because the standardized residuals of the regressions approximated a normal distribution in visual inspection of the histograms (Tabachnick & Fidell, 2007).

Sample description

The sample was demographically diverse and generalizable to the population of women who use maternity care services in the US. Of the full sample (*N*=519), 155 women (29.9%) described themselves as African American, and 82 (15.8%) overall were pregnant as teens (age 18-20 at the time of the first interview). There were 165 women (31.8%) who reported an education level of high school or less, 78 (15.0%) who belonged to households with less than $15,000 annual income, and just under a third (28.5%) of women described themselves as single. (See Table 4-1.)

In this sample, 99 women (19.1%) disclosed a history of childhood maltreatment. Over a quarter (26.6%) met criteria for a lifetime diagnosis of PTSD, and 61 women (61.6% of the childhood maltreatment group) reported both a history of CMT and PTSD. There were 356 women overall (68.6%) who were breastfeeding at 6 weeks postpartum and 163 (31.4%) who were not.

Bivariate analysis of risk factors for no breastfeeding at 6 weeks postpartum

All factors theorized to affect breastfeeding (see Figure 4-5) and that were available in the STACY dataset were examined individually. These factors included: intent, history of CMT, history of PTSD, major depression, dissociation, ante-, intra-, and postpartum complications, NICU admission, cesarean birth, BMI, attendance at childbirth education classes, provider alliance, perceived parental competence, postpartum bonding, comfort with intimate aspects of parenting, race, teen status, education, poverty, high-crime neighborhood, and partner/marital status. Table 4-5 presents rates of each characteristic for the sample as a whole and then compares these rates for those who are breastfeeding (any amount) at 6 weeks and those who are

not breastfeeding at 6 weeks.

Significant risk factors

Because of the number of variables in these analyses , the results will be summarized briefly first, and then described in more detail below. Variables in most categories were associated with breastfeeding status at 6 weeks (Table 4-2). Overall, all demographic risk variables were significantly associated with a lower rate of breastfeeding at 6 weeks (race, teen status, low education, low income, high-crime neighborhood, and single status). Intent to breastfeed was associated with a significantly higher rate of breastfeeding. PTSD was associated with a 15% lower rate of breastfeeding. NICU admission was associated with an almost 20% reduction in breastfeeding rates. Postpartum complications, although rare, were associated with a 45% decrease in breastfeeding rates. Depression and impaired postpartum bonding were associated with significantly reduced breastfeeding rates, while attending childbirth education was associated with an increased rate. Breastfeeding was associated with lower BMI at initiation of prenatal care, less comfort with intimate aspects of parenting, and a decreased sense of parental competence.

Non-significant variables

Childhood maltreatment was not significantly associated with breastfeeding status, nor were antepartum and intrapartum complications. Cesarean birth was not associated with breastfeeding status, nor was provider alliance.

Factors positively associated with breastfeeding

An overwhelming majority (90.6%) of women in this sample intended to breastfeed at least

partially, and of these women, 75.8% were still breastfeeding at the third interview (χ^2=96.454, *df*=2, *p*<.001). Just over half (54.3%) of all women attended prenatal classes/childbirth education of some kind; of these women, 89.7% were breastfeeding at the 6 week interview, compared to 68.6% of all women (χ^2=127.90, *df*=2, *p*<.001). Intent and attendance at childbirth classes were previously associated with increased odds of breastfeeding (Lu et al., 2003; Piper & Parks, 1996; Semenic, Loiselle, & Gottlieb, 2008).

Factors negatively associated with breastfeeding

Two maternal mental health factors were associated with changes in breastfeeding rates. A history of PTSD and/or major depression was negatively associated with breastfeeding. Just 58.7% of women with PTSD were breastfeeding at 6 weeks, compared to 68.6% of women overall (χ^2=8.549, *df*=2, *p*=.003), while 45.3% (*n*=29) of women with a history of depression were breastfeeding at 6 weeks (χ^2=18.367, *df*=2, *p*<.001).

Other health complications were also negatively associated with breastfeeding. Eighteen women (3.5%) had a postpartum complication (postpartum hemorrhage or other). These complications are significantly associated with a reduced rate of breastfeeding compared to the overall rate (38.9%, χ^2=7.637, *df*=2, *p*=.006). One in eight infants (12.5%) was admitted to the neonatal intensive care unit (NICU). This admission was significantly associated with a reduced breastfeeding rate at 6 weeks postpartum (55.6%, χ^2=5.107, *df*=2, *p*=.024). Breastfeeding women had a lower mean prenatal BMI (24.23, *SD*=5.699) than did women who were not breastfeeding (27.41, *SD*=8.968; *F*=16.280, *p*<.001).

All measures of parenting were significantly associated with differences in breastfeeding at six weeks; specifically, women who did not do well on these measures were *more* likely to be

breastfeeding. Breastfeeding women (52.29, *SD*=3.338, *F*=15.639, *p*<.001) scored lower on the Perceived Parental Competence scale than women overall (52.66, *SD*=3.162). Postpartum bonding was converted to a dichotomous at-risk, yes/no variable, because the instrument is not intended to be used as a psychometric indicator of bonding but instead as a clinimetric tool to identify cases of impaired bonding. Of the women considered to be at risk of impaired bonding, 84.7% were breastfeeding, significantly more than the overall rate (χ^2=18.496, *df*=2, *p*<.001). The mean score on the Intimate Aspects of Parenting Scale was 13.91 (*SD*=3.260); for women who were breastfeeding, it was 14.28 (*SD*=2.680, *F*=14.820, *p*<.001). Higher scores represent more discomfort, indicating that women who were breastfeeding at 6 weeks expressed more discomfort with the intimate physical aspects of parenting. Both the PBQ and the IAP may be reflecting breastfeeding challenges, as they were measured at the 6 week postpartum visit.

All demographic risk factors were significantly associated with lower rates of breastfeeding. Just under a third of all women (29.9%) described themselves as African American, which was significantly associated with a reduced rate of breastfeeding at 6 weeks postpartum (26.5%, χ^2=82.189, *df*=2, *p*<.001). Of the 82 women who were 18-20 years old at the start of the study, just 21 (25.6%) were breastfeeding at 6 weeks postpartum (χ^2=83.523, *df*=2, *p*<.001). Overall, 15.0% of participants reported a household income under $15,000 annually; 35.9% of these women were breastfeeding at the third interview (χ^2=45.552, *df*=2, *p*<.001). Of the 165 women (31.8%) who reported education levels of high school or less, 29.1% reported they were breastfeeding (χ^2=175.225, *df*=2, *p*<.001). Finally, less than a third of women reported not having a steady romantic partner or spouse (28.5%); these women had less than half the breastfeeding rates compared to partnered women at 6 weeks (28.4%, χ^2=155.428, *df*=2, *p*<.001).

Aim 1: Differences in breastfeeding intent by CMT status

For Aim 1, I examined breastfeeding intent at the initial interview, compared by CMT history, and, within the CMT group, whether women also had a history of PTSD. Intergroup differences were not significant when examined by dichotomous breastfeeding intent (any breast/no breast; χ^2=.891, *df*=2, *p*=.640). However, when feeding intent is divided into "exclusive breast", "some breast", and "formula", there are significant intergroup differences (Table 4-3): 86.5% (*n*=32) of the CMT-resilient group intended to breastfeed exclusively, compared to 61.4% (*n*=247) of the non-CMT group, and 59.3% (*n*=35) of the CMT-PTSD group (χ^2=10.036, *df*=4, *p*=.040). The CMT-resilient women were significantly less likely to intend mixed feeding (8.1%, *n*=3) than were the non-CMT group (28.6%, *n*=115), or the CMT-PTSD group (32.2%, *n*=19). Overall, all groups intended some breastfeeding at very high rates (over 90%), but there were significant differences in how much breastfeeding vs. formula feeding women intended.

Aim 2a: Comparing breastfeeding rates at 6 weeks (n=519)

This analysis examined intergroup differences in breastfeeding behaviors at 6 weeks. As with breastfeeding intent, the significant differences were apparent in the three-group (breast, mixed, and formula) comparisons (χ^2= 14.817, *df*=4, *p*=.005), and not in the dichotomous (breast, Y/N) comparisons (χ^2=4.745, *df*=2, *p*=.09). When comparing exclusive breastfeeding to mixed feeding and formula feeding (Table 4-4), the CMT-resilient group was most likely to breastfeed exclusively, compared to the CMT-PTSD and non-CMT groups. CMT-resilient women breastfed exclusively 60.5% of the time, while non-CMT women breastfed exclusively 49.0% of the time. CMT-PTSD women breastfed exclusively still less: 19 women (31.1%) reported breastfeeding their infant exclusively at 6 weeks postpartum (χ^2=14.817, *df*=4, *p*=.005).

