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WORKPLACE LACTATION SUPPORT AND BREASTFEEDING PRACTICES
IN EMPLOYED MOTHERS

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Nursing
at the University of Kentucky

By
Robin Ray

Lexington, Kentucky

Director: Dr. Ellen Hahn, Professor of Nursing

Lexington, Kentucky

2021

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ABSTRACT OF DISSERTATION

WORKPLACE LACTATION SUPPORT AND BREASTFEEDING PRACTICES IN EMPLOYED MOTHERS

Low rates of breastfeeding are a global public health issue. Despite national and international health agency recommendations for breastfeeding until infants are six months of age when solid foods are introduced and continued breastfeeding until 12 months of age or older, many mothers in the United States discontinue breastfeeding at an early age. Return to work after childbirth is one of the leading contributing factors to early cessation of breastfeeding in employed mothers. Understanding the association between individual and organizational factors and breastfeeding practices in employed mothers is essential for the development, implementation, and evaluation of programs and policies to promote, support, and encourage continued breastfeeding consistent with national and international health recommendations.

The purpose of this dissertation was to: 1) review literature on the psychometric properties of existing instruments used to measure nursing mothers' perceptions of workplace lactation support; 2) perform psychometric testing on a 9-item *Breastfeeding and Employment Scale* used in the Infant Feeding Practices Study II (IFPS II); and 3) examine the association between individual and organizational factors and breastfeeding practices in employed mothers who participated in the IFPS II.

This dissertation has three components; a systematic review of the psychometric properties of workplace lactation support instruments; an analysis of the psychometric properties of the IFPS II *Breastfeeding and Employment Scale*; and a secondary analysis of the IFPS II examining individual and organizational factors associated with breastfeeding practices in employed mothers. First, a search of literature published between 1993 and May 2020 on psychometric properties of existing instruments used to measure nursing mothers' perceptions of workplace lactation support was conducted using the electronic databases, PubMed, CINAHL and PsycINFO, with key words, *breastfeeding AND support AND instrument*"; *breastfeeding support AND workplace*"; *breastfeeding AND instrument AND workplace*"; *perceived AND breastfeeding support AND instrument*". Lactation was used in the place of "breastfeeding" for a repeated search. Of 26 full text eligible articles, 10 articles were included in the review. Four instruments including the 12-item *Workplace Breastfeeding Support Scale* (five

articles); 41-item *Employee Perceptions of Breastfeeding Support* (two articles); 29-item *Perceived Breastfeeding Assessment Tool* (two articles); and 9-item IFPS II *Breastfeeding and Employment Scale* (one article) were identified and reviewed for scope and conceptual definitions, reliability, and validity. The modified 18-item *Workplace Breastfeeding Support Scale* was selected as the preferred instrument based on adequate reliability demonstrated in multiple studies, limited respondent burden and cross-cultural application outside the U.S. Additional psychometric testing and research are needed to strengthen the adaptation and applicability of the various instruments in cross-cultural settings.

Next, psychometric testing was conducted on the IFPS II 9-item *Breastfeeding and Employment Scale* including internal consistency reliability; test-retest reliability; construct validity using factor analysis; and convergent validity of the 9-item scale and an IFPS II item measuring perceived level of breastfeeding support in the workplace. The sample was comprised of employed breastfeeding mothers in the U.S. who completed the 9-item *Breastfeeding and Employment Scale* and an IFPS II survey item measuring perceived level of breastfeeding support in the workplace at two time intervals (3-month [$n=498$] and 6-month [$n=413$] assessment). Kuder-Richardson 20 was used as the measure of internal consistency due to the dichotomous nature of the responses. Test-retest reliability (3- and 6-month assessments) was conducted using chi-square and Spearman's rank correlation coefficient. Construct validity was conducted using a tetrachoric correlational matrix. Spearman's rho correlation coefficient was used to evaluate convergent validity to associate the 9-item *Breastfeeding and Employment Scale* with a survey item measuring perceived level of breastfeeding support in the workplace at the 3-month assessment ($n=266$). The *Breastfeeding and Employment Scale* was reliable and valid in a sample of employed breastfeeding mothers ($N=498$) in the U.S. who participated in the IFPS II. Additional testing is warranted to further evaluate the reliability and validity of the instrument in cross-cultural and more diverse populations.

Finally, a secondary analysis was conducted on a sample of 953 employed mothers who participated in the IFPS II to compare infant feeding status (breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk) over a 12-month postpartum period. The purpose was to identify individual (e.g., prenatal infant feeding intentions and smoking status) and organizational (e.g., employment status, occupation type, and perceived level of breastfeeding support in workplace) factors, guided by the Socio-Ecological Model, associated with breastfeeding practices in a sample of employed mothers who participated in the IFPS II. At baseline (3-months postpartum survey), 57% of employed mothers were breastfeeding/feeding pumped milk. At this time point, employed breastfeeding mothers were significantly older, more likely to be married and they had higher SES compared to non-breastfeeding employed mothers; and they expressed prenatal infant feeding intentions to breastfeed only, were nonsmokers, employed part-time in a professional/executive occupation, and reported a higher level of perceived breastfeeding support in the workplace. In a subsample of employed mothers who worked either part-time (≤ 34 hours/week) or full-time (> 35 hours/week) over the 12-month postpartum period ($n=302$), generalized linear mixed modeling (GLMM) revealed that predictors of breastfeeding over time were individual factors of prenatal breastfeeding intention and non-smoking, and organizational factors of part-time

employment and perceived support for breastfeeding in the workplace. Employed mothers who were non-smokers were 291% more likely to breastfeed/feed pumped milk over the 12-month period (OR= 3.91, $p < 0.001$) compared to smokers. Employed mothers who expressed prenatal feeding intentions to only breastfeed their infants were 953% more likely to report sustained breastfeeding over time (OR=10.53, $p < 0.001$) compared to those who did not. In regard to organizational factors, employed mothers who were employed part-time (compared to full-time) were 97% more likely to continue breastfeed over the follow-up period (OR=1.97, $p = 0.002$). Finally, employed mothers who perceived high levels of breastfeeding support in the workplace ('somewhat supportive' or 'very supportive') were 178% more likely to continue breastfeeding over the 12-month follow up period compared to those with low levels of perceived breastfeeding support in the workplace (OR=2.78, $p < 0.001$).

In summary, occupational health nurses are instrumental in promoting breastfeeding supportive workplace environments. Future research is needed to examine individual, interpersonal, organizational, community, and public policy components of the Socio-Ecological Model to better understand the complex processes influencing breastfeeding continuation in employed mothers. Additional research is needed to develop, implement, and evaluate breastfeeding supportive workplace programs; guide public health policy; and better understand the relationship between multi-level factors of workplace lactation, breastfeeding practices, and maternal and child health outcomes.

KEYWORDS: Breastfeeding, Workplace, Mothers, Employment, Psychometric

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October 27, 2021
Date

WORKPLACE LACTATION SUPPORT AND BREASTFEEDING PRACTICES
IN EMPLOYED MOTHERS

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Dedication

This dissertation is dedicated to my husband Chuck, my daughter Sydney, and the rest of my family. Their love, continuous support and understanding throughout this journey was instrumental in my success.

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CHAPTER ONE:

Introduction

1.1 Background

Low rates of breastfeeding, especially in the United States (U.S.), are a global public health issue (Slusser, 2007; Victora et al., 2016). Maternal health benefits of breastfeeding are widely recognized including reduced risk of breast and ovarian cancer, type II diabetes, myocardial infarction, and postpartum depression (Stuebe, 2009). Similarly, children who are breastfed experience a variety of health benefits such as lower incidence of otitis media, gastroenteritis, asthma, pneumonia, leukemia, sudden infant death syndrome, and type 1 and 2 diabetes (Slusser, 2007). In 2017, the Breastfeeding Report Card indicated that 58.3% of mothers in the U.S. reported breastfeeding at six months of the infant's age and the rates declined to only 35.3% of mothers by 12 months of age (Centers for Disease Control and Prevention, 2020). In contrast, according to the World Health Organization [WHO] and United Nations Children's Fund [UNICEF] (2017), global breastfeeding rates were more than double the U.S. average (74% of infants breastfed at 12 months of age). Despite national and international health agency recommendations for breastfeeding infants until six months of age when solid foods are introduced and continued breastfeeding until 12 months of age or older, many mothers in the U.S. discontinue breastfeeding their infants at an early age (Eidelman, 2012; Spitzmueller et al., 2015; United States Breastfeeding Committee, n.d.; World Health Organization, n.d.).

Return to work after childbirth is a leading cause of breastfeeding cessation and lack of workplace lactation support is one of the contributing factors to breastfeeding discontinuation in employed mothers (Murtagh & Molton, 2011). Lack of managerial support, unsupportive work environments, and difficulties locating suitable milk pumping and storage locations are the most frequent reasons cited by employed mothers for

breastfeeding cessation prior to six months of infant age (Murtagh & Molton, 2011). Given that 75% of women of childbearing age (16-49 years of age) are employed in the U.S. workforce (U.S. Bureau of Labor Statistics, 2019), it is vital to understand employed mothers' perceptions of lactation support as well as examine the association of multi-level factors of workplace lactation support and breastfeeding practices in employed mothers for the development, implementation, evaluation, and enforcement of workplace lactation programs and policies in order to improve maternal and child health outcomes.

The purposes of this dissertation were to: 1) provide a systematic review of the psychometric properties of existing instruments used to measure nursing mothers' perceptions of workplace lactation support; 2) perform psychometric testing on a 9-item *Breastfeeding and Employment Scale* used in the Infant Feeding Practices Study II (IFPS II) (CDC, 2017) ; and 3) examine the association between individual and organizational factors and breastfeeding practices in employed mothers who participated in the IFPS II. This dissertation is comprised of three manuscripts, one manuscript addressing each study purpose and findings are presented in Chapters Two through Four.

1.2 Summary of Theoretical Model

Workplace lactation is a complex, multifactorial construct that involves a multi-level approach to continuation of breastfeeding in employed mothers. The Socio-Ecological Model was chosen as the theoretical framework to guide the aims of this dissertation (Figure 1.1). The Socio-Ecological Model framework, first introduced by Bronfenbrenner in the 1970's and later expanded by McLeroy, Bibeau, Steckler, and Glanz, is a theory-based framework for understanding the multifaceted and interactive effects of personal and environmental factors that influence behavior (McLeroy et al.,

1988). The Socio-Ecological Model posits that five dimensions influence health behavior: individual, interpersonal, organizational, community, and public policy. The Socio-Ecological Model has been used to guide research on health behavior change and guide the development of health promotion interventions such as improved fruit and vegetable intake (T. Robinson, 2008); bullying prevention and intervention (Lim & Hoot, 2015); utilization of contraceptive services (Ezenwaka et al., 2020); cervical cancer screening (Daley et al., 2010) and promotion of physical activity (Eime et al., 2015; Kemp et al., 2020). The model can be utilized to better understand the complex personal, environmental and societal factors that influence employed mothers continued breastfeeding. This dissertation study is focused on the individual and organizational dimensions of the Socio-Ecological Model to examine factors associated with breastfeeding practices in employed mothers who participated in the IFPS II (CDC, 2017). The overall goal was to identify individual and organizational factors that influence breastfeeding practices in employed mothers to improve maternal and child health outcomes.

1.3 Overview of Chapters 2-4

1.3.1 Overview of Chapter Two

The first manuscript is a systematic review to: 1) describe existing instruments used to measure nursing mothers' perceptions of workplace lactation support; 2) summarize the psychometric properties of the identified instruments; and 3) identify the strengths and limitations of each of the instruments, describe gaps in the research literature, and recommend research needs. English-language research articles using quantitative methods to examine measures of workplace lactation support published

between January 1993 and May 2020 were systematically reviewed. Of 26 full text articles assessed for eligibility, 10 articles were chosen for systematic review based on inclusion of an instrument to measure perceived workplace lactation support and psychometric properties of the identified instruments. Four workplace lactation support instruments were identified in the 10 articles and each instrument's purpose, reliability and validity were summarized. Authors of five papers reported using the 12-item *Workplace Breastfeeding Support Scale* (WBSS); two articles used the 41-item *Employee Perceptions of Breastfeeding Support* (EPBS-Q); two articles used the 29-item *Perceived Breastfeeding Assessment Tool* (PBSAT); and one article reported use of a 9-item scale measuring breastfeeding and employment as part of the Infant Feeding Practices Study II (IFPS II). The modified 18-item *Workplace Breastfeeding Support Scale* was selected as the preferred instrument for measuring mothers' perceptions of workplace lactation support based on adequate reliability demonstrated in multiple studies, limited respondent burden, and cross-cultural application outside the U.S. Additional psychometric testing and research would strengthen the adaptation and applicability of the four identified instruments in cross-cultural settings. Given the time frame between the development of the instruments included in this review and federal policy changes that impact breastfeeding employed mothers in the U.S, a new or revised workplace lactation support instrument may need to be developed and tested.

1.3.2 Overview of Chapter Three

Reliable and valid measures of maternal perception of workplace lactation support are needed to inform researchers, clinicians, and policymakers in order to improve breastfeeding rates and maternal/child health outcomes in employed breastfeeding

mothers. The IFPS II, a landmark study on infant feeding practices in the United States (CDC, 2017), included a 9-item *Breastfeeding and Employment Scale* that had not undergone psychometric evaluation. The aims of the dissertation study were to: a) test the internal consistency reliability of the 9-item scale at the 3-month IFPS II assessment; b) describe test-retest reliability of the scale using the 3-month and 6-month assessments; c) evaluate the construct validity of the 9-item scale using factor analysis at the 3-month assessment; and d) examine the convergent validity of the scale compared to a survey item measuring perceived level of breastfeeding support in the workplace at the 3-month assessment. The sample was comprised of employed breastfeeding mothers in the U.S. who completed the 9-item scale on breastfeeding and employment and an IFPS II survey item measuring perceived level of breastfeeding support in the workplace at two time intervals (3-month [$n=498$] and 6-month [$n=413$] postpartum assessment). Kuder-Richardson 20 was 0.72, supporting the internal consistency reliability of the 9-item scale in employed breastfeeding mothers. However, inter-item correlations (range = 0.03 to 0.50) indicated questionable homogeneity of the scale. Spearman's Rho correlation coefficient for the 9-item scale was 0.66, indicating adequate test-retest reliability at the 3-and 6-month assessments ($n=277$, $p < .001$). Factor analysis yielded one construct (barriers to breastfeeding in the workplace). Convergent validity, conducted at the 3-month assessment, indicated a moderate correlation between the 9-item scale score and breastfeeding support in the place of employment for breastfeeding mothers. Mothers reporting more barriers to breastfeeding in the workplace also reported a less supportive workplace environment (Rho = -0.50, $p < 0.001$). The 9-item *Breastfeeding and Employment Scale* was reliable and valid in a sample of employed breastfeeding mothers

in the U.S. who participated in the IFPS II. The low respondent burden of the 9-item *Breastfeeding and Employment Scale* was the main strength of this short scale in measuring employed mothers' perceptions of workplace lactation support. Additional testing is warranted to further evaluate the reliability and validity of the instrument in more culturally, ethnically and racially diverse populations.

1.3.3 Overview of Chapter Four

The Socio-Ecological Model (McLeroy et al., 1988) was used to guide a secondary analysis of employed breastfeeding mothers in the U.S. who participated in the IFPS II to: 1) determine the association of individual factors (e.g., prenatal feeding intentions and smoking status) and breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk at 3-, 6-, 9-, and 12- month assessments, controlling for age, race, marital status, and household income; and 2) determine the association of organizational factors (e.g., employment status, occupation type, and perceived level of breastfeeding support in workplace) and breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk at all time intervals, controlling for age, race, marital status, and household income. At baseline (3 month postpartum survey), 57% of employed mothers were breastfeeding/feeding pumped milk ($n=953$).