A similar pattern emerged with women reporting mixed (some breast, some formula) feedings, where CMT-PTSD women reported the highest rate (34.4%), followed by non-CMT exposed women (32.4%) and CMT-resilient women (15.8%). These findings were similar to the comparisons among the formula-feeding women: The CMT-PTSD group had the largest percentage of formula feeders (34.3%), followed by CMT-resilient women (23.7%) and non-CMT women (18.6%).

Aim 2b: Comparing breastfeeding concordance (n=498)

Breastfeeding concordance (whether intended and actual feeding method were the same) (Table 4-9) was not significantly different when considered either by dichotomous outcome (breastfed at least as much as intended, Y/N) or by three-group outcome (breastfed more than, as much as, or less than intended). For the dichotomous outcome, 66.9% of women breastfed as least as much as was intended, but there were no intergroup differences (χ^2=2.665, *df*=2, *p*=.264). For the three-category outcome (breastfed more than, as much as, or less than intended), 33.1% breastfed less than intended, while 60.0% breastfed as much as intended, and 6.8% breastfed more than intended. The intergroup differences (between breastfeeding as much as, more, or less than intended) were not statistically significant (χ^2=4.000, *df*=4, *p*=.406).

Aim 3a: Public Health Regression

The outcome measure used for this regression was whether or not the woman was breastfeeding at 6 weeks postpartum, regardless of her initial intent to breastfeed. Feeding was self-reported by the women in the study as *breast, bottle,* or *both*. The amount of breastfeeding in the mixed-feeding group was not quantified, so therefore a woman was considered to be breastfeeding if she responded either *breast* or *both*. The outcome measure was a dichotomous variable: breastfeeding or not. Therefore, a stepwise logistic regression was performed (See Table 4-7). There were eight independently significant variables: PTSD, depression, education level of high school or less, and African American race decreased odds of breastfeeding, while intent to breastfeed, history of CMT, childbirth education and being with a partner increased odds.

For this theory-based modeling, the process of going from a preliminary model with many variables to a more parsimonious one involved a series of decisions that combine driving factors based on the literature, the theoretical framework, and the effects of variables on the model, including modifying or adjusting effects as well as independent predictive effect. The relevant statistics used in this regression and the following regression were 1) R^2, the proportion of variance explained, and 2) goodness-of-fit, using the Hosmer-Lemeshow statistic (H-L). For R^2, a higher number indicates more variance explained. For Hosmer-Lemeshow, the statistic is discriminant, like the chi-squared test: higher numbers do not necessarily represent a better fit as long as the statistic does not reject the null hypothesis at the chosen significance level (here .05). Acceptable ranges for the Hosmer-Lemeshow are above .05, with 1.00 representing a perfect fit (Archer, Lemeshow, & Hosmer, 2007). Additionally, the change in R^2 was calculated at each step; Greenland (Greenland, 1989b) recommends retaining a variable if it changes the coefficient

or odds ratio (OR) of the other (in this case preceding) variables by at least 10%. Generally speaking, the R^2 should increase with each step in a well-designed model, although as we will see, there are exceptions to this. Relationships where $\alpha>.05$ are interpreted as statistically significant. Overall, this model explained just under two-thirds of all variance (60.6%, $p<.001$).

Step 1:Intent

The first step in the analysis was intent to breastfeed, measured as the woman having responded *breast* or *both* at the first interview when asked how she intended to feed her baby. This response increased the likelihood of breastfeeding at 6 weeks postpartum by almost 45 times (OR 44.85, $p<.001$) and explained 24.2% of the variance ($p<.001$). As Hosmer-Lemeshow shows the goodness-of-fit between at least two variables of a model, there is no H-L for this step of the regression.

Step 2:Trauma

This step added a history of childhood maltreatment/trauma, using the same criteria used to assign a woman to one of the trauma-exposed groups in the bivariate analyses (a positive response to the question about whether she had experienced emotional, physical, or sexual abuse prior to age 16). This barely increased the R^2, to 24.3% from 24.2%. CMT was not independently statistically significant in this step (OR 1.219, $p=.488$). Hosmer-Lemeshow was .890, indicating an excellent fit for the model at this step.

Step 3: PTSD

Adding a lifetime diagnosis of PTSD increases the variance explained by 2.4%, to 26.7%. PTSD was independently predictive and associated with a decrease in the likelihood of breastfeeding (OR .426, $p=.001$). It also interacted with the CMT factor. Once PTSD is entered into the model, CMT becomes nearly independently predictive. CMT history when modeled

with PTSD increases the odds of breastfeeding nearly two-fold and approaches statistical significance (OR 1.808, *p*=.061), while a PTSD diagnosis decreases odds of breastfeeding by 57% (OR .426, *p*=.001). This relationship of PTSD and CMT with the outcome remains stable throughout the through the remainder of the model. The goodness-of-fit remains high at .963.

Step 4:Depression

Dissociation was part of this step in the initial analysis, but did not change coefficients by >10% (Greenland, 1989b), nor was it independently significant. Therefore, it was removed from the final iteration of this model. This step adds a lifetime diagnosis of major depressive disorder to the regression, and adds another 2.1% of variance explained, for a total of 28.8% (*p*=.003). In this step, both PTSD and CMT are significant (CMT OR 1.891, *p*=.050; PTSD OR .549, *p*=.034), but MDD decreases odds that a woman will breastfeed by nearly two-thirds (OR .363, *p*=.003). Depression further adjusts the OR for CMT and PTSD, suggesting that either mental health disorder is a better predictor of not breastfeeding at 6 weeks than is a history of CMT, but prenatal depression, comorbid with PTSD or alone, is a stronger predictor. Goodness-of-fit remains acceptable at .980.

Step 5: Health Systems

Three variables (antepartum complications, intrapartum complications, and BMI) were removed from this step after the bivariate analyses. The ante- and intrapartum complications were removed because they were not significant at the bivariate level. BMI was removed because it has substantial missing data (n=403) and it does not fit the clearly in the theoretical model.

Adding childbirth education (CBE) to the model increases the variance explained by over half, to 46.6% (*p*<.001), and the goodness-of-fit worsens substantially, but remains acceptable at

.592. It also drops the odds ratio for intent from 43.4 in Step 4, to just over 24 (OR 24.15, $p<.001$), although intent remains by far the strongest predictor of breastfeeding at 6 weeks. This indicates that CBE is now sharing a large amount of intent's explained variance. CBE also accentuated the effects of a history of CMT: in this step of the model, with CBE taken into account, CMT history now has an even stronger positive association with the outcome, with the odds of breastfeeding now increased by two and a half times (OR 2.522, $p=.011$). CBE itself predicted a nine-fold increase in odds of breastfeeding at 6 weeks (OR 9.016, $p<.001$).

The addition of two medical risk factors (NICU admission and Cesarean birth) did not significantly affect the model at this point. Neither factor was independently statistically significant, despite prior work showing both NICU admission and Cesarean birth were risk factors for early cessation of breastfeeding (Dewey et al., 2003; Newton, 2004). The possible reasons for this will be addressed in the next chapter.

Step 6: Parenting Factors

There were three measures of the maternal-infant relationship in the original models: postpartum bonding (PBQ), discomfort with intimate aspects of parenting (IAP), and parenting sense of competence (PSOC). These three measures assessed essentially the same concept: the quality of the maternal-infant relationship, and none were independently significant in the multivariate regression model when all three were entered, even though they all were independently significant when considered individually. This suggests non-independence and collinearity, which violates assumptions for regression modeling. (see Table 4-6). Using both the Greenland decision tool and *a priori* theoretical reasons, one variable was retained, while two were removed (see Table 4-6).

The PBQ and the IAP were removed from the final regression model for different

reasons. The PBQ identifies women at risk for impaired bonding, which is not as useful a factor as a non-clinical concept might be. Furthermore, it is not clear whether impaired bonding might be an outcome of breastfeeding difficulties or vice versa. The IAP also is a relatively underused scale with little psychometric validation. There is little data to support the use of the IAP as a measure of the parenting relationship, and none to support its use in assessment of the breastfeeding relationship. Because neither of the measures was significant in the multivariate analysis, it suggests that previous variables better explain the differences demonstrated in the bivariate analyses. Neither measure includes the infant side of the relationship, and neither is ideal for this analysis. Because neither measure changed coefficients by >10% (Greenland, 1989b), and because of the other issues noted here, both measure were dropped from the model.

Parenting sense of competence (PSOC) suffered from many of the same limitations as the other two parenting measures (i.e., is cross-sectionally measured with the breastfeeding outcome, does not include the infant contribution to the dyad), but was retained in the final model. Although it was not independently statistically significant in the multivariate model, it adjusted the coefficients of NICU admission, cesarean birth, and intent to breastfeed by >10%, which argues for its retention under the Greenland rule (1989). Additionally, this is the most "normative" measure of the quality of the relationship (not the clinical assessment of impaired ability of the mother to bond with the infant or the discomfort with the care of the infant) available in this dataset. Therefore, although the measure itself is not ideal, it was retained. This step increased the variance explained by only 0.4% (R^2=47.1%, p<.001), but as noted, did change the coefficients of other key variables. Goodness-of-fit remained above the .05 discriminant.