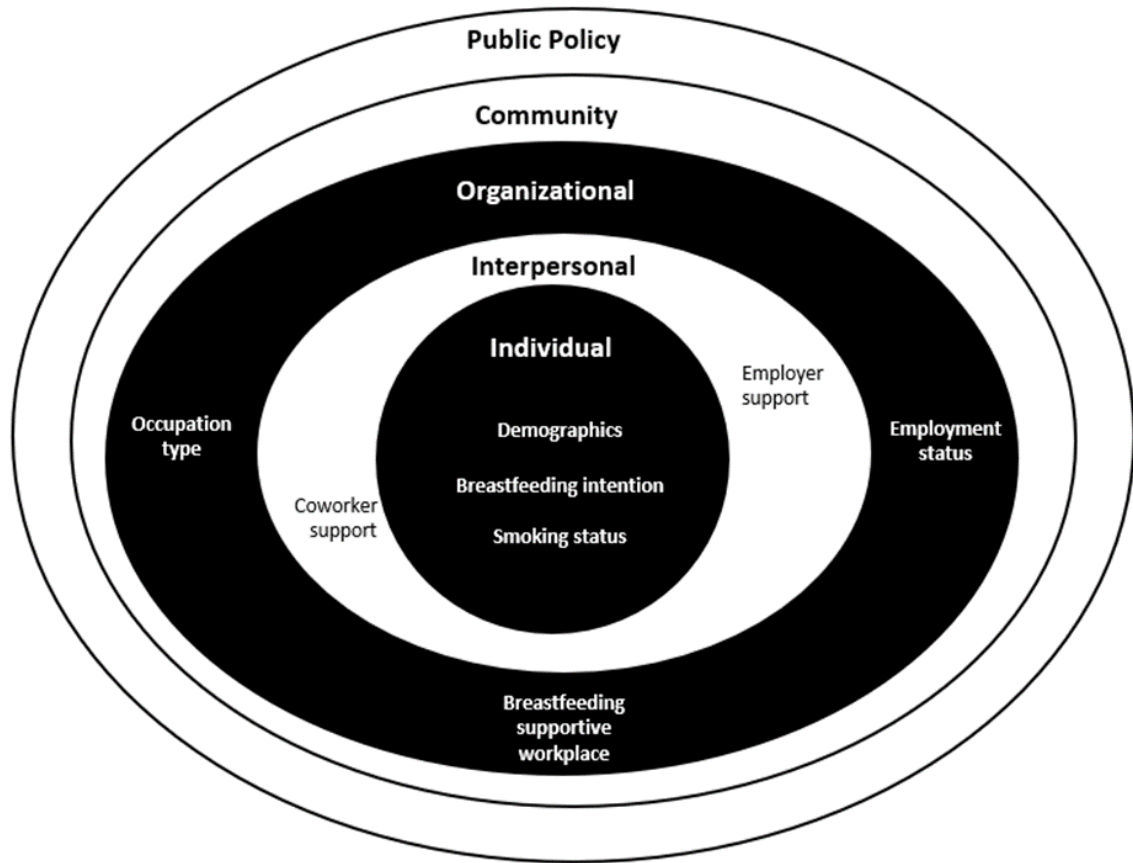
For the baseline bivariate measures, employed breastfeeding mothers were significantly older ($p < 0.001$), married ($p < 0.001$), higher SES ($p = 0.032$), expressed prenatal infant feeding intentions to breastfeed only ($p < 0.001$) and were nonsmokers ($p < 0.001$). Organizational factors associated with breastfeeding at baseline were employed part-time ($p = 0.001$), employed in a professional/executive occupation ($p < 0.001$), and reported a higher level of perceived breastfeeding support in the workplace ($p < 0.001$).

Generalized linear mixed modeling (GLMM) analysis results for a sample of employed mothers who worked either part-time (≤ 34 hours/week) or full-time (> 35 hours/week) over the 12-month postpartum period ($n=302$) revealed that individual and organizational predictors of breastfeeding were prenatal breastfeeding intention, non-smoking, part-time employment, and high levels of perceived support for breastfeeding in the workplace. Employed mothers who were non-smokers were significantly more likely to breastfeed/feed pumped milk over the 12-month period ($OR= 3.91, p < 0.001$). Mothers who expressed prenatal feeding intentions to only breastfeed their infants were 950% more likely to have sustained breastfeeding during the follow-up period ($OR=10.50, p < 0.001$) compared to mothers who planned to both breastfeed and formula feed. In regard to organizational factors, mothers who were employed part-time (compared to full-time) were 97% more likely to continue breastfeeding over the follow-up period ($OR=1.97, p = 0.002$). Employed mothers who perceived high levels of breastfeeding support in the workplace (indicated as ‘somewhat supportive’ or ‘very supportive’) were 178% more likely to continue breastfeeding over the 12-month follow up period compared to those with low levels of perceived breastfeeding support in the workplace ($OR=2.78, p < 0.001$). Future research needs to examine additional components of the Socio-Ecological Model including the interpersonal, community and public policy dimensions to better understanding the complex processes influencing continued breastfeeding in the workplace.

In summary, this dissertation aimed to further understand workplace lactation support and breastfeeding practices in employed mothers. Dissertation findings can be used to inform occupational health nurses, employers, public health practitioners, and

policymakers on the importance of breastfeeding supportive workplace environments to promote continued breastfeeding in employed mothers, consistent with national and international health agency recommendations. Understanding the association between multi-level factors influencing breastfeeding practices in employed mothers is essential for the development, implementation, evaluation, and enforcement of workplace programs and policies to promote continued breastfeeding and improve maternal and child health outcomes.

Figure 1.1 Socio-Ecological Model to Promote Breastfeeding Continuation in Employed Mothers



* Black shading indicates factor levels addressed in this dissertation including individual and organizational. Bold font indicates variables addressed in this study including breastfeeding intention, smoking status, employment status, occupation type, and breastfeeding supportive workplace environment.

CHAPTER TWO:
Systematic Review of the Psychometric Properties of
Workplace Lactation Support Instruments

Abstract

Employment, a major barrier to continuation of breastfeeding among employed mothers, has been associated with low rates of breastfeeding in the United States. The most frequently cited reasons that employed mothers discontinue breastfeeding before six months postpartum include lack of managerial lactation support, an unsupportive work environment, and difficulties locating suitable milk pumping and storage locations. The purpose was to systematically review research articles reporting psychometric properties of instruments used to measure nursing mothers' perceptions of workplace lactation support. A search was conducted in the electronic databases, PubMed, CINAHL and PsycINFO. English-language research articles using quantitative methods to examine measures of workplace lactation support published between January 1993 and May 2020 were systematically reviewed. Of 26 full text articles assessed for eligibility, 10 articles were chosen for systematic review based on inclusion of an instrument to measure perceived workplace lactation support and psychometric properties of the instrument reported. Studies published in a language other than English, opinion/editorial articles and literature reviews were excluded. Four workplace lactation support instruments were identified in the 10 articles and each instrument's purpose, reliability and validity were summarized. Authors of five papers reported using the 12-item *Workplace Breastfeeding Support Scale* (WBSS); two articles used the 41-item *Employee Perceptions of Breastfeeding Support* (EPBS-Q); two articles used the 29-item *Perceived Breastfeeding Assessment Tool* (PBSAT); and one article reported use of a 9-item scale measuring breastfeeding and employment as part of the Infant Feeding Practices Study II (IFPS II) survey. The modified 18-item WBSS was selected as the preferred instrument for measuring mothers' perceptions of workplace lactation support. Additional psychometric

testing and research would strengthen the adaptation and applicability of the various instruments in cross-cultural settings. Given the time frame between the development of the instruments included in this review and recent federal policy changes that impact employed breastfeeding mothers in the United States, a new or revised workplace lactation support instrument may need to be developed and tested.

2.1 Background

Low rates of breastfeeding, including in the United States, are a worldwide public health issue (Brown, 2017). There are multiple health benefits for breastfeeding mothers including reduced risk of breast cancer, ovarian cancer, type II diabetes and postpartum depression (Ip et al., 2007). Breastfed children experience health benefits such as reduction in childhood illnesses, otitis media and childhood obesity (Ip et al., 2007). Multiple national and international health agencies recommend exclusive breastfeeding, defined as infant feeding with breast milk only, without any additional food or drink, until six months of age when solid foods are introduced, and continued breastfeeding until 12 months of age or longer (Eidelman, et al., 2012; World Health Organization, 2020). Despite this recommendation, the 2020 Centers for Disease Control and Prevention (CDC) Breastfeeding Report Card showed that 64% of breastfeeding mothers in the United States introduce formula before their babies are three months old and 83.7% introduce formula by six months of age (CDC, 2020). One population at risk of introducing formula to their infant are employed mothers—they are increasingly likely to discontinue breastfeeding when their babies are at a young age (Rollins et al., 2017).

Lack of lactation support in the workplace is one potential contributing factor to low rates of breastfeeding in the United States (Dunn et al., 2014; CDC, 2018). The most frequently cited reasons for breastfeeding discontinuation among employed mothers before six months of infant age include lack of managerial lactation support, an unsupportive work environment, and difficulties locating suitable milk pumping and storage locations (Murtagh & Molton, 2011). Given that 75% of women of childbearing age (16-49 years of age) were employed in the U.S. workforce in 2019 (U.S. Bureau of Labor Statistics, 2019), the need for research on promotion of workplace lactation

support is critically important. To date, there is no systematic review of existing instruments to measure nursing mothers' perceptions of workplace lactation support and their psychometric properties.

The purpose of this systematic literature review is to compare the available instruments used to measure workplace lactation support from the employed mother's perspective. The aims of this systematic review are to: (1) describe existing instruments used to measure nursing mothers' perceptions of workplace lactation support; (2) summarize the psychometric properties of the identified instruments; and (3) identify the strengths and limitations for each of the instruments, describe gaps in the research literature, and recommend research needs. Results of this systematic review provide guidance to researchers and occupational health practitioners on selecting the most appropriate workplace lactation support instrument to use to better understand and evaluate programs and policies designed to promote workplace lactation support.

2.2 Methodology

A comprehensive search strategy was conducted by combining multiple search terms related to breastfeeding support for employed mothers. The following databases were searched for research papers published from January 1993 to May 2020: PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL) and PsycINFO. The date range was selected to coincide with the recruitment date for the Infant Feeding Practices Survey I (IFPS I), a landmark study on a variety of infant feeding practices and infant and maternal health outcomes (Scariati et al., 2007). The IFPS I revealed the importance of understanding workplace lactation support in the context of infant feeding practices (Scariati et al., 2007). Medical subject headings (MeSH) terms "breastfeeding"

and “workplace” were searched including the keywords “*breastfeeding AND support AND instrument*”; “*breastfeeding support AND workplace*”; “*breastfeeding AND instrument AND workplace*”; “*perceived AND breastfeeding support AND instrument*”. Lactation was also used as a keyword in place of “breastfeeding” for a repeated search. Inclusion criteria for research articles were: 1) use of an instrument to measure perceived workplace lactation support; and (2) psychometric properties of the instrument reported. Studies published in a language other than English, opinion/editorial articles, and literature reviews were excluded from the search.

2.3 Results

The initial search of PubMed, CINAHL and PsycINFO yielded 443 articles. An additional 18 research papers were identified through searching the reference lists of the articles. After removing duplicates, 280 article titles were initially screened for inclusion. Over two thirds of the articles ($n=190$) were discarded after reviewing titles and 64 more were excluded after reviewing abstracts that did not meet the inclusion criteria (use of an instrument to measure perceived workplace lactation support and psychometric properties of the instrument reported). A total of 26 full-text articles were assessed using the inclusion criteria. Following full text evaluation, 16 of the 26 articles were excluded because did not provide psychometric properties of workplace lactation support instruments. Ten articles were included in the final systematic review. A Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart is included to describe the process of study inclusion (Figure 2.1). Additionally, Table 2.1 provides a summary of the articles by author and date of publication including the

instrument, reliability, content validity, construct validity, predictive validity, and domains identified, as applicable.

The 10 research papers in this systematic review, published from 2008-2020, described a total of four instruments measuring nursing mothers' perceptions of workplace lactation support: 1) 12-item and modified 18-item *Workplace Breastfeeding Support Scale* (WBSS; Bai et al., 2008; Bai & Wunderlich, 2013; Martin et al., 2015; Wambach & Britt, 2018; Leon-Larios et al., 2019); 2) 41-item *Employee Perceptions of Breastfeeding Support Questionnaire* (EPBS-Q; Greene & Olson, 2008; Greene et al., 2008); 3) 29-item *Perceived Breastfeeding Support Assessment Tool* (PBSAT; Hirani et al., 2013; Tangusksan et al., 2020); and 4) U.S. Food and Drug Administration Infant Feeding Practices Study (IFPS) II (9-item scale measuring breastfeeding and employment; Whitley et al. 2019). Five of the 10 articles used the WBSS; two articles used the EPBS-Q; two articles used the PBSAT; and one article reported findings from the IFPS II *Breastfeeding and Employment Scale*. Of the 10 articles, eight used cross-sectional, observational designs; two used longitudinal, cohort designs; and none of the articles tested the effects of workplace lactation support interventions.

2.3.1 Workplace Breastfeeding Support Scale (WBSS)

The WBSS, a 12-item tool consisting of a 7-point Likert-type scale (ranging from 1-strongly disagree to 7-strongly agree), is used to assess maternal perceptions of workplace lactation support (Bai et al., 2008). There are four domains within the WBSS including technical support (three items), environmental support (three items), peer support (three items), and facility support (three items). Overall scores range from 12 to

84. A higher score indicates more positive perception of workplace breastfeeding support.

The WBSS was developed and tested initially by Bai and colleagues in 2008. The original study population was comprised of mothers ($n=66$) who worked outside the home in a Midwestern state in the United States with infants ranging from 6-12 months of age. Many of the WBSS items were modified from an existing instrument (Return-to-Work Breastfeeding Assessment Tool) used by lactation consultants to evaluate level of perceived lactation support at clients' workplaces (Bar-Yam, 1998). Content validity was established using a review panel of four experts including specialists in nutrition, lactation, scale development, and survey development. Internal consistency and split-half reliability tests were completed, and the WBSS instrument showed acceptable reliability ($\alpha=0.77$, $r = 0.86$, respectively). Factor analysis (principal component method using oblique rotation) was conducted to determine construct validity of the WBSS. The results of the Kaiser-Meyer-Olkin test, the degree to which each variable in a set is predicted without error by the other variables, was 0.71. According to Yong & Pierce (2013), a Kaiser-Meyer-Olkin value is reliable when it is at least more than 0.70 when there are fewer than 30 variables. Four domains of the scale accounted for 62.1% of the total variability including technical support (29.8%), environmental support (13.1%), facility support (9.96%) and peer support (9.23%). Predictive validity was not assessed in the original instrument development article (Bai et al., 2008).

The original 12-item WBSS instrument was subsequently used in a study with 113 breastfeeding mothers employed in a higher-education institution and they were clients of an obstetric hospital in New Jersey (Bai & Wunderlich, 2013). The Cronbach's

alpha for the sample was 0.84, indicating strong internal consistency reliability. The principal component method of factor analysis was used to identify factors related to duration of exclusive breastfeeding. Four independent domains of workplace lactation support were identified: break time, workplace environment, technical support, and workplace policy. Three of the four domains in this study differed from the domains in the original study population (Bai et al., 2008). Technical support was the only domain similar in both studies. Break time included frequency and duration of breaks, flexibility, and coworker support (included in the peer support domain in the original study). The workplace environment domain included how common breastfeeding was in the workplace, a quiet space other than the bathroom for pumping when needed, and supervisor support (included in the environmental support domain in the original study). Technical support (same as in original study) included availability of a refrigerator, rental breast pumps, and on-site day care. The workplace policy domain included whether there was a written policy in the workplace regarding breastfeeding and the duration of maternity leave. Workplace policy questions were derived from the EPBS-Q (Greene & Olson, 2008; see EPBS-Q section below). The four domains accounted for 70.35% of the total variance in workplace lactation support. Technical support ($r=0.71, p = 0.01$) and workplace environment ($r=0.26, p = 0.01$) showed significant positive correlations with duration of exclusive breastfeeding. The availability of a breast pump, on-site childcare center and a location for storing pumped milk as well as supervisor support contributed to longer duration of breastfeeding. Break time and workplace policy were not correlated with duration of exclusive breastfeeding (Bai & Wunderlich, 2013).

Several additional studies have utilized the WBSS using the revised domains reported by Bai & Wunderlich (2013) including break time, workplace environment, technical support, and workplace policy. One study was conducted using an online survey with 318 active duty breastfeeding mothers (Martin et al., 2015). The Cronbach's alpha in this study was 0.85, indicating strong internal consistency reliability. Active duty women who were Hispanic, less than 30 years of age, had lower educational attainment and lower income reported lower perceptions of workplace lactation support. Additionally, women in the Army had significantly lower workplace breastfeeding support scores than women in the Air Force ($p < 0.001$), and enlisted women had significantly lower scores than officers ($p < 0.001$) (Martin et al., 2015). An additional study was conducted with 78 Registered Nurses employed in a large children's hospital in the Midwest (Wambach & Britt, 2018). The Cronbach's alpha for this sample was 0.87, indicating strong internal consistency reliability. Three of the four domains (workplace environment, technical support, and workplace policy; Bai & Wunderlich, 2013) were not correlated with breastfeeding duration. Break time was the only domain significantly correlated with breastfeeding duration ($r = .335$, $p = 0.035$). Finally, a modified 18-item WBSS was translated into Spanish by three independent breastfeeding experts (Leon-Larios et al., 2019) to conduct a cross-sectional study using an online survey of 101 employees (67 faculty members and 37 administrative staff) at a major university in Spain. Each item had a value from 1-7 points with higher scores indicating a higher level of perceived workplace lactation support, utilizing the four domains from Bai & Wunderlich (2013) including break time, workplace environment, technical support, and workplace policy. Additions to the 12-item WBSS (Bai & Wunderlich, 2013) included items derived from

the EPBS-Q including three break time dimension items and three workplace policy dimension items (see EPBS-Q section below). The reliability of the Spanish version of the WBSS instrument exhibited adequate internal consistency (Cronbach's alpha = 0.77, $r = 0.86$) and the Kaiser-Meyer-Olkin test was 0.71, indicating acceptable sampling adequacy for factor analysis purposes.