Step 7: Demographics

Adding in the demographics resolves many of the issues of the previous step. The

demographic variables explain an additional 13.5% of variance ($p<.001$) and the Hosmer-Lemeshow remains a very acceptable .797. With the addition of the demographic variables, the contribution of CBE drops drastically, from OR 8.57 in Step 6 to 2.557 in Step 7 ($p=.005$), and the intent to breastfeed, while still by far the biggest predictor of breastfeeding, drops from OR 22.23 to 14.958 ($p<.001$). Women with a history of CMT are over three times as likely to breastfeed in this step (OR 3.18, $p=.006$), while PTSD and MDD represent a 50 and 60% reduction in breastfeeding odds, respectively. Demographics affect the associations of intent, maltreatment history, and CBE with breastfeeding status, but the associations of PTSD and MDD remain stable.

The significant demographic variables in this step were partner status, education, and race. Women with partners were three times as likely to be breastfeeding at 6 weeks (OR 3.039, $p=.004$) as those without. Women with a high school education or less were 56% less likely to be breastfeeding (OR .439, $p=.038$), and African American women were almost 70% less likely to be breastfeeding at 6 weeks than were non-African American women (OR .305, $p=.001$). Contrary to earlier work, neither teen pregnancy nor poverty were significant predictors of breastfeeding. However, both adjusted the other coefficients by >10%, and were retained because of this.

Aim 3b: Prediction of Concordance

For this regression, I used the same process to examine each variable that I used in the previous regression model, but am retaining for the final model the same variables I retained for the first model as a way to best compare the utility of the novel outcome variable (concordance). Overall this model explained 18.6% of the variance. There were five independently significant variables: PTSD, depression, and African American race decreased odds of concordance and childbirth education and being with a partner increased odds. For this model, intent was removed as the initial step. This is because without intent, no concordance can be determined and the step would therefore be meaningless. Otherwise, the same variables that were not independently predictive of concordance, but that adjusted the effects of other variables were retained. Otherwise, all other parts of the regression remained the same (see Table 4-8).

Step 1: Childhood Maltreatment/Trauma (CMT)

CMT was not significantly associated with concordance (OR .826, p=.414).

Step 2: PTSD

Adding PTSD to the model makes the model R^2 significant (R^2 = .014, p=.032), but explains only 1.5% of the variance. The goodness-of-fit by Hosmer-Lemeshow is acceptable at this step (.993). Unlike the previous model of the 6 week breastfeeding status, the association of CMT with concordance remains non-significant after PTSD is taken into account.

Step 3: Depression

In this step, adding a history of major depressive disorder (MDD) does two things: it triples the variance explained (to 4.4%, p=.001), and it drops the goodness-of-fit by almost 50% (H-L = .492). This is still an acceptable level for the Hosmer-Lemeshow (Archer et al., 2007). More importantly, PTSD is no longer statistically significant with MDD added in. As in the public

health model, dissociation did not change coefficients by >10% and was removed from the final model. MDD by itself predicts a drop of 63% in concordance at this point in the model.

Step 4: Health Systems

This step substantially improves the goodness-of-fit (from .492 to .600) and more than doubles the variance explained (to 10.9%, $p<.001$). As with the public health model, having attended childbirth education classes significantly increases the odds of a positive outcome (OR 2.474, $p<.001$). Again, as in the public health model, Cesarean birth and NICU admissions are not significant predictors of outcome, although if we consider a trend level, Cesarean birth would be associated with a 30% decreased likelihood of breastfeeding concordance (OR .683, $p=.076$).

Step 5: Parenting

While the variable added in this step (Parenting Sense of Competence) is not significant ($p=.697$), the overall goodness-of-fit remains acceptable at .672. The other significant variables remain the same: History of major depression (OR .378, $p=.002$) and childbirth education classes (OR 2.443, $p<.001$). Again, cesarean birth would have been significant at the .10 alpha level. I therefore removed this step from the model in the interests of parsimony, and the final model has five, rather than six, steps.

Step 6: Demographics

As with the public health model, the final step adding demographic variables changed and clarified relationships in the model in a striking way. Adding the demographic variables almost doubled the variance explained, to 18.6% ($p<.001$), while maintaining the Hosmer-Lemeshow at the .514 level. Major depression history continues to reduce the likelihood of concordance by almost two-thirds (OR .380, $p=.003$), but childbirth education completely drops out of significance in this step (OR 1.259, $p=.363$). Of the factors added, only partner status (OR 2.446,

p=.005) and African American race (OR .462, *p*=.012) were independently significant. However, the other variables adjust the coefficients sufficiently to keep them in the model (Greenland, 2003), This is congruent with the previous results from the public-health outcome as well as with the literature, as I will discuss in the next chapter.

Results Summary

Aim 1: Overall, women who were survivors of childhood abuse intended to breastfeed in very different patterns. Women who were survivors but did not have PTSD (CMT-resilient) intended to exclusively breastfeed at much higher rates than did women with a history of CMT and PTSD and women who had not experienced CMT. Women in the CMT-PTSD group were almost four times as likely to intend mixed feeding as were women in the CMT-resilient group, and three times as likely as were women in the non-CMT group. All groups had high intent (>90%) to breastfeed at least partially (Table 4-2).

Aim 2a: Actual feeding methods also differed by group. Women in the CMT-resilient group were twice as likely to be breastfeeding exclusively as were women in the CMT-PTSD group, and 20% more likely than women in the non-CMT group. They were also half as likely to be doing mixed feeding as were the women in the CMT-PTSD or non-CMT groups (Table 4-3).

Aim 2b: Concordance, by contrast, did not differ significantly among groups. Overall, 66% of women breastfed at least as much as they intended (Table 4-9).

Aim 3a and 3b: Overall, both models performed well at explaining the overall variance in breastfeeding rates (public health model) and concordance (woman-centered model). Several variables that were significant at the bivariate level (high crime, postpartum complications, postpartum bonding, discomfort with intimate aspects of parenting) were removed from the

multivariate analyses because they were not independently associated with the outcome in the model, and they did not adjust the coefficients of the other variables by >10% (Greenland, 1989) or because they overlapped and violated the assumption of independence, or because of the amount of missing data (BMI). In its final iteration, the public-health model explained 60.6% of the variance overall, while the woman-centered model explains 18.6% of variance, and both provided support for the use of the STACY theoretical model as a reasonable framework for research on breastfeeding outcomes in survivors of CMT. Issues of ways to improve the framework will be addressed in the following chapter.

Chapter V: Discussion and Implications for Future Research

Findings of this study overall (public health and woman-centered)

The overall findings of this study support the idea that women with a history of CMT differ in their breastfeeding patterns from those who do not have this history. However, a more nuanced interpretation is that among women with a history of CMT, women with PTSD differ both from resilient women with a CMT history and from women without such a history. This implies support for the argument that breastfeeding is affected by a complex interplay of relational, situational, and psychobiological effects that have not been well described to date. It also supports PTSD as a mediator between the experience of early abuse or trauma and later breastfeeding decisions and challenges. An additional nuance is that depression, which in this sample is most often associated with PTSD, and is thus comorbid, is an additional element of abuse that has not been well-studied. Furthermore, focus on the outcome of concordance between the woman's intent and her actual feeding suggests that current measurement may not be adequate in itself to evaluate breastfeeding success in a way that is meaningful both for the woman and for public health promotion efforts.

These findings are not in conflict with previous evidence for any of the major variables associated with breastfeeding (social support, intent, prenatal education, etc.), but instead encourage a modification of our conceptualization of the definition and measurement of breastfeeding success. This highlights the significance of incorporation of the woman's life

history, and more importantly her mental health status, into evaluation of her needs and desires when feeding her infant. Rather than a paradigm shift, this conceptualization is a small but crucial refocus towards considering women's autonomy and choice as intrinsic to measuring breastfeeding success. It moves knowledge from the level of clinical awareness and qualitative exploration to being empirically supported: It affirms that CMT history is significant but adds the important evidence that it is the posttraumatic sequelae (both PTSD and depression) rather than the history itself that appears to adversely affect outcomes.

In the concordance outcome, CMT was never significant, even when taking PTSD into account. This could have several explanations. First, concordance as the variable is now constructed may not be fully measuring the match between intent and outcome. Intent was measured only at one time point, substantially prior to birth, and may have changed in the interim; there may also be a mismatch between the socially-desirable intent to breastfeed and the actual desire of the woman. These issues may be particularly salient for women who have survived CMT, and may be hyperaware of pleasing those they perceive to be in a socially or otherwise powerful position relative to themselves. It may also be the case that abuse itself does not affect whether women are able to breastfeed as much as they intend, and that the outcome variable is accurately measuring this. Finally, because this analysis proposed that PTSD was the relevant factor in breastfeeding outcomes regardless of the kind of early abuse (sexual, physical, emotional) that resulted in PTSD, the outcomes were not differentiated based on type of abuse, which may be relevant.

This underscores the need both to address sequelae of childhood abuse both from a psychobiological and relational perspective, and to frame breastfeeding as an inherently relational and complex act, rather than a simple public health choice. Breastfeeding promotion is

important on a population level because of the substantial known benefits for women and infants, but there is a need to address breastfeeding benefits on an individual basis. This individualization of population-level goals also paves the way for PTSD-specific interventions to help women with a CMT history to achieve breastfeeding at a level that meets their desires, which may improve the population rates of breastfeeding.

Limitations of this analysis

There are several major limitations of this study related to measurement issues, limited research base, data collection, and issues of the maternal-infant relationship. The first issue is in part inherent in secondary analysis: Rather than conducting a study specifically designed to assess breastfeeding behaviors, some compromises were made between the desired variables and the available variables. Factors that may be important but that are not available in this data include: the nature of breastfeeding problems encountered and adequacy of help received; the supportiveness of the birth site towards the woman and the infant (whether the unit was officially "Baby-Friendly" or not, unit policies may affect outcomes (Declercq, Labbok, Sakala, & O'Hara, 2009; DiGirolamo, Grummer-Strawn, & Fein, 2008; Manganaro et al., 2009; Merewood, 2005); attitudes and social support (or lack) for breastfeeding; that breastfeeding intent was measured only once; and cultural factors, including whether the woman viewed breastfeeding as something within her capability. Many of the concepts (breastfeeding as a relational act, dyadic interactions between woman and infant, the meaning of concordance to any one woman) are complex and challenging to measure with existing metrics in general, and there are added issues of measurement given that the parent study was not intended to examine breastfeeding. Qualitative investigation on these topics would have been helpful to use as verification that the choice of

variables used for this study tracked with the lived experiences of the women. Despite the fact that breastfeeding is indeed relational and dyadic by nature, there are not existing measures that adequately address that aspect, and the available measures of parenting/relationships proved to be of limited use in the regression models. This may be in part due to the cross-sectional nature of both the parenting and the breastfeeding data, and repeated measures may have shown different results. Regardless of the underlying cause, however, this significantly limits the ability of this study to definitively describe the contribution of the relational aspects of breastfeeding to the outcomes.

The second limitation is related to the paucity of research on breastfeeding for survivors of CMT of any kind, and the essential absence of research on non-sexual abuse. While the research design used an established theoretical framework modified to be congruent with what literature are available, the scantiness of that research means that I may have underestimated or missed some variables, and overestimated the importance of others. This is supported by the difference between the 60.6% variance explained by the public-health outcome model, and the less-satisfying 18.8% explained in the concordance model, which suggests the need for a concerted effort at both measurement development and model development via qualitative research. We simply do not know enough about what breastfeeding looks like or means for women who have survived abuse, and we have not asked enough questions of survivors with PTSD to be able to adequately theorize the relationships between their histories and their feeding decisions. This presents an opportunity for further work and for empirical testing of interventions derived from this work, but it also means that this is a very preliminary step towards full understanding of the complex relationships between CMT, PTSD, and breastfeeding outcomes.

Next, there are issues related to how the data were collected. The parent study design excluded women who did not "fit" into any of the three original categories (PTSD+, CMT-resilient, and non-affected), and thus data are not available for women who may have had PTSD symptomatology, for example, but not a full diagnosis. Because of the growing research showing a substantial proportion of women experience some PTSD symptomatology in the childbearing year (Beck et al., 2011; Beck & Gable, 2012; Grekin & O'Hara, 2014; Seng et al., 2004), this may mean that I missed the effects of partial-PTSD symptoms on breastfeeding. Second, the study ended at 6 weeks postpartum, at a time when infant attachment cannot be measured (Bowlby, 1977) and maternal-infant bonding is not yet complete (Kennell, 1984), and when breastfeeding rates are still quite high compared to later time points (Centers for Disease Control and Prevention, 2014). A more ideal end time would have been at 6 months or later, when maternal-infant bonding has matured and when there has been a more drastic drop in breastfeeding rates overall. Additionally, the research was conducted in a single region of one state, within local breastfeeding culture and expectations. As noted in earlier chapters, breastfeeding rates, legal support, and social norms vary widely by location, and this limits the generalizability of the results in that we cannot know whether the same difficulties would be encountered to the same degree by breastfeeding women in a different locale.

Finally, the inability of the study to adequately measure and describe the relational aspect of breastfeeding and the maternal-infant relationship as a whole is possibly its most significant limitation. Rather than a comprehensive picture of a developing or mature intimate relationship, the available data are at best a snapshot of a few aspects of that relationship. Three potentially significant factors – infant temperament, infant behavior (including how well the infant learned to breastfeed), and the woman's working model of the child (how she perceives that child, which

then affects how she responds to him or her [Muzik et al., 2012]) – are missing from this study. That the relational data that were available – postpartum bonding, parenting sense of competence, and discomfort with intimate aspects of parenting – proved to be largely insignificant in the multivariate model despite being highly significant in the bivariate analyses suggests that there is a relational aspect to breastfeeding success, but that it is being measured inadequately or imperfectly by the measures available. This is an important limitation, but also suggests a direction for future research.

Strengths of the study

This study had a number of strengths. First, as secondary analysis of a prospective cohort study, it eliminates the risk of recall bias about what one's intended feeding method would be, for example, and allows data to be collected at multiple time points, each of which is appropriate to the measure. For example, it would be difficult to collect reliable data on one's comfort with intimate acts of parenting before one had actually been presented with those acts in reality. The data set is large and diverse, which not only allows reliable multivariate modeling, but also encourages generalizability to a diverse population.

A significant strength of this study is the use of established instruments to more accurately identify PTSD and CMT in this sample, as well as the use of measures of postpartum bonding and dissociation that had been previously validated against established clinical interviews. While there are limitations (as discussed above) to their ability to capture complex concepts, they are nonetheless the best available measures for the variables and can be expected to provide reliable results.

Finally, this study draws from a diverse literature base in several different disciplines, including nursing, social psychology, developmental psychology, midwifery, and women's studies, and uses a theoretical framework with a great deal of flexibility in the specifics of the modeling. The STACY framework allows the researcher to insert her own variables for outcomes and in the appropriate places in the model, thus adapting a stepwise modeling process that has been previously useful for studying CMT and PTSD in other contexts to a breastfeeding-specific one. This helps build the science via consistent conceptualization, while still allowing the researcher to modify as needed (as I did when I considered dissociation as a possible proxy for the unmeasured hypothesized oxytocin dysregulation). Using this variety of approaches and disciplinary assumptions enriches the development of the new concordance measure, as well as providing different perspectives on a multifactorial public health challenge.

Implications for future research

There are two major implications for future research that arise from these findings. First, this is the first study to include PTSD as a mediator for breastfeeding issues in survivors of childhood maltreatment/trauma, and one of the first to look at breastfeeding issues for survivors of non-sexual abuse. The findings of the study support using a theoretical model that includes PTSD as a mediator between CMT history and adverse breastfeeding outcomes, and future research is needed to clarify and describe that relationship more fully. This is a different approach to research in breastfeeding patterns and promotion, which has thus far considered breastfeeding to be a health decision similar to vaccination or the Back to Sleep campaign, and focused on patient education to achieve the universal public health outcome goal. Given the interest in integrated psychobiological models in health phenomena, and the unfolding evidence

for the neuroendocrine effects of early trauma, more research is needed to identify possible biological mechanisms for PTSD's effects, points for intervention in the model, and development of those interventions. Because depression also played a role, maintaining a focus on depression alone and depression comorbid with PTSD is warranted.

Because of the limitations of the secondary analysis, it was not possible to confirm a neurobiological factor in breastfeeding outcomes for survivors of CMT. Research is needed in order to explore whether the hypothesized effects of trauma on the ANS and the oxytocin-cortisol axis are valid, and by what specific pathways they affect breastfeeding. I had posited that dissociative symptoms might be a proxy for dysregulation in the oxytocin system based on prior theoretical models proposed by Porges, Teicher, and Seng (Porges, 2001; 2003; Schore, 2001; 2002; Seng et al., 2013; Teicher et al., 2002; 2006). However, dissociation was not an independent predictor in either model. Dissociation is a complex clinical phenomenon. Sometimes, especially in times of stress, it is protective and promotes survival. If CMT survivors use dissociation to surmount stress and pain during the initial period of breastfeeding or to dampen triggered reactions to any ways breastfeeding may remind them of past trauma, it may have a neutral or beneficial effect. Qualitative research and clinical observation studies designed to include attention to dissociation may illuminate this question. Direct oxytocin measurement would also shed light on this complex theoretical question.