In summary, five studies included in this systematic review used the WBSS. Cronbach's alphas ranged from 0.77- 0.87 (Bai et al., 2008 and Leon-Larios et al., 2019; Wambach & Britt, 2018, respectively). Content validity was reported in two of the studies (Bai et al., 2008; Leon-Larios et al., 2019). Factor analysis, using the principal components method, was used to assess construct validity of the WBSS instrument in three of the five studies (Bai et al., 2008; Bai & Wunderlich, 2013; Leon-Larios et al., 2019). Kaiser-Meyer-Olkin test values of 0.71 and 0.76 were reported for two of the studies, indicating adequate construct validity (Leon-Larios et al., 2019 & Bai et al., 2008, respectively). In the original instrument development study, the authors identified four domains including technical support, environmental support, facility support, and peer support (Bai et al., 2008). In three subsequent studies, one domain was retained (technical support) and three new domains were utilized including workplace environment, break time, and workplace policy (Bai & Wunderlich, 2013; Wambach & Britt, 2018; Leon-Larios et al., 2019).

2.3.2 Employee Perceptions of Breastfeeding Support Questionnaire (EPBS-Q)

The EPBS-Q, originally developed by Greene and Olson (2008), is a 41-item instrument developed as part of their Breastfeeding and Employment Study to assess

workplace lactation support. The EPBS-Q instrument consists of four dichotomous (yes/no) questions and 37 questions using 4-point Likert response options, ranging from strongly agree to strongly disagree. The EPBS-Q includes five subscales: organization support (11 items), manager support (12 items), coworker support (6 items), time (3 items), and physical environment (9 items). A literature review guided the development of four subscales including organization support; manager support; coworker support, and time. An expert panel of 11 members including licensed practitioners and researchers, suggested adding the physical environment subscale for a total of five subscales in the final EPBS-Q. Next, in-depth qualitative interviews were conducted with a subsample of 14 women who had previously breastfed during full-time employment (Greene & Olson, 2008). While the Socio-Ecological Model (Bronfenbrenner, 1979) guided the development of the EPBS-Q, the meaning of the overall score nor the score range were discussed in the original instrument development article (Greene & Olson, 2008).

To assess reliability and validity of the EPBS-Q, a pilot study with 104 employed pregnant women or women who recently gave birth in Michigan and who planned to return to work full-time within three months of delivery was conducted (Greene et al., 2008). Construct validity was confirmed using the Multiple Random Coefficients Multinomial Logit Model, which is a multidimensional extension of the Rasch measurement model (Greene et al., 2008). Dimensionality analysis was conducted comparing two-dimension and three-dimension models from the original instrument development study (Greene & Olson, 2008). The two-dimensional model included components of 1) workplace policies/organizational culture (i.e., organizational support

[11 items], time [3 items], and physical environment [9 items]) and 2) manager/coworker support (i.e., manager support [12 items] and coworker support [6 items]). The three-dimension model included components of 1) time (i.e., perceptions of availability of time and ability to use the time available for lactation); 2) manager/coworker support (i.e., perceptions of breastfeeding support available from company, manager, co-workers, and physical environment and accommodations in the workplace for lactation) and 3) acceptability (i.e., perceptions about expressing breast milk being socially acceptable in the workplace). The authors selected the two-dimensional model (two dimensions including workplace policies/organizational culture and manager/coworker support) for the EPBS-Q based on the results. The internal consistency reliability, using separation indices, was strong with 0.87 for dimension 1 (organizational policies/workplace culture) and 0.89 for dimension 2 (coworker/employer support) (Greene et.al, 2008). Predictive validity was not assessed.

In summary, two papers in this review used the EPBS-Q to assess workplace lactation support. An expert review panel and qualitative interviews with employed breastfeeding mothers informed the content validity of the instrument (Greene & Olson, 2008). The EPBS-Q has two subscales: workplace policies/organizational culture (23 items) and manager/coworker support (18 items) (Green et al., 2008). Internal consistency reliability was strong for each of the two subscales (0.87 and 0.89; respectively) (Greene et al., 2008).

2.3.3 Perceived Breastfeeding Support Assessment Tool (PBSAT)

The PBSAT is a 29-item instrument originally developed based on the Socio-Ecological model (Bronfenbrenner, 1979) to measure urban Pakistani employed mothers'

perceptions of lactation support (Hirani et al., 2013). Response options for the original 29 items were unavailable; however, the statistical analysis methods (Hirani et al., 2013) leads the author to believe the response options were ordinal, or interval level. Scoring for the full instrument or subscale scoring was not described in the original instrument development publication. Content validity to measure employed mothers' perception of various forms of lactation support including workplace, informational, social, and healthcare was assessed using a panel of seven experts including two physicians (one obstetrician/gynecologist and one public health), a lactation consultant, nutritionist, pediatric consultant, nurse, and psychologist.

The PBSAT was originally pilot tested with a subsample of 20 participants and then the instrument was tested with 200 employed breastfeeding mothers living in urban Pakistan (Hirani et al., 2013). Cronbach's alpha was 0.85, indicating strong internal consistency reliability. Construct validity was confirmed through factor analysis with a Kaiser-Meyer-Olkin test result of 0.762 (Hirani et al., 2013). Two subscales, workplace environmental support (12 items including workplace support and informational support) and social environmental support (17 items including social and healthcare support) were identified. Predictive validity indicated workplace environmental support was higher for mothers with a higher level of educational attainment, who worked more hours per week and who had taken maternity leave before returning to work. Mothers with higher levels of social support in addition to higher levels of workplace support were more likely to continue breastfeeding while employed.

The PBSAT was also used in a case-control study of 285 employed mothers in urban Bangkok, Thailand to investigate maternal, social and workplace factors and the

interaction of these factors on exclusive breastfeeding for six months postpartum (Tanguskan et al., 2020). The PBSAT was translated into Thai with permission of the instrument's authors' and then blind back translated into English for accuracy by a bilateral (English/Thai) expert. The content validity of the PBSAT was reviewed by a panel of three breastfeeding experts in Thailand. The content validity index, the degree to which an instrument has an appropriate sample of items for the construct being measured (Polit & Beck, 2006), was 0.91, indicating an adequate and acceptable measure of the content validity of the PBSAT instrument.

The original 29-item PBSAT instrument was altered slightly for the Tanguskan et al., 2020 study. In a subsample of 30 of the 285 study participants, the Cronbach's alpha was 0.87 (Tanguskan et al., 2020); however, the Cronbach's alpha for the full sample was only 0.62. While the article did not report on the method used to alter the instrument, items fell into three dimensions or subscales: health professional support, family support, and emotional support. The response options were changed as well. First, some items used a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Second, some items provided four categorical response options ('Yes, and I can use it'; 'Yes, but I cannot use it'; 'I do not know'; and 'No'). Third, some items provided three categorical response options ('Yes'; 'No'; and 'I do not know'). Total scores ranged from 20-80. Subscale scores ranged from 7-28 for health professional support; 8-32 for family support; and 5-20 for emotional support, with higher scores indicating a higher level of perceived support.

In summary, two articles in this review used the PBSAT to measure workplace lactation support. The PBSAT was reported to have content validity; however, kappa

values or other quantitative indicators of content validity were missing. Cronbach's alpha values ranged from 0.62-0.87 (Hirani et al., 2013; Tanguskan et al., 2020). Factor analysis, using principal components analysis, revealed two subscales: workplace environmental support and social environmental support (Hirani et al., 2013). However, in another study (Tanguskan et al., 2020), there were three reported subscales: health professional support, family support, and emotional support. Women with higher levels of social support in addition to higher levels of environmental support were among those most likely to continue breastfeeding, supporting the predictive validity of the PBSAT (Hirani et al., 2013).

2.3.4 Infant Feeding Practices Study (IFPS) II Breastfeeding and Employment Scale

The IFPS II, a longitudinal study conducted by the Food and Drug Administration (FDA) and CDC between 2005-2007, was focused on infant feeding practices (CDC, 2017). Between May and December 2005, 4,900 pregnant women from across the nation were recruited via mail to participate in the IFPS II and invited to complete a series of 12 surveys throughout the prenatal and postpartum period. Approximately 2,000 mother-infant dyads completed the final survey at 12-months postpartum. Nine survey items, included on the 3-, 6-, 9-, and 12-month IFPS II postpartum surveys, assessed maternal perception of workplace lactation support as well as maternal perception of coworker and employer workplace lactation support, discomfort with lactation in the workplace and ease in finding a pumping location in the workplace. The IFPS II *Breastfeeding and Employment Scale* asks employed breastfeeding mothers: Have you had any of the following experiences during the last four weeks? (yes/no). Two items assess perceived

social support (coworker and employer/supervisor); four items measure breastfeeding logistics (e.g., break time, space, and milk storage); and three items assess feelings (i.e., worry and embarrassment) encountered by employed breastfeeding mothers. Mothers are instructed to mark “No” if the item does not describe her circumstances and to answer considering the last time she was breastfeeding. Information is lacking on the scaling or scoring of the 9-item subscale.

One study examining workplace lactation support and job satisfaction used six of the nine items on the IFPS II *Breastfeeding and Employment Scale* (Whitley et al., 2019). The authors’ used retrospective data from the IPFS II survey including the *Breastfeeding and Employment Scale* conducted at 3- and 6-months postnatally with a subsample of mothers ($n=278$) who were both breastfeeding and currently employed. The authors excluded three of the nine survey items related to worry or embarrassment, since they believed these psychosocial distress items could lead to bias in predicting job satisfaction. The authors conducted test-retest reliability using the 6-item IFPS II subscale between the 3- and 6-month assessments using the simple agreement percentage and the κ coefficient. The simple agreement percentage ranged from 84.5% (item 3) to 96.8 % (item 1) and the κ coefficient ranged from 0.0 (item 2) to 0.63 (item 3), indicating adequate test-retest reliability among the 3- and 6-month assessments (Whitley et al., 2019). In summary, one article in this review evaluated six of the nine items of the IFPS II *Breastfeeding and Employment Scale*. Literature is lacking on the reliability or validity of the 9-item scale.

2.4 Discussion

The WBSS, EPBSQ and PBSAT instruments, three of the four measurement tools reviewed, are reliable and valid measures of employed mothers of childbearing age

perceptions of workplace lactation support. Little is known about the reliability and validity of the 9-item IFPS II scale on breastfeeding and employment. Each of the four instruments comprise a relatively low number of items measuring perception of workplace lactation support, ranging from a total of 9 (CDC, 2017) to 41 items (Hirani et al., 2013). Given the low number of items comprising each of the instruments, minimum participant burden and resources needed for survey administration are a strength of these four instruments. The Socio-Ecological Model guided the development of two of the instruments (EPBS-Q and PBSAT), revealing the importance of multilevel social support components in understanding workplace lactation support. Two of the four instruments, the WBSS and PBSAT, were tested in cross-cultural settings outside of the original study population, strengthening the validity of the instrument (Tuthill et al., 2014).

The use of expert panels as a method of content validity was noted with three of the four instruments (WBSS, EPBS-Q, and PBSAT); however, none of the studies used quantitative methods to assess content validity. Internal consistency reliability was strong for the WBSS and PBSAT instruments ranging from 0.77-0.89, respectively (Bai et al., 2008; Bai et al., 2013; Martin et al., 2015; Wambach & Britt, 2018; Hirani et al., 2013; Tanguskan et al., 2020), and reliability coefficients were strong (0.87-0.89) for the EPBS-Q (Greene & Olson, 2008).

Three of the four instruments contain several subscales based on construct validity testing. The WBSS and PBSAT measured construct validity using Meyer-Kaiser-Olkin test values of 0.71 and 0.79, respectively (Bai et al., 2008; Hirani et al., 2013). The 12-item WBSS is comprised of four subscales including break time, technical support, environmental support, and peer support (Bai & Wunderlich, 2013). The 29-item PBSAT

has two subscales (environmental support and social environmental support). Alternatively, construct validity of the EPBS-Q instrument was assessed using the Multidimensional Random coefficients Multinomial Logit Model, with two subscales (workplace policies/organizational culture and manager/coworker support) each providing unique information about breastfeeding mothers' perceptions of workplace lactation support. To date, the 9-item IFPS II *Breastfeeding and Employment Scale* lacks construct validity testing. The PBSAT was the only instrument to report predictive validity, revealing that higher levels of social support and environmental support were associated with continued breastfeeding while employed (Hirani et al., 2013).

Each of the four instruments reviewed here have strengths and limitations. Strengths of the WBSS include few items, strong reliability and validity documented in five papers, and adaptation of the instrument with different populations. Additionally, the WBSS is the only instrument that assesses workplace policy as a separate construct compared to the other three tools. Lack of a theoretical framework to guide instrument development and lack of predictive validity testing are limitations of the WBSS.

Strengths of the EPBS-Q are use of the Socio-Ecological Model to guide item development and use of content validity to guide instrument development. The EPBS-Q is a comprehensive measure of multi-level factors that influence employed mothers' perceptions of workplace lactation support. For example, the EPBS-Q items measure interpersonal factors (coworker and employer support), organizational factors (frequency and length of breaks for breastfeeding and designated space for breastfeeding/pumping milk) and policy factors (presence of written policy for breastfeeding employees).

Limitations for the EPBS-Q include lack of overall scaling and scoring and lack of predictive validity testing.

Similar to the EPBS-Q, the PBSAT is based on the Socio-Ecological Model and two of its subscales reflect multilevel aspects of workplace lactation support. For example, items related to interpersonal factors (employer, coworker and significant other support); and organizational factors (availability of location for breastfeeding/pumping milk) are measured. Further, the PBSAT is the only instrument that measures employed mothers' perceptions of other types of lactation support beyond workplace support (i.e., informational, social and healthcare support). The PBSAT has several limitations. First, the range and meaning of the overall score as well as subscale scores are not well described (Hirani et al., 2013). Similarly, the response options for the items are not clearly defined. In contrast to the EPBS-Q, the PBSAT lacks items related to workplace policy, limiting the comprehensiveness of the instrument. Further, the instrument has not been tested in the United States.

The strength of the 9-item IFPS II *Breastfeeding and Employment Scale* is the few number of items, reducing participant burden. However, there are multiple limitations of the 9-item IFPS II scale. First, a theoretical framework was not described as guidance of item development. Second, the response options are dichotomous and the score range and meaning of the scores is not described. Third, there is lack of information on the reliability of the instrument. Fourth, construct validity testing is lacking, and the existence of subscales is unknown. Lastly, the IFPS II *Breastfeeding and Employment Scale* has not been tested outside the United States.

Based on this systematic review and comparing the strengths and limitations of each of four measurement tools, the modified 18-item WBSS is recommended as the instrument of choice for measuring workplace lactation support (Bai & Wunderlich, 2013). First, the modified WBSS has been applied in a cross-cultural setting with a subset of nursing mothers in a country outside of the United States (Spain; Leon & Larios et al., 2019). Second, the modified WBSS has been tested in multiple studies between 2013-2019 revealing adequate reliability. Third, the brevity of the 18-item survey reduces participant burden. Lastly, the overall meaning and interpretation of the scores is easy to analyze, interpret, and disseminate findings. While the original and modified WBSS have shown strong internal consistency reliability, further psychometric testing including construct and predictive validity is needed. Although the modified WBSS instrument is the recommended instrument of choice at the present time for measuring perceived workplace lactation support, further research is warranted. Application of the modified 18-item WBSS in a wider variety of populations in the US and abroad would be helpful for strengthening the cross-cultural adaptability of the instrument. Given that low rates of breastfeeding exist globally as well in the US, it is important that the “gold standard” for measuring workplace lactation support be validated in populations throughout the world.

Multiple gaps in the research literature exist for the WBSS, EPBS-Q, PBSAT and IFPS II *Breastfeeding and Employment Scale*. First, the content validity for these four tools lacks kappa values, simple agreement percentages or the use of a content validity index to quantify whether the items measure what is intended. Next, only one of the instruments (i.e., PBSAT) measures other forms of support outside of the workplace environment. Finally, the articles included in this review were published between 2003-

2020 and all four instruments were developed prior to the U.S. Patient Protection and Affordable Care Act of 2010 and the Break Time for Nursing Mothers Act (U.S. Department of Labor, 2010). The Patient Protection and Affordable Care Act of 2010 amended the Fair Labor Standards Act or federal wage and hour law, and the Break Time for Nursing Mothers Act requires employers to provide reasonable break time and a private, non-bathroom place for nursing mothers to express breast milk during the workday for one year after the child's birth (Abdulloeva & Eycler, 2013). While these national breastfeeding policies are a great step in the right direction for promoting mothers' breastfeeding rights upon returning to work, issues with compliance and enforcement may exist under the jurisdiction of local and state agencies. Additionally, stipulations under the FLSA restrict applicability to all US workers. For example, workplaces with less than 50 employees may not be subject to the FLSA if the employer can demonstrate that compliance with the provision would impose an undue hardship (U.S. Department of Labor, n.d).

2.5 Conclusions

The modified 18-item WBSS is recommended as the instrument of choice for measuring workplace lactation support (Bai & Wunderlich, 2013). However, further psychometric testing on all four instruments reviewed here is needed to strengthen the adaptation and applicability of the measures in cross-cultural settings. Adaptability, number of items (to minimize participant burden), and interpretation of total and subscale scores are all important aspects to consider when selecting a measure to assess breastfeeding mothers' perceptions of workplace lactation support. Given the time frame between the development of the instruments included in this review and the current state

of workplace lactation support policy, a new or revised workplace lactation support instrument may be needed to more accurately measure the phenomenon based on recent policy changes that impact employed breastfeeding mothers in the United States.