The contribution of depression to both models, but particularly to the concordance model, also bears investigation. A history of major depression was one of only five significant variables in this model, and it reduced the odds of breastfeeding concordance by 60%. It may be that women who have experienced depression may desire to breastfeed, but because of their increased susceptibility to postpartum mood disorders (Kendall-Tackett et al., 2013; Robertson,

Grace, Wallington, & Stewart, 2004) they are unable to do so. It is also possible that something common to women who have experienced depression decreases the odds of their success in breastfeeding, which in turn increases their risk of postpartum mood disorders (Bogen, Hanusa, Moses-Kolko, & Wisner, 2010; Cooke et al., 2007). This disparity between intent and outcome suggests that women with a history of depression want to breastfeed and believe themselves able to do so, but are stymied by some other factor – whether relational or psychobiological – from being able to do so. If their depression presents as hypersomnia, making night feedings more difficult, or if it presents as increased anxiety around their infant, as postpartum depression often does, they may also find their breastfeeding experience unexpectedly challenging. They may opt, given the contradictory advice available, to stop psychiatric medications like antidepressants due to their concerns about breastfeeding while taking them. Their expectations may also simply be higher than are those of women with PTSD, or their risk may be greater than that of CMT-resilient women.

Additionally, while this sample was racially diverse, future work in other locations (in the US or abroad) is needed to explore the possible effects of the larger social breastfeeding/parenting climate on breastfeeding patterns for survivors of abuse. Breastfeeding patterns for survivors of CMT may look completely different in Scandinavia, for example, where low-intervention pregnancy and birth care are the norm, where there is wide public support for breastfeeding and for new mothers, and where PTSD-specific factors may also vary. Other STACY analyses have shown that African Americans were older at the age of maltreatment, younger at the age of pregnancy, less likely to have used psychotherapy, and more likely to have had interim exposures to other traumatic events, such as crime, accidents, and not having enough money for food (Seng, Kohn-Wood, McPherson, & Sperlich, 2011), and so extent of resilience

and recovery and priority-setting may change the way the phenomenon looks across cultures and would change the focus of interventions. The large amount of variance explained by demographics in these models implicates structural inequality factors as a major force that warrants continued research by looking at effects of policy. Cultural factors that were unmeasured here likely also play a role. This is speculative at this point, but it does point to the value of conducting participatory studies so that diverse women inform future studies in terms of questions, measures, and intervention design.

The second implication for future research is the shift from the exclusively public-health outcome measure to adding the woman-centered outcome measure. This represents a potentially improved way of identifying breastfeeding success, and with that identification, a richer understanding of the factors affecting breastfeeding for all women, not only women with a history of trauma. Additionally, this change responds to the critiques described in Chapter II, and encourages a critical examination of not only an individual woman's feeding choices, but the structural and systemic factors that play a role in those choices. Using the reproductive justice model as guidance, future work can examine not only what concordance is, but what it means in the context of an unjust society where resources vary widely. While the concordance outcome measure is imperfect, it opens up a new conversation about what we are studying about breastfeeding, and how that affects the women we are researching. It is feasible to use with studies of existing data, so other preliminary types of breastfeeding studies with this outcomes would be feasible, in national survey data perhaps or using electronic health records where these two charting elements likely are recorded.

Implications for breastfeeding measurement

There are significant implications of both the conceptual shift in breastfeeding measurement discussed at length in Chapter II (to including concordance with compliance) and the findings of this study overall. First, because of the need for feminist analysis of the measurement of a primarily gendered behavior, including concordance allows a more comprehensive assessment both of the woman's context and of her decisions related to infant feeding. While compliance/public health measures of breastfeeding remain important both theoretically and practically, including concordance in future breastfeeding research will give a more comprehensive and nuanced assessment of the breastfeeding experience/relationship, and allow more specific measurement of this assessment.

That concordance is measuring a different concept than compliance is shown by the findings of the second regression, in which five of the eight significant predictors of breastfeeding status at 6 weeks dropped out. What is not clear (because of the nature of secondary analysis) is precisely what is represented by concordance, or what a better measure of that might be. Qualitative work and instrument development/testing will be needed to better operationalize the concept of a woman-centered measure of success. However, once that concept is both understood and fully measurable, there are wide-ranging implications for both practice and for interventions research and policy.

Implications for Practice

As noted in the introduction to this project, the research question arose from the lack of information to guide practice for clinicians caring for survivors in the perinatal period. Without best practices guidelines, it becomes difficult for clinicians to identify ways to improve their

practice that are evidence-based. While this is early research into an under-studied area, several general recommendations can be made based on this work.

First, clinicians should consider making their care generally trauma-informed (http://www.samhsa.gov/nctic/trauma-interventions). Given the differences this study showed between the breastfeeding patterns of CMT survivors (those with and without PTSD) and non-exposed women, and given the low rates of disclosure of abuse relative to prevalence (Pérez-Fuentes et al., 2012), it is logical to recognize the different outcomes of trauma survivors and to assume that the majority of survivors will not self-identify. Therefore, trauma-informed practices like general anticipatory guidance around birth and breastfeeding as potentially stressful and/or triggering experiences will both recognize the needs of a large subset of the general patient population, and also destigmatize survivors by not singling them out. Other interventions that could potentially improve outcomes if they were standard practice include assessing routinely for PTSD, and referring for PTSD-specific treatments like cognitive-behavioral therapy and eye movement desensitization and reprocessing therapy as needed. While care can and should be individualized to the particular woman, having standardized practices like not touching a patient without verbal consent, avoiding common trigger words like “relax”, and respecting a woman’s boundaries are both ethical and universal in their application (Coles & Jones, 2009). Many aspects of trauma-informed care (seeking consent for touch, avoiding unnecessary exams, consciously placing the patient in a position of power) are, after all, also aspects of good nursing care.

Second, encouraging women to identify what would constitute successful breastfeeding for themselves is a crucial step to translate the concept of concordance into practice. Many internationally board-certified lactation consultants already explicitly support women who

choose to formula-feed or partially breastfeed (many will teach women to bottle-feed in the *en face* position, for example, and to avoid bottle-propping), but nurses and providers may not, particularly given the universality of breastfeeding promotion efforts. Concordance offers an opportunity to nuance the public-health support of breastfeeding, and make it both relevant and empowering to an individual patient, whether or not she has a history of trauma.

Implications for policy

Policy changes suggested by this study include institutional support for trauma-informed practices in the perinatal period. Much as the "Baby-Friendly Hospital" initiative has transformed nursing care for infants, "Survivor-Friendly Care" has the potential to turn a potentially traumatic experience into a supportive one. While this has benefits for the survivor herself, other women will also benefit from an increase in institutional understanding of the complex interplay between history, mental health status, choice, and biology that affects not only breastfeeding, but much of the childbearing year.

The larger issues of policy that are raised by this work center around breastfeeding promotion and how we measure success at those policy measures. As I discussed in Chapter II, there are significant problems with using an external universal measure to define success, and the adoption of that measure as the sole definition of breastfeeding success has implications not only for individual women, but potentially for their relationships with their infant. The question becomes are we supporting lactation (the production and transfer of milk), or are we supporting breastfeeding (the relational and nutritional act between the maternal-infant dyad)? While we know there are substantial public-health benefits to breastfeeding, this warrants a second look at how these are enacted in policies like "Baby-Friendly Hospital", and what the implications may

be for women who do not or cannot breastfeed according to these standards. We should not be replacing one public health risk (formula feeding) with another (impaired maternal self-image or mood) in our quest to support breastfeeding. Instead, we need to look at what it would mean to support breastfeeding women.

Conclusion

The implications of early childhood trauma are far-reaching and long-lasting. In this analysis women with a history of CMT *intended* to breastfeed at higher rates. The resilient ones among them *did* breastfeed at higher rates. Although these data do not allow us to know the meaning this had for them, previous qualitative work suggests they see this as a good step on the road to parenting their child in a positive way that meets their desire to parent better than they were parented. However, those affected by PTSD had a different pattern. They intended to breastfeed at very high rates, as did other groups, but were much less likely to be breastfeeding at six weeks. This suggests that responses need to be tailored to whether the woman with the CMT history is resilient or not. Making PTSD and depression assessments part of maternity care and giving lactation consultants access to this information may be key to advancing clinical care. In order to better support survivors, we need further research on the psychobiological effects of CMT, but also on the complex relationships between choice, circumstance, and preference that shape infant feeding decisions. Using trauma-informed practice supports both survivors who have disclosed and those who have not, and is congruent with good overall patient care. Shifting the definition of breastfeeding success to include concordance as well as duration/exclusivity empowers women to define their own success, and enables researchers to more fully examine breastfeeding as both a health behavior and in the context of an individual woman's life.