Breastfeeding through 12 months of age to provide optimal nutrition for infants as well as improved health outcomes for infants and mothers is a national and global public health promotion priority (Brown, 2017). Despite recommendations for continued breastfeeding, there is an ongoing trend for breastfeeding to be discontinued at an early age (Spitzmueller et al., 2016). Return to work following the birth of a child is one of the leading causes of stopping breastfeeding (Guendelman et al., 2009). Assessment of employed mothers' perceptions of workplace lactation support is instrumental in better understanding and promoting breastfeeding duration congruent with United States and global health expert recommendations (Steurer, 2017). Therefore, it is important to understand the relationship between occupational status, perception of overall workplace lactation support and breastfeeding practices in employed mothers.

Table 2.1 Summary of Psychometric Properties of Workplace Lactation Support Instruments Described in 10 Articles

Author (year)	Instrument	Study sample	Reliability	Content validity	Construct validity
Bai et al. (2008)	<i>Workplace Breastfeeding Support Scale (WBSS)</i>	66 mothers in Indiana, United States	Cronbach's alpha-0.77	Expert review panel	Factor analysis (Kaiser-Meyer-Olkin test-0.71)
Bai & Wunderlich (2013)	<i>Workplace Breastfeeding Support Scale (WBSS)</i>	113 mothers employed in a higher-education institution who were clients of an obstetric hospital in New Jersey, United States	Cronbach's alpha-0.84	Not discussed	Factor analysis (Kaiser-Meyer-Olkin test- not reported)
Martin et al. (2015)	<i>Modified Workplace Breastfeeding Support Scale (WBSS)</i>	318 active duty mothers, United States	Cronbach's alpha-0.85	Not discussed	Not discussed
Wambach & Britt (2018)	<i>Modified Workplace Breastfeeding Support Scale (WBSS)</i>	78 Registered Nurses employed in large children's hospital in the Midwest, United States	Cronbach's alpha-0.87	Not discussed	Not discussed
Leon-Larios et al. (2019)	<i>Modified Workplace Breastfeeding Support Scale (WBSS)</i>	101 employees at a major university, Spain	Cronbach's alpha-0.77	Expert review panel	Factor analysis (Kaiser-Meyer-Olkin test -0.76)

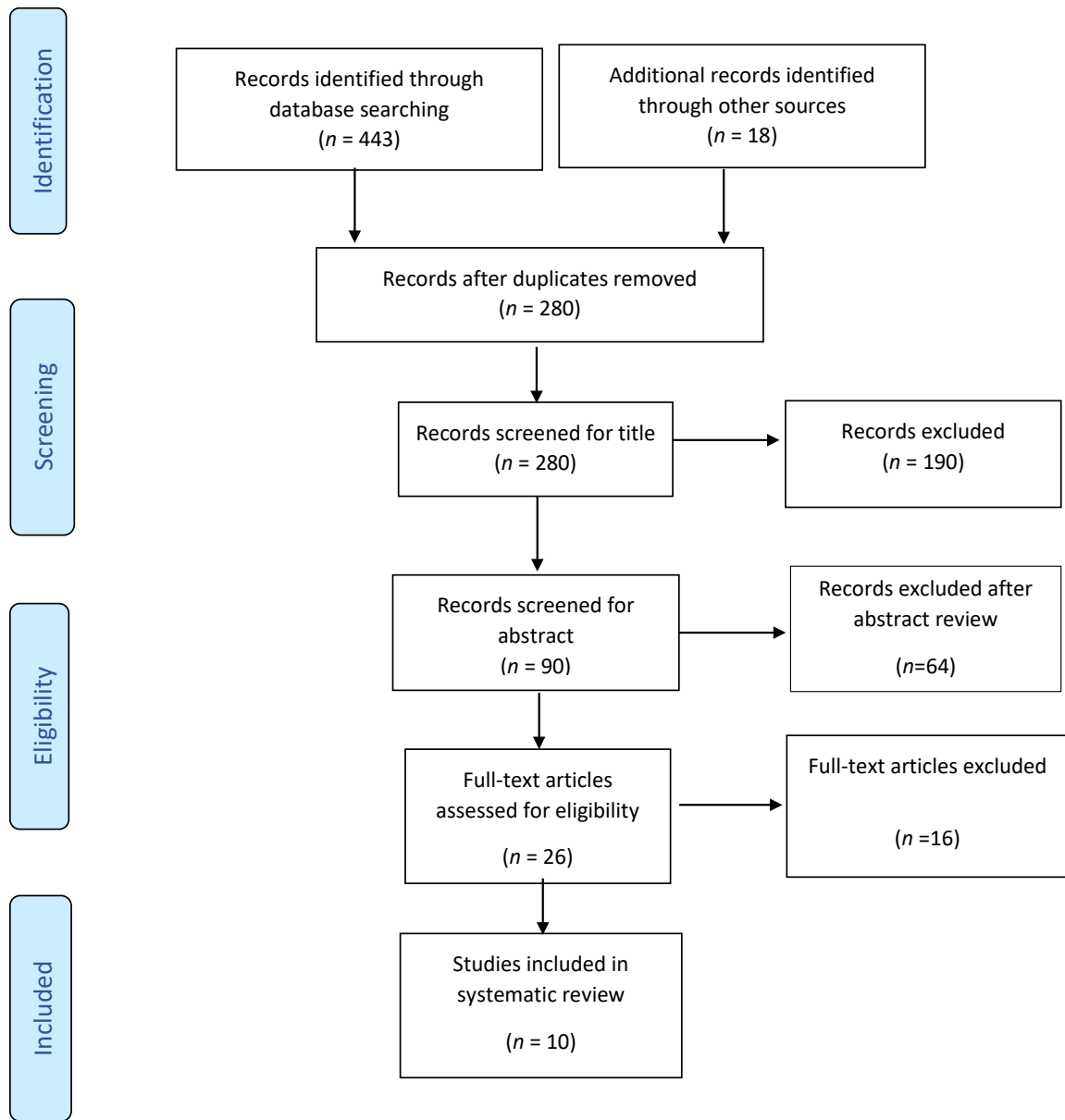
Table 2.1 Continued

Author (year)	Instrument	Study sample	Reliability	Content validity	Construct validity
Greene & Olson (2008)	<i>Employee Perceptions of Breastfeeding Support Questionnaire (EPBS-Q)</i>	Not discussed	Not discussed	Literature review, expert review panel and qualitative interviews with 14 mothers	Multidimensional Random Coefficients Multinomial Logit Model
Greene et al. (2008)	<i>Employee Perceptions of Breastfeeding Support Questionnaire (EPBS-Q)</i>	104 mothers in Michigan, United States	Internal consistency reliability coefficients- 0.87 (dimension 1) and 0.89 (dimension 2)	Not discussed	Multidimensional Random Coefficients Multinomial Logit Model
Hirani et al. (2013)	<i>Perceived Breastfeeding Support Assessment Tool (PBSAT)</i>	200 mothers in Pakistan	Cronbach's alpha-0.85	Expert review panel	Factor analysis (Kaiser-Meyer-Olkin test -0.76)

Table 2.1 Continued

Author (year)	Instrument	Study sample	Reliability	Content validity	Construct validity
Tanguskan et al. (2020)	<i>Perceived Breastfeeding Support Assessment Tool (PBSAT)</i>	285 employed urban mothers, Bangkok, Thailand Pilot study ($n=30$) Full sample ($n=285$)	Cronbach's alpha: Pilot study ($n=30$) 0.87 Entire sample ($n=285$) 0.62	Expert review panel	Not discussed
Whitley et al. (2019)	Infant Feeding Practices Study (IFPS) II <i>Breastfeeding and Employment Scale</i>	Subsample of mothers from IFPS II study that completed the 3-month and 6-month 9-item subscale, United States ($n=278$)	Not discussed	Not discussed	Not discussed

Figure 2.1 PRISMA Flow Diagram



CHAPTER THREE:

Psychometric Properties of the Infant Feeding Practices Study II

Breastfeeding and Employment Scale

Abstract

Employment is a major barrier to continuation of breastfeeding among employed mothers. Lack of workplace lactation support is one potential contributing factor to low rates of breastfeeding among employed mothers in the United States. The most frequently cited reasons employed mothers discontinue breastfeeding before six months postpartum include lack of managerial lactation support, an unsupportive work environment, and difficulties locating suitable milk pumping and storage locations. Reliable and valid measures of maternal perception of workplace lactation support are needed to inform researchers, clinicians, and policymakers to improve breastfeeding rates and maternal/child health outcomes among employed mothers. The Infant Feeding Practices Study II (IFPS II), a landmark study on infant feeding practices and maternal and infant health outcomes in the United States, included a 9-item *Breastfeeding and Employment Scale* that has not undergone psychometric evaluation.

The aims of this study were to test the (1) internal consistency reliability of the 9-item scale at the 3-month IFPS II assessment; (2) test-retest reliability of the 9-item scale using the 3 and 6-month assessments; (3) construct validity of the 9-item scale using factor analysis; and (4) convergent validity of the 9-item scale and an IFPS II item measuring perceived level of breastfeeding support in the workplace at the 3-month assessment. This is a secondary analysis of the IFPS II conducted by the CDC and FDA between 2005-2007 ($N=4,902$). The sample was comprised of employed breastfeeding mothers in the United States who completed the 9-item scale on breastfeeding and employment and an IFPS II survey item measuring perceived level of breastfeeding support in the workplace at two time intervals (3-month [$n=498$] and 6-month [$n=413$] assessment). Kuder-Richardson 20 was used as the measure of internal consistency due to

the dichotomous nature of the responses. Test-retest reliability (3- and 6-month assessments) was conducted using chi-square and Spearman's rank correlation coefficient. Construct validity was conducted using a tetrachoric correlational matrix. Spearman's Rho correlation coefficient was used to evaluate convergent validity to associate the 9-item *Breastfeeding and Employment Scale* with a survey item measuring perceived level of breastfeeding support in the workplace at the 3-month assessment ($n=266$).

Kuder-Richardson 20 was 0.72, supporting the internal consistency reliability of the 9-item scale in employed breastfeeding mothers. Inter-item correlations (range = 0.03 to 0.50) indicated questionable homogeneity of the scale. Spearman's Rho correlation coefficient for the 9-item scale was 0.66, indicating adequate test-retest reliability at the 3-and 6-month assessments ($p < 0.001$). Factor analysis yielded one construct (barriers to breastfeeding in the workplace). Convergent validity conducted at the 3-month assessment; indicated a moderate correlation between the 9-item scale scores and breastfeeding support in the place of employment for breastfeeding mothers; mothers reporting more barriers to breastfeeding in the workplace also reported a less supportive workplace environment (Rho = -0.50, $p < 0.001$).

The 9-item *Breastfeeding and Employment Scale* was reliable and valid in a sample of employed breastfeeding mothers in the United States who participated in the IFPS II. The low respondent burden of the 9-item *Breastfeeding and Employment Scale* was the main strength of this short scale in measuring employed mothers' perceptions of workplace lactation support. Additional testing is warranted to further evaluate the reliability and validity of the instrument.

Keywords: Workplace, mothers, employment, breastfeeding, validity, reliability,
psychometric

3.1 Background

Low rates of breastfeeding, especially in the United States, are a global public health issue (Slusser, 2007; Victora et al., 2016). There are multiple widely recognized health benefits of breastfeeding for the mother including reduced risk of breast and ovarian cancer, type II diabetes, myocardial infarction, and postpartum depression (Stuebe, 2009). Children who are breastfed also receive health benefits including lower incidence of otitis media, gastroenteritis, asthma, pneumonia, leukemia, sudden infant death syndrome, and type 1 and 2 diabetes (Slusser, 2007). Most national and international health agencies including the American Academy of Pediatrics, United States Breastfeeding Committee, and World Health Organization, recommend exclusive breastfeeding, defined as infant feeding with breast milk only, without any additional food or drink until six months of age along with the introduction of solid foods, and until 12 months of age (Breastfeeding, 2012; United States Breastfeeding Committee, n.d. & World Health Organization, n.d.). The Breastfeeding Report Card indicated that in 2017, 58.3% of mothers in the U.S. reported breastfeeding at six months of the infant's age and only 35.3% of mothers by 12 months of age (Centers for Disease Control and Prevention [CDC], 2020). According to the UNICEF and WHO Global Breastfeeding Scorecard (2017), global breastfeeding rates were more than double the U.S. average (74% of infants breastfed at 12 months of age).

One contributing factor of low breastfeeding rates in the United States is lack of workplace lactation support (Murtagh & Molton, 2011). The most frequent reasons cited by employed mothers for discontinued breastfeeding before six months of infant age include lack of managerial lactation support, an unsupportive work environment and difficulties locating suitable milk pumping and storage locations (Murtagh & Molton,

2011). The prevalence of onsite lactation rooms, separate rooms that go above and beyond Affordable Care Act requirements, increased from 35% to 51% between 2015-2019 among U.S. worksites that offer workplace lactation support programs (Society for Human Resource Management, 2019). Female workers who participate in workplace lactation programs typically incur lower insurance costs, decreased number of sick days, increased job satisfaction and increased job retention, which provides benefits to employers (Ortiz et al., 2004; U.S. Department of Health and Human Services, 2008).

Since 2010, employed breastfeeding mothers have received some support and protection at the federal level under the Affordable Care Act. The Fair Labor Standards Act and the Break Time for Nursing Mothers Act require employers to provide reasonable break time and a private, non-bathroom place for nursing mothers to express breast milk during the workday for one year after the child's birth (Abdulloeva & Eyer, 2013). However, issues with implementation, compliance, and enforcement may exist under the jurisdiction of local and state agencies. Additionally, stipulations under the Fair Labor Standards Act restrict applicability to all U.S. workers. For example, workplaces with fewer than 50 employees may not be subject to the policy if the employer can demonstrate that compliance with the provision would impose an undue hardship (U.S. Department of Labor, 2010).

The purpose of this study was to evaluate the psychometric properties of a 9-item scale used to assess breastfeeding and employment among employed mothers in the 3-month and 6-month postpartum assessments of the Infant Feeding Practices Survey (IFPS) II survey. The IFPS II, a longitudinal study on infant feeding practices and maternal health outcomes, was conducted by the Food and Drug Administration [FDA]

and CDC between 2005 and 2007 (CDC, 2017). Since existing literature is lacking on the scaling and scoring of the IFPS II *Breastfeeding and Employment Scale*, a total score (ranging from 0-9 points) was calculated for the 3-month and 6-month assessments. The higher the total score, the more perceived barriers related to breastfeeding in the workplace. Other reliable and valid measures of maternal perceptions of workplace lactation support include the 12-item *Workplace Breastfeeding Support Scale* (Bai et al., 2008); 41-item *Employee Perceptions of Breastfeeding Support Questionnaire* (Greene & Olson, 2008) and the 29-item *Perceived Breastfeeding Support Assessment Tool* (Hirani et al., 2013). The IFPS II 9-item *Breastfeeding and Employment Scale* was selected as the instrument of choice for this psychometric analysis as it is a brief scale with low respondent burden and literature is lacking on the scaling, scoring, and meaning of the 9-item scale. Additionally, there are no known studies describing the reliability and validity of the 9-item *Breastfeeding and Employment Scale*.

3.2 Specific Aims

The Specific Aims of this paper are to: (1) test the internal consistency reliability of the 9-item scale at the 3-month assessment; (2) describe test-retest reliability of the scale using the 3-month and 6-month assessments; (3) evaluate the construct validity of the 9-item scale using factor analysis at the 3-month assessment; and (4) examine the convergent validity of the scale compared to a survey item measuring perceived level of breastfeeding support in the workplace at the 3-month assessment.

3.3 Methodology

3.3.1 Design, Sample, and Procedures

The accessible population for participation in the IFPS II study was drawn from Synovate, a consumer opinion panel consisting of 500,000 households throughout the U.S. Women had to be at least 18 years old and able to speak English to be eligible to participate in the IFPS II. The IFPS II over-sampled low educated, African-American and Hispanic women to increase the total number of women represented from these groups (CDC, 2017). Between May and December 2005, 4,900 pregnant women from across the nation were recruited via mail to participate in the IFPS II and invited to complete a series of 12 surveys including a demographic survey at baseline, a prenatal survey during the third trimester, a birth screener interview at the time of expected delivery, and postpartum surveys monthly from 2 to 7 months of age and then every seven weeks until the infant was 12 months old.

Participants were invited to complete a 22-item demographic survey including age and sex of all household members, household size, race and ethnicity, marital status, education, employment status, occupation, household income, and home ownership at baseline. During the third trimester of pregnancy, each woman received a mailed self-report questionnaire to assess factors associated with infant feeding choices, the baby's family medical history, and the mother's employment and social support system. All interviews were conducted via mail except for the birth screener interview, which was conducted by telephone or mail. Each participant received a mailed neonatal questionnaire within 2-4 weeks after delivery, to assess factors that affect infant feeding choices such as early feeding practices, sources of information, sources of support, and any feeding-related treatment for jaundice. To participate in the postpartum

questionnaires, the infant had to be a singleton born at ≥ 35 weeks gestation, weigh at least 5 lbs., and without medical conditions that would affect infant feeding. Postpartum questionnaires were mailed to the mother monthly from the time her infant was 2 months through 7 months of age, then 3 times (about every 7 weeks) until 12 months of age, for a total of nine postpartum surveys. These questionnaires consisted of nine modules containing content related to infant feeding and health; breastfeeding cessation; food allergy; breastfeeding, pumping and expressing milk; infant formula; information sources; breastfeeding awareness campaign evaluation; sleeping arrangements, childcare, and employment. Response rates for the full IFPS II sample ranged from 63% to 87% for the different questionnaires (i.e., prenatal, neonatal and postpartum) and approximately 2,000 mother-infant dyads completed the final 12-month postpartum assessment (CDC, 2017).