In previous chapters, I discussed issues of extant breastfeeding research, including lack of consideration of relational aspects and lack of eco-social context, and suggested intimate justice, reproductive justice, and patient-centered research as possible approaches from which to draw when addressing these issues. Given the lack of data on the experiences of women with histories of CMT, a first step to addressing some of the deficits of both this study and breastfeeding research as a whole will be qualitative work that includes not only the experience of breastfeeding as a survivor of CMT, but also the physical and emotional experience of breastfeeding for women with PTSD. Rather than describing what we believe to be true about their experiences and their decisions, it is crucial both to explore what their realities are, and to draw on their expertise in shaping both practice recommendations and interventions to help them meet their infant feeding goals. Survivors, after all, are just that: they have survived and sometimes thrived after experiencing abuse and maltreatment from the people who were responsible for protecting them. By using that strength and their knowledge of what can help themselves and other survivors, we would not only improve our understanding of a crucial clinical problem, but would also re-center the conversation and the decisions on the women most affected by them, and the ones best positioned to help us reach understanding.

FIGURES

Figure 3-1
STACY study theoretical framework (Seng, 2002)

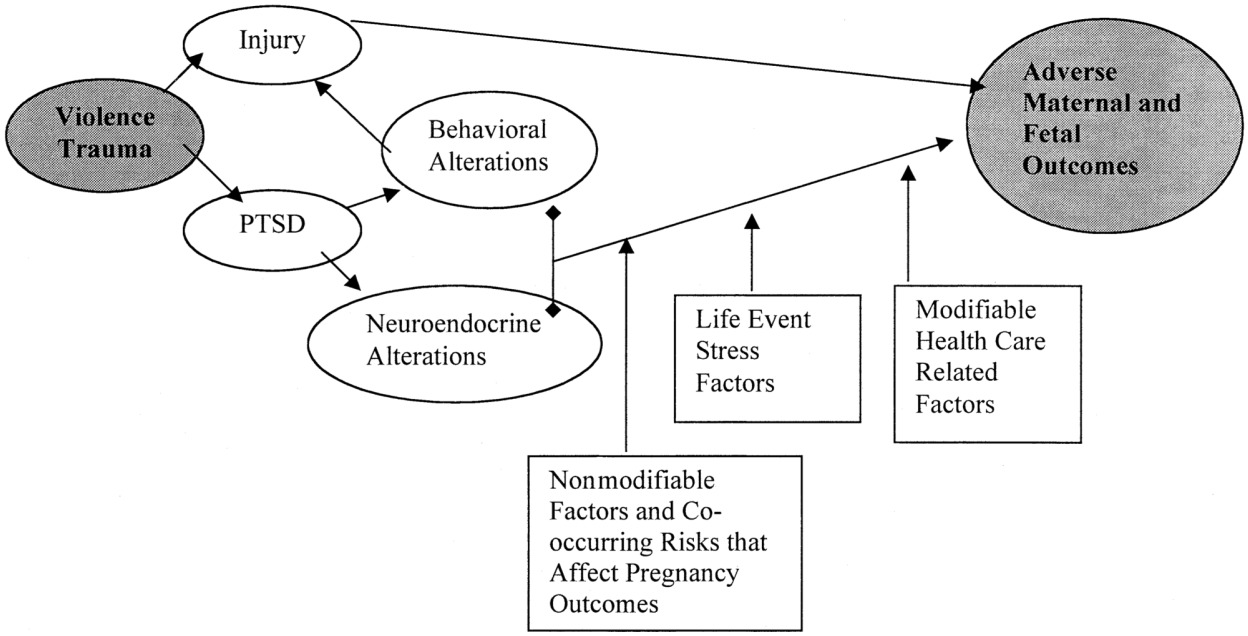
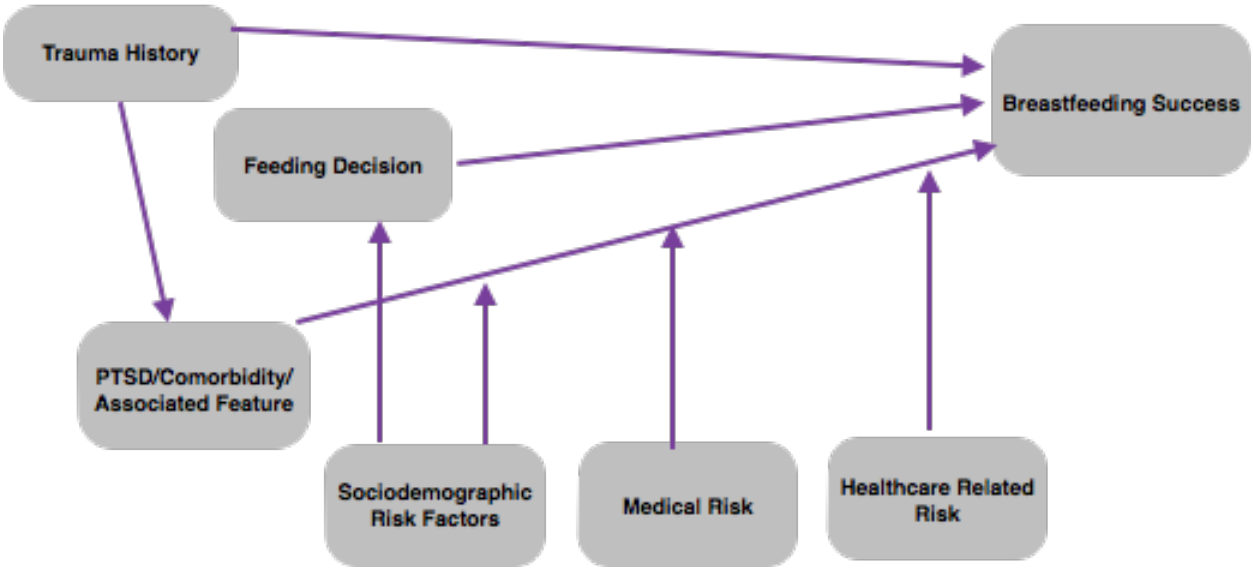


Figure 3-2
Modified STACY theoretical framework with measures mapped to concepts



MEASURE	LSC	NWS PTSD UM-CIDI DES-T	*Intended feeding *Actual feeding *Concordance between intent and outcome	CDC PRAMS items	Medical record	Provider Alliance Questionnaire CBE Y/N	Concordance Public health outcome
VARIABLE	CMT	Lifetime PTSD Lifetime MDD Dissociation		Race Teen Poverty Low education Single	*Major AP/IP/PP complication *NICU admission *Cesarean birth	Attendance at CBE Provider alliance score	Concordance cohort (nominal or ordinal) Feeding method at 6 weeks PP (Breast Y/N)