To qualify for participation in this secondary psychometric analysis, employed breastfeeding mothers had to answer the IFPS II 9-item *Breastfeeding and Employment Scale* and survey item measuring perceived level of breastfeeding support in the workplace at the 3-month assessment ($n=498$). De-identified data are publicly available through the CDC. Institutional Review Board approval through the Office of Research Integrity at the University of Kentucky was not required as the data were publicly available and deidentified.

3.3.2 Measures

The IFPS II survey items provided detailed information about foods fed to infants including breast milk, infant formula, and solid foods; contributing factors to infant feeding practices and breastfeeding success; and mothers employment status.

Demographic variables on the prenatal survey included age, race, marital status, and household income, employment status, and occupation. Additional items used from the prenatal survey included infant feeding plans for the first few weeks after delivery, cigarettes smoked during pregnancy, employment status and occupation type.

3.3.3 IFPS II 9-item Breastfeeding and Employment Scale

The 9-item scale asked mothers who reported breastfeeding in the past four weeks as well as those who reported working for pay in the past four weeks the following questions at 3-, 6-, 9-, and 12 months postpartum: Have you had any of the following experiences during the last four weeks? Response options were dichotomous (yes/no) for each of the nine items in the scale. Two questions pertained to **perceived social support** (coworker and employer/supervisor); four questions pertained to **structural issues** related to breastfeeding (e.g., break time, space, and milk storage); and the final three questions pertained to feelings encountered by employed breastfeeding mothers including **worry and embarrassment**. Literature is lacking on the scaling, scoring, and meaning of the IFPS II *Breastfeeding and Employment Scale*. For this secondary analysis, a total score (ranging from 0-9 points) was calculated for the 3- and 6-month assessments. The higher the score on the *Breastfeeding and Employment Scale*, the more barriers to workplace lactation. A total of 508 employed mothers completed the 9-item scale at the 3-month assessment (90% participation rate for total number of women who reported breastfeeding and working for pay in the past four weeks); 422 employed mothers completed the 6-month assessment (83% retention at 6-months); 337 completed the 9-month assessment; and 229 completed the 12-month assessment (45% retention rate at 12 months).

3.3.4 IFPS II item on breastfeeding supportive workplace environment

The IFPS II item on supportive workplace environment asked mothers who reported working for pay during the past four weeks the following question on the prenatal, 3-, 6-, 9-, and 12 months postpartum surveys: In your opinion, how supportive of breastfeeding is your place of employment? Response options were not at all supportive (1), not too supportive (2), somewhat supportive (3), or very supportive (4) with higher scores on this item indicating a more supportive workplace environment. A total of 902 employed mothers completed this item at the 3-month assessment; 927 employed mothers completed the 6-month assessment; 913 completed the 9-month assessment; and 865 completed the 12-month assessment. A total of 498 employed mothers completed both the 9-item *Breastfeeding and Employment Scale* and the IFPS II item on supportive workplace environment at the 3-month assessment.

3.4 Data Analysis

Data were analyzed using SPSS for Windows, Version 27 (IBM SPSS, New York, United States) and SAS (version 9.4, SAS, Inc.). Descriptive statistics including means, standard deviations, and percentages were used to summarize sample characteristics. Kuder-Richardson 20 was used as the measure of internal consistency at the 3-month time point ($N= 498$) due to the dichotomous nature of the responses in the 9-item *Breastfeeding and Employment Scale* (categorized as yes/no). Homogeneity of the scale was assessed using inter-item correlations. Test-retest reliability (3 and 6-month assessments) was conducted using the 6-month sample ($n=422$). To evaluate test-retest in the 9-item scale, chi-squared tests of independence were used for individual items and Spearman's rank correlation coefficient evaluated the association of the total scores at

each timepoint. For construct validity, factor analysis was based on the tetrachoric correlation matrix of the items; this method was used since the 9 items in the *Breastfeeding and Employment Scale* are binary. Convergent validity, using Mann-Whitney U for individual items and Spearman's Rho for the entire 9-item scale, was conducted on the 9-item *Breastfeeding and Employment Scale* and the IFPS II item on supportive workplace environment at the 3-month assessment. An a priori α level of .05 was used as the level of significance.

3.5 Results

Table 3.1 describes study sample characteristics at the prenatal assessment for those who completed the measures at 3 months postpartum. Mothers ranged in age from 18-45 and the mean age of the participants ($N=498$) was 30.4 years ($SD\pm 5.3$). They were primarily white (88%) and married (85%). Most mothers (81%) expressed feeding intentions to breastfeed only. Nearly all the participants (96%) did not smoke cigarettes during the prenatal period. Most participants reported an annual household income of \$30,000 or greater (82%). Of the 498 participants, 59% worked full-time (defined as 35 or more hours per week) and 68% of participants held professional jobs. Most of the participants (85%) reported their workplace as somewhat supportive (39%) or very supportive (46%) of breastfeeding.

3.5.1 Internal Consistency Reliability

The Kuder Richardson 20 (KR20) was 0.72 for the entire 9-item *Breastfeeding and Employment Scale*, indicating acceptable internal consistency. Inter-item correlations ranged from -0.03 (items 2 and 5) to 0.50 (items 4 and 5) and the mean was 0.20 (Table

3.2). Multiple correlation coefficients were less than 0.20, demonstrating potential homogeneity issues with the 9-item scale as a single construct.

3.5.2 Test-Retest Reliability

Test-retest reliability was conducted with the 3 and 6-month assessments. A total of 277 participants completed both the 3 and 6-month 9-item *Breastfeeding and Employment Scale*. A chi-squared test of independence was performed to compare responses to individual items (1-9) at 3 and 6-months and Spearman's rank correlation coefficient to test the association between scale scores over time (Table 3.2). A chi-square test of independence showed there was a significant association between items 3, 4, 6, 7, 8, and 9 at the 3-month and 6-month assessments ($p < .001$). A chi-square value was not reported for item 2 since this item was constant between the 3 and 6-month assessments. Fisher's exact test was significant for items 1 and item 5 since expected cell counts were less than 5 for these items ($p < 0.001$).

To calculate test-retest reliability on the 9-item scale, a total score for the *Breastfeeding and Employment Scale* (ranging from 0-9 points) was calculated for each period at the 3 and 6-month assessments. The higher the total score, the more perceived barriers related to breastfeeding in the workplace. The mean for the 3-month assessment was 1.01 and the mean for the 6-month assessment was 0.79, indicating a low level of perceived barriers to breastfeeding in the workplace in this sample. Spearman's rank correlation coefficient between the total scores at 3 and 6 months was significant ($p = 0.66, p < 0.001$). This indicated adequate test-retest reliability for the 9-item *Breastfeeding and Employment Scale* for the 3- and 6-month assessments.

3.5.3 Construct Validity

In the initial factor extraction, one factor was retained with the scree plot exhibiting a notable drop off after component one. Eigenvalues were 4.7 for component one, 2.2 for component two and 0.89 for component three. Using the promax oblique rotation factor method, factor loadings were 0.40 or greater, indicating all nine items in *the Breastfeeding and Employment Scale* fit under a one-factor solution. Loadings for the one-factor solution ranged from 0.41 (item 5) to 0.84 (item 1). Inter-item correlations (ranging from 0.03-0.50) indicated questionable homogeneity of the scale.

To further evaluate the dimensionality of the 9-item *Breastfeeding and Employment Scale*, a 2-factor solution was conducted using the varimax orthogonal rotation matrix. The two-factor solution consisted of factor 1 (items 1, 2, 7, 8 and 9) and factor 2 (items 3, 4, 5 and 6). Three items (4, 8 and 9) were double loaded at 0.40 or greater for each of the two factors. Under the 2-factor model, inter-item correlations for Factor 1 (items 1,2,7,8 and 9) ranged from 0.11 (items 1 and 9) to 0.44 (items 1 and 2) and the mean was 0.25 (Table 3.4). Inter-item correlations for Factor 2 (items 3,4,5 and 6) ranged from 0.21 (items 3 and 5) to 0.50 (items 3 and 4) and the mean was 0.32 (Table 3.5). Under the 2-factor model, multiple correlation coefficients were less than 0.20 for Factor 1, however, the correlation coefficients for Factor 2 were all greater than 0.20. Under the 2-factor model, the Kuder-Richardson 20 for Factor 1 (items 1,2,7,8 and 9) was 0.58 and Factor 2 (items 3,4,5 and 6) was 0.64. Spearman's rank correlation coefficient was conducted separately for factor 1 and factor 2 and the results were also significant ($\rho=0.63, p < 0.001$ for factor 1 and $\rho=0.58, p < 0.001$ for factor 2). Given the low number of items in the scale, results for the one-factor and two-factor models

indicate adequate measurements of internal consistency. Based on post hoc reliability analysis and factor analysis results including low and double loadings for the two-factor solution, a one-factor solution was selected as the best fit for a single construct (psychosocial and structural barriers to breastfeeding in the workplace) for the 9-item *Breastfeeding and Employment Scale*.

3.5.4 Convergent Validity

Employed breastfeeding mothers ($n=498$) who scored higher on the 9-item *Breastfeeding and Employment Scale* (indicating more barriers to breastfeeding in their workplace) at the 3-month postpartum assessment were more likely to indicate a less supportive workplace environment ($Rho = -0.50, p < 0.001$), indicating a moderate negative correlation between the two measures of workplace lactation support. When the individual nine items comprising the *Breastfeeding and Employment Scale* were analyzed separately, items 1, 3-6, 8, and 9 exhibited a significant association with the workplace environment item ($p < 0.05$). Statistical analysis was indeterminate for item 2 (coworker negative comments) since all participants answered no to this survey item. Item 7 (worry about keeping job because of breastfeeding) was not associated with the workplace environment item (Table 3.6).

3.6 Discussion

The 9-item *Breastfeeding and Employment Scale* demonstrated adequate internal consistency reliability in a sample of employed breastfeeding mothers in the U.S. Test-retest reliability was also adequate for the 3- and 6-month assessments. The factor analysis revealed that the unidimensional 9-item instrument accurately measures the structural and psychosocial barriers to breastfeeding in the workplace, revealing construct

validity. The instrument also demonstrated convergent validity; employed mothers who reported a less supportive workplace environment were more likely to encounter barriers to breastfeeding on the job.

The sample of breastfeeding mothers who completed the 9-item *Breastfeeding and Employment Scale* at the 3-month assessment consisted of primarily white, married, and highly educated participants with a strong intent to breastfeed after delivery. Employed breastfeeding mothers with these characteristics may have different breastfeeding perceptions and practices compared to those who are racially and ethnically diverse, unmarried, and with low education levels. Pitonyak et al. (2015) conducted a longitudinal study with 1,226 mothers using IFPS II data to determine predictors of exclusive breastfeeding. College educated, and married women were associated with greater odds of exclusive breastfeeding lasting greater than four months. Conversely, a plan to return to work after birth, living in the Southern region of the United States, and postpartum depression were associated with lower odds of exclusive breastfeeding lasting greater than four months (Pitonyak et al., 2015). Similar results were found in a prospective cohort study by Dagher et al. (2016) with 816 Minnesota women who were hospitalized for childbirth. They measured breastfeeding initiation during hospital enrollment and breastfeeding cessation rates at six months postpartum. Odds of breastfeeding initiation were higher for women who held professional jobs, had a graduate degree, did not smoke prenatally, did not have breastfeeding problems, and had family or friends who breastfeed. Cessation of breastfeeding by six months was lower for professional workers and higher for women who returned to work at any time during the 6 months postpartum versus those who did not return; higher among single than married

women; higher for every educational category compared to graduate school; and higher for those with no family or friends who breastfed (Dagher et al., 2016).

Compared to the 9-item *Breastfeeding and Employment Scale*, internal consistency reliability for the 12-item and modified 18-item *Workplace Breastfeeding Support Scale* and 29-item *Perceived Breastfeeding Support Assessment Tool* are strong ranging from 0.77-0.89, respectively (Bai et al., 2008; Bai et al., 2013; Martin et al., 2015; Wambach & Britt, 2018; Leon-Larios et al., 2019; Hirani et al., 2013; Tanguskan et al., 2020). Similarly, reliability coefficients were strong (0.87-0.89) for the 41-item *Employee Perception of Breastfeeding Support Questionnaire* (Greene & Olson, 2008) compared to the adequate internal consistency reliability for the 9-item IFPS II *Breastfeeding and Employment Scale* in this analysis (0.71).

In contrast to the single factor solution for the 9-item *Breastfeeding and Employment Scale* identified in this analysis, the 12-item *Workplace Breastfeeding Support Scale* consists of four factors including break time, technical support, workplace environment, and workplace policy (Bai et al., 2008). Two additional reliable and valid measures of workplace lactation support each contain two factors including the 29-item *Perceived Breastfeeding Support Assessment Tool* (workplace environmental support and social environmental support) and the 41-item *Employee Perceptions of Breastfeeding Support Questionnaire* (workplace policies/organizational culture and manager/coworker support) (Greene & Olson, 2008; Hirani et al., 2013).

Prior to this paper, literature was lacking on the reliability and validity of the 9-item IFPS II *Breastfeeding and Employment Scale*. The only known publication using the 9-item scale focused on workplace lactation support and job satisfaction. Authors

excluded three of the items in the *Breastfeeding and Employment Scale* (items 7, 8 and 9) since they were viewed as a separate construct (feelings of worry and embarrassment), which may have led to bias in their model for predicting job satisfaction (Whitley et al., 2019). Indeed, the results of the psychometric evaluation reported here shows that deleting these three items reduces the internal consistency reliability of the *Breastfeeding and Employment Scale* (KR 20 of 0.72 with full 9-item scale and KR 20 of 0.61 retaining only items 1-6) and the three items do not load on a separate construct. Further, the analysis reported here considered data from the 3-month and 6-month assessments with mothers who were both breastfeeding and currently employed ($n=277$). Regarding test-retest reliability, the Whitley (2019) study used the simple agreement percentage (percentage of each item responses that were the same at both time points) between the 3 and 6 month assessments and the κ coefficient. Results for the simple agreement percentage ranged from 84.5% (item 3) to 96.8 % (item 1) and the κ coefficient ranged from 0.0 (item 2) to 0.63 (item 3) (Whitley et al., 2019). The test-retest reliability results in the analysis reported here were congruent with the findings by Whitley and colleagues (2019).

One limitation of the existing IFPS II data set used to conduct the psychometric evaluation of the 9-item *Breastfeeding and Employment Scale* was the use of a non-probability sampling method. Selection bias may be a threat to external validity of this psychometric evaluation, limiting generalizability of the findings to the entire population of employed mothers in the U.S. Maternal recall bias and social desirability bias are additional limitations given responses were self-reported for all questionnaires. Additionally, data were collected between 2005-2007, prior to implementation of the

Break Time for Nursing Mothers' Law under the Affordable Care Act in 2010 (Abdulloeva & Eyler, 2013). Therefore, findings may not be representative of the views of current employed breastfeeding mothers and the psychometric analysis may not reflect the impact of current federal breastfeeding legislation. Passage of additional proposed breastfeeding accommodation legislation such as the proposed Providing Urgent Maternal Protections (PUMP) for Nursing Mothers Act would strengthen the Break Time law by providing additional coverage for salaried workers as well as other employees currently excluded from protections; clarification on break time pay if pumping occurs during working hours; and remedies for nursing mothers similar to those available for other violations of the Fair Labor Standards Act (Maloney, 2021). Finally, the IPFS II was only available in English, which limits the cross-cultural application of the findings.

3.7 Conclusions

The 9-item *Breastfeeding and Employment Scale* is a potentially useful instrument for occupational health practitioners and researchers to measure maternal perception of workplace lactation support. Further research and application of the instrument in the United States as well as abroad is needed to document the reliability and validity of the instrument in more diverse populations of employed mothers since the Break Time for Nursing Mothers' Law was enacted in 2010. While post hoc reliability analysis and factor analysis results indicated a one-factor solution, further construct validity testing is warranted with a more racially, ethnically, and SES diverse sample. Psychometric testing is also needed with diverse occupation types (professional vs. other industries such as service, manufacturing, etc.). Contrary to the findings reported here, the 9-item scale may indeed have two factors, or subscales, related to 1) psychosocial issues (e.g., coworker

support, employer/supervisor support and feelings of worry or embarrassment) and 2) structural breastfeeding issues (e.g., break time for breastfeeding or pumping milk, locating a place to breastfeed, breast milk storage location and ability to carry equipment needed for pumping milk) and further research is needed. As a unidimensional scale, the 9-item *Breastfeeding and Employment Scale* could be helpful in reducing response burden in subsequent workplace lactation support studies. After further research and testing, the 9-item *Breastfeeding and Employment Scale* can be used to develop, implement, and evaluate workplace lactation support programs; guide public health policy; and better understand the relationship between workplace lactation support, breastfeeding practices, and maternal and child health outcomes.

Table 3.1 Sample Characteristics at Prenatal Assessment for Employed Breastfeeding Mothers Who Completed the IFPS II 9-item Breastfeeding and Employment Scale and Survey Item on Level of Support for Breastfeeding in the Workplace at 3 months (N=498)

Characteristics	Mean (SD) or (Valid %)
Age (years)	30.4 ± 5.3
Race	
White	(88)
Black	(4)
Other	(8)
Marital status	
Married	(85)
Never married	(11)
Divorced/separated	(4)
Household income	
\$0-\$29,999	(18)
\$30,000-\$59,999	(41)
\$60,000-\$99,999	(31)
\$100,000+	(10)
Prenatal infant feeding intentions	
Breastfeed only	(81)
Breast/formula or formula feed only	(19)
Smoked cigarettes during pregnancy	
No	(96)
Yes	(4)
Employment status	
Works for someone else full-time	(59)
Works for someone else part-time	(18)
Self-employed	(9)
Other	(14)
Occupation type	
Professional/executive	(68)
Admin/technician/service/other	(32)
Supportive of breastfeeding at workplace	
Very supportive	(46)
Somewhat supportive	(39)
Not too supportive	(10)
Not at all supportive	(5)

Table 3.2 Test-Retest Reliability for the IPFS II Breastfeeding and Employment Scale at 3-month and 6-month Assessments ($n=266$)

Item	Chi-Square	<i>p</i> value
1. A coworker made negative comments or complained to me about breastfeeding.	54.83*	< 0.001
2. My supervisor or employer made negative comments or complained to me about breastfeeding.	constant	N/A
3. It was hard for me to arrange break time for breastfeeding or pumping milk.	107.21	< 0.001
4. It was hard for me to find a place to breastfeed or pump milk.	75.42	< 0.001
5. It was hard for me to arrange a place to store pumped breast milk.	30.38*	< 0.001
6. It was hard for me to carry the equipment I needed to pump milk at work.	33.92	< 0.001
7. I felt worried about keeping my job because of breastfeeding.	56.74	< 0.001
8. I felt worried about continuing to breastfeed because of my job.	32.09	< 0.001
9. I felt embarrassed among coworkers, my supervisor, or my employer because of breastfeeding.	38.28	< 0.001

p value < 0.05- significant; *- Fisher's exact test significant at p < 0.05

Table 3.3 Internal Consistency Reliability for the IPFS II Breastfeeding and Employment Scale: Inter-Item Correlations (1-Factor Model) at 3-month Assessment

	1	2	3	4	5	6	7	8	9
1) Coworker	1.00								
2) Employer/supervisor	.44	1.00							
3) Break time	.20	.05	1.00						
4) Place to breastfeed	.19	.10	.50	1.00					
5) Place to store breast milk	.08	-.03	.21	.24	1.00				
6) Hard to carry equipment needed to pump breast milk	.09	.06	.32	.28	.36	1.00			
7) Worry about keeping job because of breastfeeding	.20	.21	.12	.17	.04	.23	1.00		
8) Worry about continuing breastfeeding because of job	.15	.19	.40	.31	.19	.31	.34	1.00	
9) Embarrassment in workplace due to breastfeeding	.12	.19	.22	.30	.09	.33	.33	.34	1.00

Table 3.4 Internal Consistency Reliability for the IPFS II *Breastfeeding and Employment Scale*: Inter-Item Correlations (2-Factor Model) at 3-month Assessment- Factor 1

	1	2	7	8	9
1) Coworker	1.00				
2) Employer/supervisor	.44	1.00			
7)Worry about keeping job because of breastfeeding	.20	.21	1.00		
8)Worry about continuing breastfeeding because of job	.15	.19	.34	1.00	
9) Embarrassment in workplace due to breastfeeding	.11	.19	.33	.35	1.00

Table 3.5 Internal Consistency Reliability for the IPFS *II Breastfeeding and Employment Scale*: Inter-Item Correlations (2-Factor Model) at 3-month Assessment- Factor 2

	3	4	5	6
3) Break time	1.00			
4) Place to breastfeed	.50	1.00		
5) Place to store breast milk	.21	.24	1.00	
6) Hard to carry equipment needed to pump breast milk	.32	.28	.36	1.00

Table 3.6 Convergent Validity for the IFPS II *Breastfeeding and Employment Scale* and Workplace Environment Item at 3-month Assessment ($n=266$)

Item	Mann-Whitney U	p value
1. A coworker made negative comments or complained to me about breastfeeding.	498	0.003
2. My supervisor or employer made negative comments or complained to me about breastfeeding.	*	N/A
3. It was hard for me to arrange break time for breastfeeding or pumping milk.	3,593	< 0.001
4. It was hard for me to find a place to breastfeed or pump milk.	2,516	< 0.001
5. It was hard for me to arrange a place to store pumped breast milk.	959	0.011
6. It was hard for me to carry the equipment I needed to pump milk at work.	1,216	< 0.001
7. I felt worried about keeping my job because of breastfeeding.	728	0.095
8. I felt worried about continuing to breastfeed because of my job.	2,896	< 0.001
9. I felt embarrassed among coworkers, my supervisor, or my employer because of breastfeeding.	996	< 0.001

p value < 0.05- significant; *- unable to calculate since all participants answered No

CHAPTER FOUR:

Individual and Organizational Factors Associated with Breastfeeding Practices in
Employed Mothers

Abstract

Breastfeeding is recommended by multiple national and international health agencies through six months of age, following the introduction of solid foods, and continued until at least 12 months of age. However, many mothers in the United States discontinue breastfeeding at an early age and return to work following childbirth. The purpose of this work was to identify individual and organizational factors, guided by the Socio-Ecological Model, associated with breastfeeding practices in a sample of employed mothers who participated in the Infant Feeding Practices Study II (IFPS II). A secondary analysis was conducted on a sample of 953 employed mothers who participated in the IFPS II to compare infant feeding status (breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk) over a 12-month postpartum period. At baseline (3-months postpartum survey), 57% of employed mothers were breastfeeding/feeding pumped milk. At this time point, employed breastfeeding mothers were significantly older, more likely to be married and they had higher SES compared to non-breastfeeding employed mothers; and they expressed prenatal infant feeding intentions to breastfeed only, were nonsmokers, employed part-time and in a professional/executive occupation and reported a higher level of perceived breastfeeding support in the workplace. In a subsample of employed mothers who worked either part-time (≤ 34 hours/week) or full-time (> 35 hours/week) over the 12-month postpartum period ($n=302$), generalized linear mixed modeling (GLMM) revealed that predictors of breastfeeding over time were prenatal breastfeeding intention, non-smoking, part-time employment, and perceived support for breastfeeding in the workplace. Employed mothers who were non-smokers were 291% more likely to breastfeed/feed pumped milk over the 12-month period (OR= 3.91, $p < 0.001$). Working mothers who were employed part-time (compared to full-time)

were 97% more likely to continue breastfeed over the follow-up period (OR=1.97, $p = 0.002$). Working mothers who expressed prenatal feeding intentions to only breastfeed their infants were over nine times more likely to have sustained breastfeeding over time (OR=10.50, $p < 0.001$). Working mothers who perceived high levels of breastfeeding support in the workplace ('somewhat supportive' or 'very supportive') were 178% more likely to continue breastfeeding over the 12-month follow up period compared to those with low levels of perceived breastfeeding support in the workplace (OR=2.78, $p < 0.001$). Future research needs to examine the individual, interpersonal and organizational factors as well as the community factors and public policy components of the Socio-Ecological Model to better understand the complex processes influencing breastfeeding duration among employed mothers. Understanding the association between multi-level factors of workplace lactation and breastfeeding practices in employed mothers is essential for the development, implementation, evaluation, and enforcement of programs and policies to promote breastfeeding in employed mothers and improve maternal and child health outcomes.

4.1 Background

Breastfeeding provides multiple health benefits for mothers and their children. There are multiple widely recognized health benefits of breastfeeding for mothers such as reduced risk of breast cancer, ovarian cancer, type 2 diabetes, myocardial infarction, and postpartum depression as well as a decrease in postpartum retained gestational weight gain (Stuebe, 2009). Children who are breastfed also experience health benefits of breastfeeding including lower prevalence of otitis media, gastroenteritis, asthma, pneumonia, leukemia, and sudden infant death syndrome as well as a decreased incidence of type 1 and 2 diabetes (Slusser, 2007). Multiple national and international health agencies including the American Academy of Pediatrics, United States Breastfeeding Committee, and the World Health Organization, recommend exclusive breastfeeding, defined as infant feeding with breast milk only, without any additional food or drink, until six months of age when solid foods are introduced, and continued breastfeeding until 12 months of age (Eidelman, 2012; United States Breastfeeding Committee, n.d.; World Health Organization, n.d.). The most frequent reasons cited by employed mothers for discontinuing breastfeeding their babies before six months of age include lack of managerial lactation support, an unsupportive work environment and difficulties locating suitable milk pumping and storage locations at work (Murtagh & Molton, 2011). Given that 75% of women of childbearing age (16-49 years of age) were employed in the U.S. workforce in 2019 (U.S. Bureau of Labor Statistics, 2019), the need for research on factors associated with sustained breastfeeding in employed mothers is critically important.

4.2 Socio-Ecological Model

The Socio-Ecological Model (Figure 4.1) was used in this study to guide the examination of individual-level factors including individual and organizational factors associated with breastfeeding practices in employed mothers. The Socio-Ecological Model framework, first introduced by Bronfenbrenner in 1974 and later expanded by McLeroy, Bibeau, Steckler, and Glanz, is a theory-based framework for understanding the multifaceted and interactive effects of personal and environmental factors that influence behavior (McLeroy et al., 1988). The Socio-Ecological Model describes five dimensions that influence health behavior including individual, interpersonal, organizational, community and public policy. The Socio-Ecological Model is useful in identifying multi-level factors that may influence an employed mother's decision to continue or discontinue breastfeeding. This paper focused on the individual and organizational level factors of the Socio-Ecological Model including individual and organizational influences on breastfeeding practices in employed mothers. The purpose of this study was to identify individual and organizational factors, guided by the Socio-Ecological Model, associated with breastfeeding practices in a sample of employed mothers who participated in the Infant Feeding Practices Study II (IFPS II). The goal was to identify factors that influence breastfeeding practices in employed mothers over time to promote improved maternal and child health outcomes.

4.3 Specific Aims

The specific aims were to: 1) determine the association of individual factors (e.g., prenatal infant feeding intentions and smoking status) and breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk at 3-, 6-, 9-, and 12- month assessments

controlling for age, race, marital status, and household income; and 2) examine the association of organizational factors (e.g., employment status, occupation type, and perceived level of breastfeeding support in workplace) and breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk at all time intervals; controlling for age, race, marital status, and household income.

4.3.1 Hypotheses

It was hypothesized that employed mothers who express prenatal intention to breastfeed only and are not current smokers would be more likely to breastfeed/feed pumped milk at all-time intervals (3-, 6-, 9-, and 12-months; controlling for age, race, marital status, and household income; Aim 1). Regarding organizational factors, it was hypothesized that mothers who work part-time would be more likely to breastfeed/feed pumped milk compared to mothers who work full-time at all-time intervals (3-, 6-, 9-, and 12-months; controlling for age, race, marital status, and household income; Aim 2). Further, mothers in professional/executive occupations would be more likely to breastfeed/feed pumped milk at all time intervals compared to women employed in other occupations, controlling for age, race, marital status, and household income. Additionally, employed mothers who report a more supportive workplace environment for breastfeeding would be more likely to breastfeed/feed pumped milk compared to women who report lower levels of breastfeeding support in the workplace at all time intervals, controlling for age, race, marital status, and household income.

4.4 Methodology

4.4.1 Design and Setting

The IFPS II was a longitudinal study focused on infant feeding practices conducted by the Food and Drug Administration [FDA] and Centers for Disease Control and Prevention [CDC] (CDC, 2017). The accessible population for the IFPS II study was drawn from Synovate, a consumer opinion panel consisting of 500,000 households, throughout the U.S. between 2005-2007. Women had to be at least 18 years old and able to speak English to be eligible to participate in the IFPS II. The IFPS II over-sampled low educated, African American and Hispanic women (CDC, 2017). Between May and December 2005, 4,900 pregnant women from across the U.S. were recruited via mail to participate in the IFPS II and invited to complete a series of 12 surveys including a demographic and prenatal survey during the third trimester, a birth screener interview at the time of delivery, and postpartum surveys monthly from two to seven months of age and then every seven weeks until the infant was 12 months old. To qualify for the IFPS II postpartum surveys, the mother had to be at least 18 years old, and the infant had to be a singleton born at ≥ 35 weeks gestation, weighing at least 5 lbs., and without medical conditions that would affect feeding. Approximately 2,000 mother-infant dyads completed the final 12-month postpartum assessment (CDC, 2017).

To qualify for this analysis, participants were employed either part-time (≤ 34 hours/week) or full-time (> 35 hours/week) at any time during the 12-month postpartum period and must have answered all variables of interest at the four time points (3-, 6-, 9-, and 12-months postpartum). De-identified data were publicly available through the CDC. Institutional Review Board approval through the Office of Research Integrity at the

University of Kentucky was not required as the data were publicly available and deidentified.

4.4.2 Measures

The IFPS II survey items provided detailed information including foods fed to infants, including breast milk; contributing factors to infant feeding practices and breastfeeding success; and mothers' employment status. Participants completed a 22-item demographic survey including age and sex of all household members, household size, race and ethnicity, marital status, education, employment status, occupation, household income, and home ownership during the prenatal assessment. Near the expected date of delivery, a birth screener telephone interview was conducted with any household member to verify the birth of the infant and determine if the family qualified to continue participation in the study. Subsequent IFPS II surveys were administered via mail. Each participant received a mailed neonatal questionnaire within 2-4 weeks after delivery, to assess factors that affect infant feeding choices such as early feeding practices, sources of information, sources of support, and feeding-related treatment for jaundice.

Postpartum questionnaires were mailed to the mother monthly from the time her infant was 2 months through 7 months of age, then 3 times (about every 7 weeks) until 12 months of age, for a total of nine postpartum surveys. These questionnaires consisted of nine modules containing content related to infant feeding and health; breastfeeding cessation ; breastfeeding, pumping and expressing milk; and employment. Overall, response rates ranged from 63% to 87% across all questionnaires for the full study (CDC, 2017).

Personal characteristics including age (years), race (White or non-White); marital status (married or unmarried); and household income (\$0-\$59,999 or \geq \$60,000) were collected during the prenatal survey. Prenatal feeding intention (breastfeed only versus breast/formula feed or formula feed only) was also collected at the prenatal survey. Employment status, assessed as work for pay within the past four weeks, and smoking status (number of cigarettes smoked per day) were collected during the prenatal survey as well as the 3-, 6-, 9- and 12-month postpartum surveys. Organizational variables collected during the 3-, 6-, 9- and 12-month postpartum surveys included the number of hours the mothers worked per week (X number of hours per week); occupation type (broad categories such as professional, administrative support, sales, etc.) and level of perceived breastfeeding support in place of employment [(1) not at all supportive, (2) not too supportive, (3) somewhat supportive and (4) very supportive]. For this analysis, variables were recoded into numbers of hours worked per week for employment status (part time \leq 34 hours/week or full-time \geq 35 hours/week); occupation type (professional/executive or other occupation types) and level of perceived support for breastfeeding in place of employment from 1 (not at all supportive or not too supportive) to 2 (somewhat supportive and very supportive). Scores for perceived support for breastfeeding in place of employment ranged from 1 to 2, with higher scores reflecting more support.

4.5 Data Analysis

Descriptive statistics, including means and standard deviations or frequency distributions, were used to characterize the sample. Women who reported breastfeeding/feeding pumped milk at designated time intervals were compared to those

not breastfeeding/feeding pumped milk at designated time intervals (3-, 6-, 9-, and 12-months) using independent t-tests for continuous variables and chi-square tests of association for categorical variables. Group comparisons were made between those breastfeeding/feeding pumped milk and those not at each of the time intervals (3-, 6-, 9-, and 12 months) for prenatal breastfeeding intention and similarly for smoking status, employment status, occupation type, and perceived breastfeeding support in the workplace.

Generalized Linear Mixed Modeling (GLMM) was used to identify which individual and organizational factors were most strongly linked to the binary outcome (breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk) over the 12-month follow-up period. The purpose of this study was to identify individual and organizational factors, within the context of the Socio-Ecological Model, associated with breastfeeding practices over time. Since the participants were employed mothers who were invited to complete Infant Feeding Practices Study II (IFPS II) surveys at multiple points in time, with clustered responses due to the repeated measures design, GLMM was chosen as an appropriate data analysis method. The logistic link function specified was specified given the binary outcome. Time-dependent factors included infant feeding status (breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk; the outcome variable), smoking status, and breastfeeding support in the workplace at the four time points (3-, 6-, 9-, and 12-months postpartum). Data were analyzed using SPSS version 27.0 for Windows (IBM SPSS, New York, United States) and SAS version 9.4 (SAS, North Carolina, United States). An *a priori* alpha level of 0.05 was used as the significance level for the analysis.