Figure 3-3
Relationships of study sample to data sources in STACY parent study

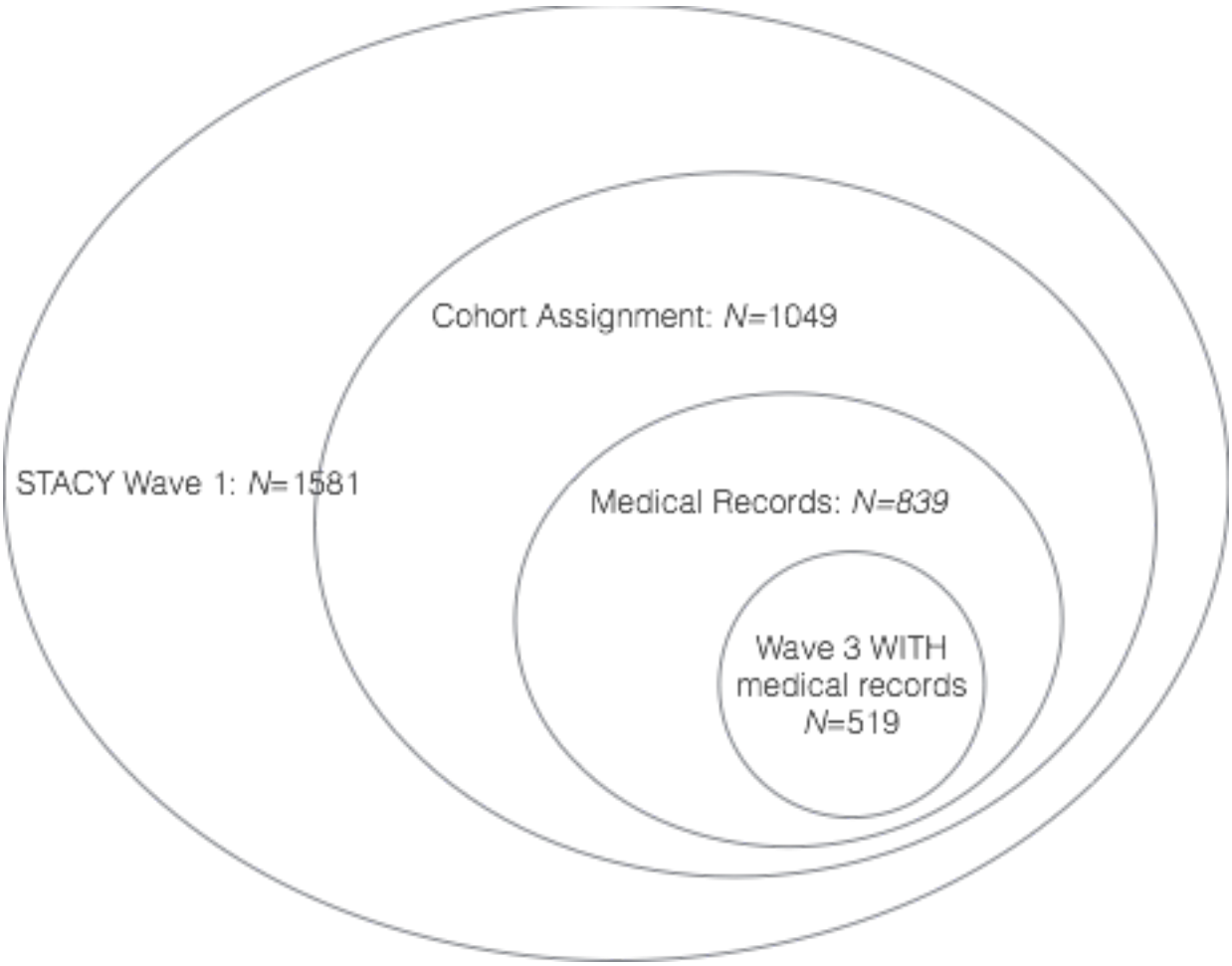
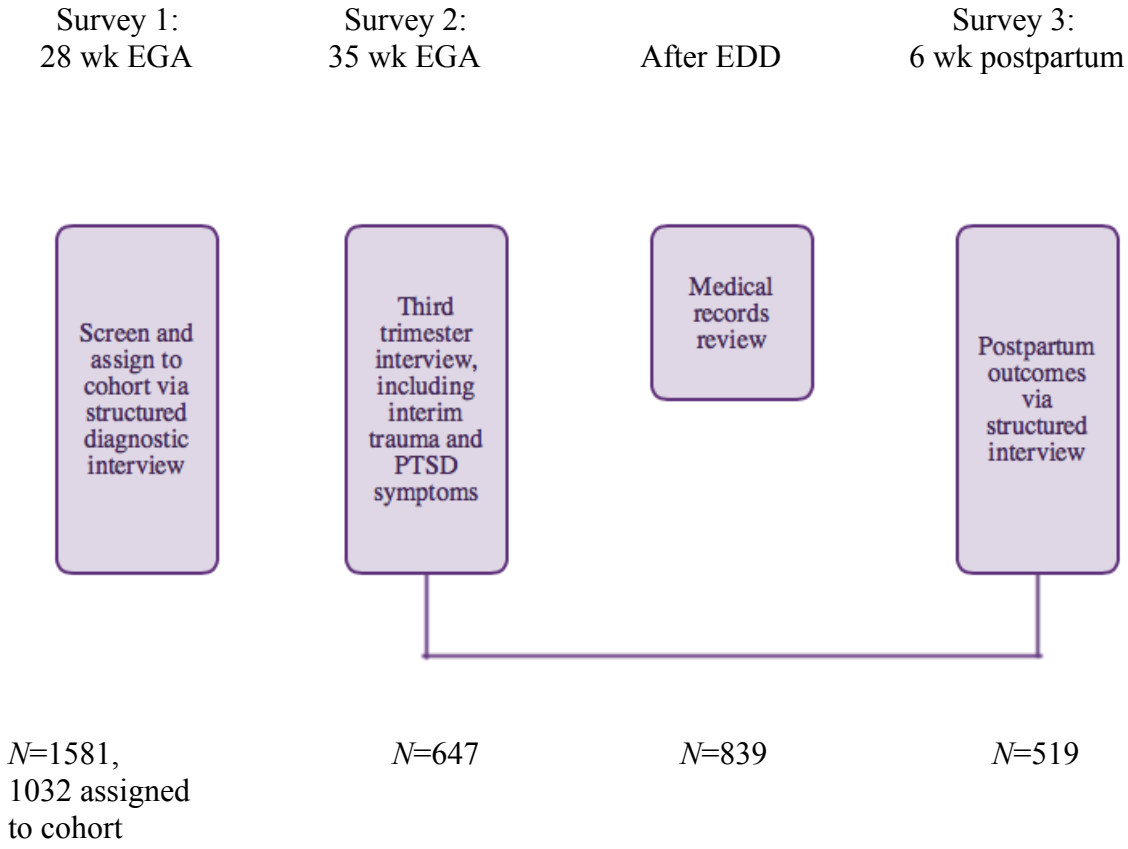


Figure 3-4
Sample derivation for secondary analysis from STACY data



TABLES

Table 3-1
Validity testing for variable measures

Measure	Validity testing (original)	Alpha coefficient (this sample)
National Women's Study PTSD Module (NWS-PTSD)	0.99 (sensitivity) 0.79 (specificity)	
Composite International Depression Interview – Short Form (UM-CIDI)	Kappa 0.97 (depression)	
Dissociative Experiences Scale – Taxon Version (DES-T)		0.68
Health Care Alliance Questionnaire (HCAQ)	N/A	0.93
Parenting Sense of Competence (PSOC)	N/A	
Postpartum Bonding Questionnaire (PBQ)	0.67-0.96	0.77-0.95
Intimate Aspects of Parenting (IAP)	N/A	0.66 (with breastfeeding questions) 0.86 (with breastfeeding questions omitted)

Table 4-1
Sample characteristics for secondary analysis

Variable	% (*n*)
History of CMT	19.1 (99)
Lifetime history of PTSD	26.6 (138)
Poverty (<$15,000 annual household income)	15.0 (78)
Single (not married or partnered)	28.5 (148)
Teen (18-20 years old)	15.8 (82)
High school education or less	31.8 (165)
African American	29.9 (155)
Insurance type (n=447)	
Private	66.1 (343)
Medicaid	19.1 (99)
None	0.6 (3)
Self	0.4 (2)
Provider (n=511)	
Physician	76.3 (396)
Midwife	22.2 (115)

Table 4-2
Concordance groups: Actual feeding method by intended feeding method (frequencies)

Actual feeding method	Intended exclusive breast	Intended mixed feeding	Intended exclusive formula
Exclusive breast	41.8 (208)	6.2 (31)	0.2 (1)
Mixed feeding	10.0 (56)	9.4 (47)	0.4 (2)
Exclusive formula	9.6 (50)	11.8 (59)	8.8 (44)

Table 4-3
Intended feeding method at 28 weeks EGA

Group	Exclusive breast	Mixed feeding	Exclusive formula	Don't know	Chi-squared
CMT-resilient % (n)	84.2 (32)	3 (7.9)	2 (5.3)	2.6 (1)	χ^2=10.523, *df*=6, *p*=.020
CMT-PTSD % (n)	57.4 (35)	31.1 (19)	8.2 (5)	3.3 (2)	
Non-CMT % (n)	58.8 (247)	27.4 (115)	9.5 (40)	4.3 (18)	
Overall % (n)	60.5 (314)	26.4 (137)	9.1 (47)	4.0 (21)	

Table 4-4
Feeding method at 6 weeks EGA

Group	Exclusive breast	Mixed feeding	Exclusive formula	Chi-squared
CMT-resilient % (n)	60.5 (23)	15.8 (6)	23.7 (9)	χ^2=14.817, *df*=4, *p*=.005
CMT-PTSD % (n)	31.1 (19)	34.4 (21)	34.4 (21)	
Non-CMT % (n)	49.0 (206)	32.4 (136)	18.6 (78)	
Overall % (n)	47.8 (246)	31.4 (163)	20.8 (108)	

Table 4-5
Breastfeeding rates at 6 weeks postpartum by variable

Variable	Sample total	Breastfeeding	Not breastfeeding	Test statistic	*p*-value
African American % (n)	29.9 (155)	26.5 (41)	73.5 (114)	χ^2=82.189	<.001
Pregnant as a teen (18-20) % (n)	15.8 (82)	25.6 (21)	74.4 (61)	χ^2=83.523	<.001
HS education or less % (n)	31.8 (165)	29.1 (48)	70.9 (117)	χ^2=175.225	<.001
Poverty (<$15K/year) % (n)	15.0 (78)	35.9 (28)	64.1 (50)	χ^2=45.552	<.001
Single % (n)	28.5 (148)	28.4 (42)	71.6 (106)	χ^2=155.428	<.001
CMT+ % (n)	19.1 (99)	72.7 (72)	27.2 (27)	χ^2=.970	.325
PTSD+ % (n)	26.6 (138)	58.7 (81)	41.3 (57)	χ^2=8.549	.003
Intended to breastfeed % (n)	90.6 (451)	75.8 (342)	24.2 (109)	χ^2=96.454	<.001
Major depression % (n)	12.3 (64)	45.3 (29)	54.7 (35)	χ^2=18.367	<.001
Dissociation mean (SD)	.37 (1.254)	.38 (1.306)	.36 (1.137)	*F*=.030	.862
Cesarean birth % (n)	31.6 (164)	65.9 (108)	34.1 (56)	χ^2=.835	.361
NICU admission % (n)	12.5 (63)	55.6 (35)	44.4 (28)	χ^2=5.107	.024
AP complications % (n)	79.8 (414)	66.7 (276)	33.3 (138)	χ^2=3.526	.060
IP complications % (n)	88.4 (459)	67.5 (310)	32.5 (149)	χ^2=2.053	.152
PP complications % (n)	3.5 (18)	38.9 (7)	61.1 (11)	χ^2=7.637	.006
BMI, mean (SD) (n=403)	24.92 (6.665)	24.23 (5.699)	27.41 (8.968)	*F*=16.280	<.001
Attended CBE % (n)	54.3 (282)	89.7 (253)	10.3 (29)	χ^2=127.900	<.001
Provider alliance, mean (SD)	67.66 (9.548)	68.20 (9.722)	66.46 (9.049)	*F*=3.742	.054
Parenting sense of competence, mean (SD) (n=453)	52.66 (3.162)	52.29 (3.338)	53.55 (2.491)	*F*=15.639	<.001
Impaired postpartum bonding % (n)	22.7 (118)	84.7 (100)	15.3 (18)	χ^2=18.496	<.001
Discomfort with IAP, mean (SD)	13.91 (3.260)	14.28 (2.680)	13.104 (4.157)	*F*=14.820	<.001

Table 4-6
Decision indicators and final status of variables in regression models

Variable	BV *p*>.05	MV *p*>.05	<10% change: Greenland	Theory-based reason to retain	Literature supports retaining	Final decision
African American	No	No	No	Yes	Yes	Keep
Pregnant as a teen (18-20)	No	Yes	Yes	Yes	Yes	Keep
HS education or less	No	No	No	Yes	Yes	Keep
Poverty (<$15K/year)	No	Yes	Yes	Yes	Yes	Keep
Single	No	No	No	Yes	Yes	Keep
CMT+	Yes	Yes	NA	Yes	Yes	Keep
PTSD+	No	No	No	Yes	No	Keep
Intended to breastfeed	No	No	NA	Yes	Yes	Keep
Major depression	No	No	No	Yes	Yes	Keep
Dissociation	Yes	Yes	Yes	Yes	No	Remove
Cesarean birth	Yes	Yes	Yes	Yes	Yes	Keep
NICU admission	No	No	No	Yes	Yes	Keep
AP complications	Yes	Yes	Yes	Yes	No	Remove
IP complications	Yes	Yes	Yes	Yes	No	Remove
BMI	No	Yes	No	No	Yes	Remove
Attended CBE	No	No	No	Yes	Yes	Keep
Provider alliance	Yes	Yes	Yes	Yes	No	Remove
Parenting sense of competence	No	Yes	Yes	Yes	No	Keep
Impaired postpartum bonding	No	Yes	Yes	Yes	No	Remove
Discomfort with IAP	No	Yes	Yes	Yes	No	Remove

Table 4-7
Effects of variables on breastfeeding outcomes at 6 weeks postpartum

		Odds ratio	*p*-value	Hosmer-Lemeshow	Change in Exp(B)
Step 1: Intent	R^2=.242, p<.001				
Intent to breastfeed		44.815	<.001		New
Step 2: Trauma	R^2=.243, $R^2\Delta$=.001,p=.001			.890	
Adds childhood	Intent to breastfeed	44.586	<.001		<10%
maltreatment trauma	Hx CMT	1.219	.481		New
Step 3: PTSD	R^2=.267, $R^2\Delta$=.024, p=.001			.963	
Adds PTSD (lifetime	Intent to breastfeed	44.286	<.001		<10%
diagnosis)	Hx CMT	1.808	.061		>10%
	Hx PTSD	.426	.001		New
Step 4: Mental health	R^2=.288, $R^2\Delta$=.021, p=.003			.980	
Adds prenatal dx of	Intent to breastfeed	43.434	<.001		
major depression	Hx CMT	1.891	.050		<10%
	Hx PTSD	.549	.034		<10%
	Hx MDD	.363	.003		>10%
					New
Step 5: Health system	R^2=.466, $R^2\Delta$=.118, p<.001			.592	
Adds medical risk	Intent to breastfeed	24.145	<.001		>10%
factors and CBE	Hx CMT	2.522	.011		>10%
	Hx PTSD	.524	.044		<10%
	Hx MDD	.343	.005		<10%
	Attended CBE	9.016	<.001		New
	Cesarean birth	.763	.307		New
	NICU admission	.762	.400		New
Step 6: Parenting	R^2=.471, $R^2\Delta$=.005, p<.001			.456	
Adds perceived	Intent to breastfeed	22.229	<.001		>10%
parenting competence	Hx CMT	2.465	.014		<10%
at 6 weeks postpartum	Hx PTSD	.503	.033		<10%
	Hx MDD	.345	.006		<10%
	Attended CBE	8.676	<.001		<10%
	Cesarean birth	.753	.286		>10%
	NICU admission	.673	.305		>10%
	PSOC	.933	.143		New
Step 7: PRAMS	R^2=.606, $R^2\Delta$=.135, p<.001			.797	
Adds demographic risk	Intent to breastfeed	14.958	<.001		>10%
factors	Hx CMT	3.176	.006		>10%
	Hx PTSD	.492	.049		<10%
	Hx MDD	.402	.039		>10%
	Attended CBE	2.557	.005		>10%
	Cesarean birth	.653	.175		>10%
	NICU admission	.519	.139		>10%
	PSOC	.986	.773		<10%
	Poverty (<$15K)	1.416	.376		New
	Partnered	3.039	.004		New
	Teen (18-20 yo)	.659	.328		New
	Education (HS or less)	.439	.038		New
	African American	.305	.001		New

Table 4-8

Effects of variables on concordance between intent at 28 weeks EGA and 6 weeks postpartum

		Odds ratio	*p*-value	Hosmer-Lemeshow	Change in Exp(B)
Step 1: Trauma	R^2=.003, *p*=.321				
Childhood maltreatment trauma	Hx CMT	1.219	.488		New
Step 2: PTSD	R^2=.015, $R^2\Delta$=.012, *p*=.037			.993	
Adds PTSD (lifetime diagnosis)	Hx CMT	.972	.913		>10%
	Hx PTSD	.614	.036		New
Step 3: Mental health	R^2=.042, $R^2\Delta$=.027, *p*=.002			.837	
Adds prenatal dx of major depression	Hx CMT	1.006	.983		<10%
	Hx PTSD	.797	.368		>10%
	Hx MDD	.386	.002		New
Step 4: Health system	R^2=.118, $R^2\Delta$=.070, *p*<.001			.524	
Adds medical risk factors and CBE	Hx CMT	1.037	.896		<10%
	Hx PTSD	.835	.489		<10%
	Hx MDD	.406	.005		<10%
	Attended CBE	2.707	<.001		New
	Cesarean birth	.683	.076		New
	NICU admission	1.107	.738		New
Step 5: PRAMS	R^2=.191, $R^2\Delta$=.073, *p*<.001			.584	
Adds demographic risk factors	Hx CMT	1.006	.982		<10%
	Hx PTSD	.888	.663		<10%
	Hx MDD	.405	.007		<10%
	Attended CBE	1.387	.211		>10%
	Cesarean birth	.672	.079		<10%
	NICU admission	1.048	.882		<10%
	Poverty (<$15K)	1.024	.940		New
	Partnered	2.528	.004		New
	Teen (18-20 yo)	.866	.671		New
	Education (HS or less)	1.265	.490		New
	African American	.509	.030		New

Table 4-9
Concordance in breastfeeding intent and outcome at 6 weeks, by CMT and PTSD status

Group	More BF than intended	Full concordance	Less BF than intended	Chi-squared
CMT-resilient % (n)	2.7 (1)	67.6 (25)	29.7 (11)	χ^2=4.000, *df*=4, *p*=.406
CMT-PTSD % (n)	6.8 (4)	50.8 (30)	42.4 (25)	
Non-CMT % (n)	7.2 (29)	60.7 (244)	32.1 (129)	
Overall % (n)	6.8 (34)	60.0 (299)	33.1 (165)	

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