4.6 Results

At baseline (3 months postpartum; $N=953$), over half of the mothers were breastfeeding or feeding pumped milk (57%). The mean age of the sample was 29.6 ± 5.4 and the sample was predominantly White (88%) and married (79%). Most of the participants had a household income of less than \$60,000 (68%) and the majority did not smoke cigarettes during the prenatal period (86%). Six of 10 mothers (62%) expressed prenatal infant feeding intentions to only breastfeed following the birth of the child (Table 4.1). More than half of the mothers (54%) worked part-time; slightly less than half (49%) worked in professional or executive occupations. Most participants (81%) reported their workplace was either very supportive (50%) or somewhat supportive of breastfeeding (31%) (Table 4.2).

At baseline, breastfeeding employed mothers were significantly older ($p < 0.001$), more likely to be married ($p < 0.001$) and reported a higher SES ($p = 0.019$). They expressed prenatal infant feeding intentions to breastfeed only ($p < 0.001$), were more likely to be nonsmokers ($p < 0.001$), employed part-time ($p = 0.001$) in a professional/executive occupation ($p < 0.001$), and reported a higher level of perceived breastfeeding support in the workplace ($p < 0.001$) compared to non-breastfeeding employed mothers (Table 4.1 and Table 4.2). The participant's race was not associated with breastfeeding status at baseline, but at 9- and 12-month assessments, it was significantly associated with breastfeeding status. Non-white employed mothers were less likely to breastfeed/feed pumped milk at the 9- and 12-month assessments. Prenatal infant feeding intention, smoking status, employment status, and perceived level of breastfeeding support in the workplace remained factors associated with breastfeeding status at all subsequent time points. Occupation type was associated with breastfeeding

status at the 6 and 9-month assessments, however, it was no longer associated with breastfeeding status at the 12-month assessment.

The GLMM included variables correlated with breastfeeding/feeding pumped milk in the bivariate analysis at any of the four time points (3-, 6-, 9-, and 12-months postpartum) as well as demographic factors included as controls including age, race, marital status, and household income ($n=302$). In the GLMM subsample, the mean age was 31.2 (SD=5.1), predominately White (89%), and married (82%). Slightly over half (55%) of the subsample had a household income of \$60,000 or less and 62% of the participants expressed prenatal infant feeding intentions to breastfeed only. Most participants in the subsample were employed in professional/executive occupations (70%) and support for breastfeeding in the workplace ranged from 77% at the 3-month postpartum survey to 80% at the 12-month survey. Rates of breastfeeding/feeding pumped milk in subsample participants decreased from 59% at 3 months postpartum to 22% at the 12-month survey. Comparatively, rates of breastfeeding/feeding pumped milk in the full sample decreased from 60% at 3 months postpartum to 25% at the 3-month survey. The percentage of non-smokers was consistent throughout the 12-month postpartum period with 87% of participants reporting no cigarette smoking at the 3-month survey and 88% at 12-months. The percentage of mothers employed part-time decreased from 51% at 3 months postpartum to 44% at the 12-month survey.

Significant predictors of breastfeeding/feeding pumped milk over the 12-month period were: prenatal infant feeding intention to breastfeed only, being a non-smoker, employed part-time, and higher perceived level of breastfeeding support in the workplace. Employed mothers who expressed prenatal feeding intentions to breastfeeding

only were much more likely to have sustained breastfeeding during the study period (OR=10.50, $p < 0.001$). Non-smoking employed mothers were more likely to breastfeed over the 12-month period compared to employed mothers who smoked (OR= 3.91, $p < 0.001$). Mothers employed part-time (compared to full-time) were more likely to continue breastfeeding over the follow-up period (OR=1.97, $p = 0.002$). Employed mothers who perceived high levels of breastfeeding support in the workplace (indicated as ‘somewhat’ or ‘very’ supportive) were more likely to have continued breastfeeding compared to those with low levels of perceived breastfeeding support in the workplace across the follow-up period (OR=2.78, $p < 0.001$) (Table 4.3).

4.7 Discussion

It was hypothesized that employed mothers who are older, White, married, have a higher household income, express prenatal intention to breastfeed only and are not current smokers would be more likely to breastfeed/feed pumped milk at all-time intervals (3-, 6-, 9-, and 12-months; controlling for age, race, marital status, and household income; Aim 1). In regard to organizational factors, it was hypothesized that mothers who work part-time would be more likely to breastfeed/feed pumped milk compared to mothers who work full-time at all-time intervals (3, 6, 9 and 12 months; controlling for age, race, marital status, and household income; Aim 2). Further, mothers in professional/executive occupations would be more likely to breastfeed/feed pumped milk at all time intervals compared to women employed in other occupations, controlling for age, race, marital status and household income. Additionally, employed mothers who report a more supportive workplace environment for breastfeeding would be more likely to breastfeed/feed pumped milk compared to women who report lower levels of

breastfeeding support in the workplace at all time intervals, controlling for age, race, marital status, and household income.

Individual factors associated with breastfeeding/feeding pumped milk among employed mothers at all four time points were prenatal feeding intention to breastfeed only and smoking status, consistent with the hypothesis. Employed women who expressed intention in the prenatal period to breastfeed only and who were nonsmokers were more likely to breastfeed compared to those who did not initially intend to breastfeed and smokers. A woman's intent to breastfeed plays a pivotal role in her success in breastfeeding initiation and duration. Maternal feeding intentions develop during the prenatal period involving a complex decision making process including motivation, attitudes, subjective norms, and perceived control (Wambach, 1997; Azjen, 2002). Consistent with our findings, intent to breastfeed has been well established as a strong predictor of breastfeeding initiation and duration (Donath et al., 2003; Colaizy et al., 2012; Linares et al., 2015).

Our results support similar findings that mothers who are non-smokers are more likely to initiate and continue breastfeeding/feeding pumped milk compared to mothers who smoke. An analysis of the Infant Feeding Practices Study I found that the number of cigarettes smoked daily during pregnancy was negatively correlated with breastfeeding initiation and breastfeeding duration (Fein & Roe, 1998). Lack of breastfeeding initiation has also been linked with maternal smoking in the postpartum period and mothers who smoke and breastfeed tend to wean their babies faster than their non-smoking counterparts (Bailey & Wright, 2011; Horta, et al., 2011). Smoking more than 10 cigarettes per day decreases milk production and alters milk composition, which may also

contribute to the decreased rate of breastfeeding/feeding pumped milk in mothers who smoke (Menella et al., 2007). Mothers who breastfeed protect their infants from potential risks of environmental smoke by continued breastfeeding. Given that breastfeeding mothers protect their infants from potential risks related to environmental smoke, the American Academy of Pediatrics supports continued breastfeeding in mothers who smoke (Gartner et al., 2005). Occupational health nurses and worksite wellness programs need to encourage working mothers regardless of smoking status to continue breastfeeding.

Organizational factors associated with breastfeeding/feeding pumped milk among employed mothers over time included employment status (part- or full-time), occupation type, and breastfeeding support in the workplace. Women who were employed part-time were more likely to breastfeed/feed pumped milk compared to women who are employed full-time. These findings are congruent with multiple studies on the impact of work status on breastfeeding intention, initiation, and duration. Mothers who are employed full-time are less likely to breastfeed compared to mothers employed part-time. In one longitudinal study using data from the IFPS I ($N=1,488$), working full-time at 3 months postpartum decreased breastfeeding duration by an average of 8.6 weeks ($p < 0.001$) relative to not working at all (Fein & Roe, 1998). In a secondary analysis of the IPFS II study focused on breastfeeding initiation ($N=1,975$) and breastfeeding duration rates in women employed full-time vs part-time (defined as < 35 hours per week) compared with expecting not to work at all, part-time work was not associated with breastfeeding initiation while expecting to work full-time decreased breastfeeding initiation (Mandal et al., 2010). Expecting to work less than 35 hours a week was not associated with

breastfeeding initiation but expecting to work 40 plus hours a week was associated with decreased breastfeeding initiation. Women who worked more than 34 hours a week had a significantly shorter breastfeeding duration compared to women who did not work and women who worked 1-19 hours per week (Mandal et al., 2010).

Occupation type (professional/executive vs other types of employment) was significant at 3-, 6-, and 9-month assessments but no longer significant at 12 months in bivariate correlations. However, occupation type was not a significant predictor of continued breastfeeding in the GLMM, which was not consistent with the hypothesis or previous literature on occupation type and breastfeeding practices. Since occupation type was not a predictor of continued breastfeeding in this study, mothers may have been able to navigate and overcome any barriers to continued breastfeeding encountered throughout the 12-month follow-up period. Dagher and colleagues (2016) found that mothers employed in professional jobs were more likely to initiate breastfeeding and continue breastfeeding through six months of infant age compared to other types of employment. Whitley et al. (2021) in a study on work, race, and breastfeeding outcomes in mothers in the U.S., found that mothers working in service occupations had the shortest breastfeeding duration compared to mothers who did not work outside of the home and mothers working in professional occupations. Flexibility in scheduling and break time may be a contributing factor to the differences in breastfeeding practices including breastfeeding initiation and duration in mothers employed in professional occupations vs other types of employment (Murtagh & Molton, 2011).

Employers can help promote continued breastfeeding by providing employed breastfeeding mothers with flexible scheduling such as part-time employment during the

first year postpartum (Johnston & Esposito, 2007). Occupational health nurses have a professional responsibility to advocate for breastfeeding employees as well as to serve as liaisons between employees and employers. Additionally, occupational health nurses can assist in the development, implementation, evaluation, and enforcement of breastfeeding supportive workplace policies and programs to provide a breastfeeding supportive workplace environment for all employed breastfeeding mothers, regardless of occupation type. Common elements of workplace lactation support programs include reasonable break time for direct feeding or milk expression; availability of a clean and private (non-bathroom) designated lactation space; a written lactation policy that at a minimum meets federal requirements; and communication of lactation support offered to all employees during the prenatal and postpartum periods (Bar Yam, 1998). Benefits of workplace lactation support programs for employees include increased rates of breastfeeding intention, initiation, and duration. Benefits of these programs for employers include lower health insurance costs, decreased employee sick days, increased job retention, and increased job satisfaction in employees (Cohen et al., 1995; Ortiz et al., 2004). This study also demonstrated that women who reported higher levels of perceived support for breastfeeding in the workplace were more likely to breastfeed/feed pumped milk at all time points compared to mothers who reported a low level of perceived breastfeeding support in the workplace. In a recent systematic review of workplace environment interventions to facilitate breastfeeding in employed mothers, Vilar-Compte and colleagues (2021) reported that lactation support interventions in the workplace positively impact breastfeeding duration and reduce the introduction of breastmilk substitutes such as formula. Key strategies to support and promote breastfeeding in employed mothers

included a designated lactation space in the workplace, reasonable break time for milk expression and organizational policies supportive of breastfeeding (Vilar-Compte et al., 2021). Sufficient break time for milk expression and perceived level of breastfeeding support from colleagues and supervisors were positively correlated with breastfeeding duration in a study of predictors of breastfeeding duration with female physicians by Sattari and colleagues (2013). In a study utilizing the Workplace Breastfeeding Support Scale with Registered Nurses in a large children's hospital in the Midwest region of the U.S., breastfeeding support in the workplace was overall positively rated among participants and adequate break time was positively related to breastfeeding duration (Wambach & Britt, 2018). Our findings are consistent with previous literature that points to the positive impact of workplace lactation support on breastfeeding duration in employed mothers. Policies at the organizational, state, and national level are needed to promote breastfeeding supportive workplace environments. Breastfeeding employees receive some protection at the federal level under the Patient Protection and Affordable Care Act [ACA], enacted in 2010 (U.S. Department of Labor). Under the ACA, the Fair Labor Standards Act and the new federal law (Break Time for Nursing Mothers Act), requires employers to provide reasonable break time and a private, non-bathroom place for nursing mothers to express breast milk during the workday for one year after the child's birth (Abdulloeva & Eyler, 2013). While this law is a great step in the right direction for supporting the rights of breastfeeding mothers upon returning to work, issues with implementation, compliance and enforcement may exist under the jurisdiction of local and state agencies. Passage of additional proposed breastfeeding accommodation legislation such as the PUMP for Nursing Mothers Act would strengthen the Break Time

law by providing additional coverage for salaried workers as well as other employees currently excluded from protections; provide clarification on break time pay if pumping occurs during working hours; and offer remedies for nursing mothers similar to those available for other violations of the Fair Labor Standards Act (Maloney, 2021).

4.8 Strengths and Limitations

This study was the first to measure individual and organizational factors associated with breastfeeding practices in a subsample of employed mothers in the U.S. who participated in the IFPS II. Unlike the Mandal and colleagues' study (2010), the study reported here included a variety of infant feeding practice data obtained during the prenatal and postpartum IFPS II surveys and used GLMM to analyze data at multiple time points. Our results were congruent with published research findings that prenatal infant feeding intentions to breastfeed only, maternal non-smoking, part-time employment and high levels of perceived breastfeeding support in the workplace predict breastfeeding/feeding pumped milk over time in employed mothers.

The use of a consumer opinion panel as the recruitment method for the IFPS II sample, was one limitation in this study, which may have led to selection bias. Lack of variability in race and marital status in the sample limits generalizability of the findings. Additionally, with only 5% of the sample identifying as Hispanic, there was a lack of variability in ethnicity. Maternal self-report recall bias and social desirability bias were also limitations. Since IFPS II data were collected between 2005-2007 (prior to implementation of the Break Time for Nursing Mothers' Act in 2010 under the Affordable Care Act), findings may not be representative of the views of current employed breastfeeding mothers (U.S. Department of Labor, 2010). This law requires

employers to provide reasonable break time and a private, non-bathroom place for nursing mothers to express breast milk during the workday for one year after the child's birth. The 9-item IFPS II *Breastfeeding and Employment Scale* was only administered to employed breastfeeding mothers, so we were unable to include this scale in the GLMM for comparison between employed mothers who breastfeed/fed pumped milk vs those who did not. Additionally, the questionnaire was only available in English, limiting the representation of non-English speaking mothers in the study sample. Further, the use of a one-item survey question to measure perceived breastfeeding support in the workplace may not accurately reflect the entire construct of workplace breastfeeding support. However, this one-item was found to be moderately correlated with the IFPS II 9-item *Breastfeeding and Employment Scale* ($Rho = -0.50, p < .001$) (Chapter Three in this dissertation). Finally, only factors at the individual and organizational levels were included in the model. Additional studies need to examine multi-level factors influencing breastfeeding practices in employed mothers including the interpersonal, community, and policy dimensions of the Socio-Ecological Model. Future research warrants attention to additional levels to better understand how these complex personal and environmental factors influence breastfeeding practices in employed mothers.

4.9 Conclusions

The purpose of this study was to identify individual and organizational factors associated with breastfeeding practices in a sample of employed mothers who participated in the IFPS II. It was hypothesized there would be differences among employed mothers regarding infant feeding (breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk) with a variety of individual and organizational

factors. It was believed that older, White, married, higher SES mothers who expressed infant feeding intentions to breastfeed only and were non-smokers would be more likely to breastfeed/feed pumped milk over the 12-month period. Similar findings were expected with employed mothers who worked part-time in professional/executive occupations and who reported higher levels of perceived breastfeeding support in the workplace. However, only non-smoking, part-time employment, prenatal breastfeeding only feeding intentions and higher levels of perceived breastfeeding support in the workplace were significant predictors of breastfeeding/feeding pumped milk at all time points. Occupational health nurses can provide employed breastfeeding mothers who smoke with tips including smoking as far away from the infant as possible, cutting back on the number of cigarettes smoked per day or quitting smoking including the use of cessation aids, and smoking after breastfeeding or pumping milk (Higgins, et. al., 2010; Drehmer et al., 2020). Worksite wellness programs including smoking cessation and lactation support are critically important to provide a supportive environment for employed mothers.

Additional research is needed to identify determinants of breastfeeding/feeding pumped milk in employed mothers beyond individual and organizational factors. Future research is needed to examine the individual, interpersonal and organizational dimensions along with the community factors and public policy components of the Socio-Ecological Model to better understand the complex processes involved in breastfeeding practices in the workplace. It is important to understand from the nursing mothers' perspective, which individual, interpersonal, organizational, community and policy level factors influence breastfeeding practices in employed mothers. Occupational health nurses have a

responsibility to provide supportive workplace environments that promote continued breastfeeding in employed mothers consistent with national and international breastfeeding recommendations (Mills, 2009; Rietz & McCullagh, 2010; Hilliard, 2016). Understanding the association between multi-level factors of workplace lactation support and breastfeeding practices in employed mothers is essential for the development, implementation, evaluation, and enforcement of workplace lactation programs and policies to improve maternal and child health outcomes.

Table 4.1 Demographic and Individual Characteristics of Employed Mothers Who Participated in IFPS II Survey at 3 Months Postpartum, with Comparisons by Breastfeeding Status ($N= 953$)

Characteristic	Total Mean (SD) or n (%) $N=953$	Breastfeeding Mean (SD) or n (Valid %) $n=541$	Not breastfeeding Mean (SD) or n (Valid %) $n=412$	Unadjusted Odds Ratio	p -value for chi-square test of association
Age (years)*	29.6 \pm 5.4	30.2 \pm 5.1	28.7 \pm 5.7	1.04	<0.001 ^a
Race*					
White	811 (88)	466 (88)	345 (87)	1.08	0.714
Non-white (ref)	115 (12)	64 (12)	51 (13)		
Marital status*					
Married	702 (79)	441(86)	261 (69)	2.68	<0.001
Unmarried (ref)	189 (21)	73 (14)	116 (31)		
Household income*					
\$0-\$59,999	590 (62)	319 (59)	271 (66)	0.75	0.032
\geq \$60,000 (ref)	363 (38)	222 (41)	141 (34)		
Prenatal feeding intention*					
Breastfeed only	590 (62)	431 (80)	159 (39)	6.27	<0.001
Breast/formula feed or formula feed only (ref)	361 (38)	109 (20)	252 (61)		
Current smoker					
No	814 (86)	502 (93)	311 (76)	4.28	<0.001
Yes (ref)	134 (14)	37 (7)	98 (24)		

Note: Not all cell counts add to 953 due to limited missing data.

* Data collected at prenatal survey; $p < 0.05$

^a Comparison made using two-sample t-test

Table 4.2 Organizational Factors Associated with Breastfeeding Status in Employed Mothers who Participated in the IFPS II at 3 Months Postpartum (N=953)

Characteristic	Total n (%) N=953	Breastfeeding n (%) n=541 (57)	Not breastfeeding n (%) n=412 (43)	Unadjusted Odds Ratio	p-value for chi-square test of association
Employment status Part-time \leq 34 hours/week Full-time \geq 35 hours/week (ref)	503 (54) 435 (46)	330 (62) 201 (38)	173 (43) 234 (57)	2.22	0.001
Occupation* Professional/executive Admin/technician/service/other (ref)	293 (49) 306 (51)	195 (57) 147 (43)	98 (38) 159 (62)	2.15	<0.001
Support for breastfeeding in workplace High (somewhat or very supportive) Low (not at all or not too supportive) (ref)	725 (81) 174 (19)	465 (89) 58 (11)	260 (69) 116 (31)	3.58	<0.001

Note: Not all cell counts add to 953 due to limited missing data.

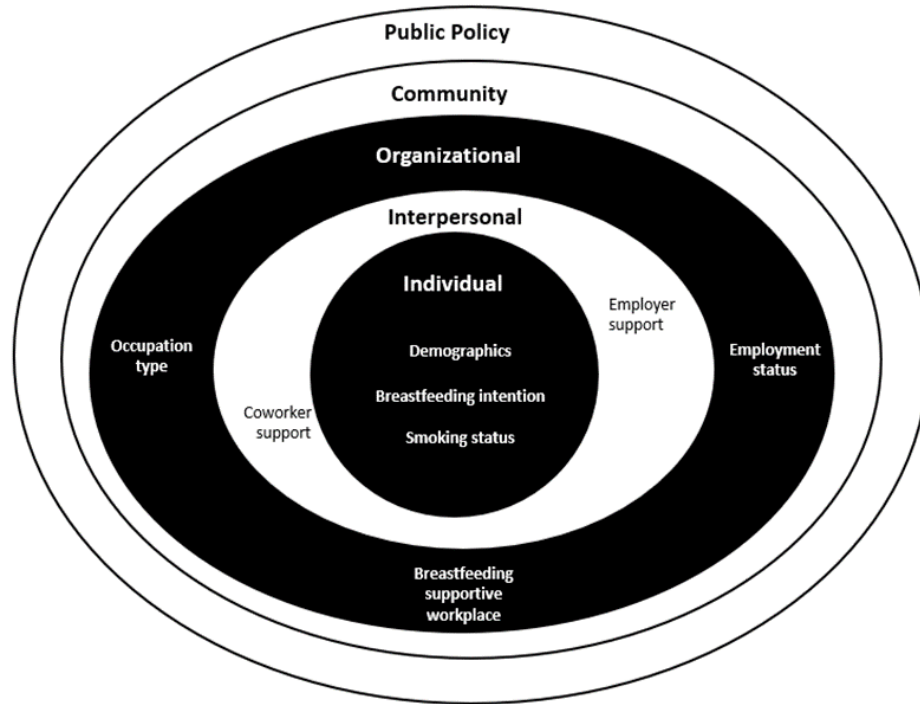
*Data collected at prenatal survey; $p < 0.05$ - significant

Table 4.3 Generalized Linear Mixed Model to Determine Factors Associated with Breastfeeding Status Over Time (3, 6, 9, and 12 Months Postpartum) ($n=302$)

Individual and organizational factors	Exp(β) Adjusted Odds ratio	95% Confidence Interval	<i>p</i> value
Age	1.02	(0.97, 1.08)	0.385
Race			
White	1.41	(0.79, 2.32)	0.455
Non-White	ref	ref	ref
Marital status			
Married	1.29	(0.63, 2.66)	0.482
Unmarried	ref	ref	ref
Household income			
\$0-\$59,999	1.19	(0.70, 2.01)	0.518
\geq \$60,000	ref	ref	ref
Prenatal feeding intention			
Breastfeed only	10.50	(6.16, 17.91)	<0.001
Breast/formula or formula feed only	ref	ref	ref
Current smoker			
No	3.91	(1.81, 8.42)	<0.001
Yes	ref	ref	ref
Employment status			
Part-time	1.97	(1.27, 3.06)	0.003
Full-time	ref	ref	ref
Occupation			
Professional/executive	1.49	(0.84, 2.65)	0.168
Admin/technician/service/other	ref	ref	ref
Breastfeeding support in workplace			
High	2.78	(1.97, 3.94)	<0.001
Low	ref	ref	ref

$p < 0.05$ - significant

Figure 4.1 Socio-Ecological Model to Promote Breastfeeding Continuation in Employed Mothers



* Bold font indicates the variables addressed in this study including demographics, breastfeeding intention, and smoking status (individual factors), and employment status, occupation type, and breastfeeding supportive workplace environment (organizational factors).

CHAPTER FIVE:

Dissertation Synthesis of Findings, Discussion, Implications, and Conclusions

5.1 Background and Purpose

Breastfeeding is recommended by multiple national and international health agencies through six months of age, following the introduction of solid foods, and continued until at least 12 months of age (Eidelman, 2012; United States Breastfeeding Committee, n.d.; World Health Organization, n.d). However, many mothers in the United States (U.S.) discontinue breastfeeding at an early age and return to work following childbirth. Return to work following childbirth is one of the leading reasons why mothers discontinue breastfeeding. Despite improvements in workplace lactation support programs and policies in the U.S. (e.g., passage of the Break Time for Nursing Mothers Act in 2010 under the Patient Protection and Affordable Care Act), breastfeeding rates in employed mothers fail to meet national and international health agency recommendations. Given the complexity of workplace lactation support, efforts to develop, implement, and test the effects of lactation support programs to promote breastfeeding supportive workplace environments are needed. Additional research examining multiple levels of the Socio-Ecological Model is needed to effectively address barriers faced by employed breastfeeding mothers in the workplace.

The purpose of this dissertation was to 1) provide a systematic review of the psychometric properties of existing instruments used to measure nursing mothers' perceptions of workplace lactation support; 2) perform psychometric testing on a 9-item *Breastfeeding and Employment Scale* used in the Infant Feeding Practices Study II (IFPS II); and 3) examine the association between individual and organizational factors and breastfeeding practices in employed mothers who participated in the IFPS II. Despite the limitations presented in each of the three main manuscripts (Chapters Two through Four), the findings in this dissertation contribute to the existing body of knowledge on

measurement of workplace lactation support in employed mothers and individual and organizational factors influencing breastfeeding practices? in employed mothers.

5.2 Synthesis of Findings

5.2.1 Chapter 2: Systematic Review of the Psychometric Properties of Workplace Lactation Support Instruments

The purpose of the first manuscript was to 1) describe existing instruments used to measure nursing mothers' perceptions of workplace lactation support; 2) summarize the psychometric properties of the identified instruments; and 3) identify the strengths and limitations for each of the instruments, describe gaps in the research literature, and recommend research needs. A systematic review of the literature was conducted using PubMed, CINAHL and PsycINFO including the keywords “breastfeeding AND support AND instrument”; “breastfeeding support AND workplace”; “breastfeeding AND instrument AND workplace”; “perceived AND breastfeeding support AND instrument. Four workplace lactation support instruments were identified in the 10 articles including 1) 12-item and modified 18-item *Workplace Breastfeeding Support Scale* (WBSS; Bai et al., 2008, Bai & Wunderlich, 2013, Martin et al., 2015, Wambach & Britt, 2018, Leon-Larios et al., 2019); 2) 41-item *Employee Perceptions of Breastfeeding Support Questionnaire* (EPBS-Q; Greene & Olson, 2008, Greene et al., 2008); 3) 29-item *Perceived Breastfeeding Support Assessment Tool* (PBSAT; Hirani et al., 2013, Tangusksan et al., 2020); and 4) U.S. Food and Drug Administration and Centers for Disease Control and Prevention Infant Feeding Practices Study (IFPS) II (9-item scale measuring breastfeeding and employment; Whitley et al. 2019).

The *Workplace Breastfeeding Support Scale*, *Employee Perceptions of Breastfeeding Support Questionnaire* and *Perceived Breastfeeding Support Assessment Tool instruments*, three of the four measurement tools reviewed, are reliable and valid measures of employed childbearing-aged mothers' perceptions of workplace lactation support. Little is known about the reliability and validity of the 9-item IFPS II *Breastfeeding and Employment Scale*. The modified 18-item *Workplace Breastfeeding Support Scale* was selected as the preferred instrument based on cross-cultural application outside the U.S.; adequate reliability demonstrated in multiple studies; and limited respondent burden. Additional psychometric testing and research are needed to strengthen the adaptation and applicability of the various instruments in cross-cultural settings.

5.2.2 Chapter 3: Psychometric Properties of the Infant Feeding Practices Study II *Breastfeeding and Employment Scale*

The purpose of the second manuscript was to test the (1) internal consistency reliability of the 9-item scale at the 3-month IFPS II assessment; (2) test-retest reliability of the 9-item scale using the 3 and 6-month assessments; (3) construct validity of the 9-item scale using factor analysis; and (4) convergent validity of the 9-item scale and an IFPS II item measuring perceived level of BF support in the workplace at the 3-month assessment. This was a secondary analysis of the IFPS II conducted by the FDA and CDC between 2005-2007 ($N=4,902$). The IFPS II, a landmark study on infant feeding practices in the United States, included a 9-item *Breastfeeding and Employment Scale* that had not undergone psychometric evaluation (CDC, 2017). The sample was comprised of employed breastfeeding mothers in the United States who completed the 9-

item scale on breastfeeding and employment and an IFPS II survey item measuring perceived level of breastfeeding support in the workplace at two time intervals (3-month [$n=498$] and 6-month [$n=413$] assessment). Kuder-Richardson 20 was 0.72, supporting the internal consistency reliability of the 9-item scale in employed breastfeeding mothers. However, inter-item correlations (range = 0.03 to 0.50) indicated questionable homogeneity of the scale. Spearman's Rho correlation coefficient for the 9-item scale was 0.66, indicating adequate test-retest reliability at the 3-and 6-month assessments ($p < 0.001$). Factor analysis yielded one construct (barriers to breastfeeding in the workplace). Convergent validity conducted at the 3-month assessment indicated a moderate correlation between the 9-item scale scores and breastfeeding support in the place of employment for breastfeeding mothers. Mothers reporting more barriers to breastfeeding in the workplace reported a less supportive workplace environment (Rho = -0.50, $p < 0.001$).

The 9-item *Breastfeeding and Employment Scale* was reliable and valid in a sample of employed breastfeeding mothers in the United States who participated in the IFPS II. The low respondent burden of the 9-item *Breastfeeding and Employment Scale* was the main strength of this brief scale in measuring employed mothers' perceptions of workplace lactation support. Additional testing is warranted to further evaluate the reliability and validity of the instrument.

5.2.3 Chapter 4. Individual and Organizational Factors Associated with Breastfeeding Practices in Employed Mothers

The purpose of the third manuscript was to 1) determine the association of individual factors (e.g., smoking status and prenatal infant feeding intentions) and

breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk at 3-, 6-, 9-, and 12- month assessments, controlling for age, race, marital status, and household income; and 2) determine the association of organizational factors (e.g., employment status, occupation type, and perceived level of breastfeeding support in workplace) and breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk at all time intervals, controlling for age, race, marital status, and household income.

A secondary analysis was conducted on a sample of employed mothers who participated in the IFPS II to compare infant feeding status (breastfeeding/feeding pumped milk vs. not breastfeeding/feeding pumped milk) over a 12-month postpartum period. At baseline (3 month postpartum survey), 57% of employed mothers were breastfeeding/feeding pumped milk (N=953). For the baseline bivariate measures, employed breastfeeding mothers were significantly older ($p < 0.001$), married ($p < 0.001$), reported higher SES ($p = 0.032$), were nonsmokers ($p < 0.001$), expressed prenatal infant feeding intentions to breastfeed only ($p < 0.001$), were employed part-time ($p = 0.001$), were employed in a professional/executive occupation ($p < 0.001$), and reported a higher level of perceived breastfeeding support in the workplace ($p < 0.001$) compared to non-breastfeeding employed mothers.

Generalized linear mixed modeling (GLMM) with a sample of employed mothers who worked either part-time (≤ 34 hours/week) or full-time (> 35 hours/week) over the 12-month postpartum period ($n=302$) revealed that predictors of breastfeeding over the 12-month period were prenatal breastfeeding intention, non-smoking, part-time employment, and high levels of perceived support for breastfeeding in the workplace. Employed mothers who were non-smokers were significantly more likely to

breastfeed/feed pumped milk over the 12-month period (OR= 3.89, $p < 0.001$). Employed mothers who worked part-time (compared to full-time) were 97% more likely to continue breastfeed over the follow-up period (OR=1.97, $p = 0.002$). Employed mothers who expressed prenatal feeding intentions to only breastfeed their infants were 950% more likely to continue breastfeeding during the follow-up period (OR=10.50, $p < 0.001$) and employed mothers who perceived high levels of breastfeeding support in the workplace (indicated as ‘somewhat supportive’ or ‘very supportive’) were 178% more likely to have continued breastfeeding over the 12-month follow up period compared to those with low levels of perceived breastfeeding support in the workplace (OR=2.78, $p < 0.001$). Future research warrants the examination of the interpersonal (e.g., coworker support and employer support), community (e.g., workplace lactation programs in businesses and schools), and public policy (e.g., enactment and enforcement of state-specific breastfeeding accommodation legislation evaluation and enforcement of the Break Time for Nursing Mothers Act and) components of the Socio-Ecological Model to better understanding the complex processes influencing breastfeeding duration in the workplace. Understanding the association between multi-level factors of workplace lactation support and breastfeeding practices in employed mothers is essential for the development, implementation, evaluation, and enforcement of programs and policies to promote breastfeeding in employed mothers and improve maternal and child health outcomes.

5.3 Limitations and Strengths

This dissertation has several limitations. First, the four instruments analyzed in the systematic review of literature in Chapter Two lacked content validity. Formal

methods of evaluating content validity such as kappa coefficients, simple agreement percentages or the use of a content validity index, would strengthen the validity of the instruments and provide an objective measure of whether the items in the instruments measure the intended constructs. Additionally, only one instrument reviewed in Chapter Two (*Perceived Breastfeeding Assessment Tool*) measured the influence of breastfeeding support outside of the workplace (e.g., family support). Using the Socio-Ecological Model presented in this dissertation, additional domains (e.g., interpersonal and community) could be considered to guide the examination of lactation support outside of the workplace environment such as spousal/partner, family, and friend support. Further, the four instruments reviewed in Chapter Two were developed and tested prior to the enactment of the Break Time for Nursing Mothers Act in 2010 and may not accurately represent the current perceptions of employed breastfeeding mothers. Given the time frame between the development of the instruments included in this review and the current state of workplace lactation support policy, a new or revised workplace lactation support instrument may be needed to more accurately measure the phenomenon based on recent policy changes that impact breastfeeding employed mothers in the U.S. Several limitations existed related to the use of the IFPS II data set including the use of non-probability sampling for study recruitment, maternal recall, and social desirability bias. Data collection for the IFPS II (2005-2007) also occurred prior to the enactment of the Break Time for Nursing Mothers Act. Therefore, findings from Chapter Four may not accurately reflect the views of current employed breastfeeding mothers. Additionally, since IFPS II recruitment was restricted to only English speaking mothers, cross-cultural application of the findings from Chapter Four are limited. Given that the sample was not

ethnically representative of the entire U.S., findings from this study may not be generalizable. Additionally, only factors at the individual and organizational levels of the Socio-Ecological Model were included in the Generalized Linear Mixed Model (GLMM) in Chapter Four. Incorporation of additional levels including interpersonal, community, and public policy would have strengthened the findings on the association of workplace lactation support and breastfeeding practices in employed mothers.

Despite these limitations, this dissertation has several strengths. First, to this author's knowledge, a systematic review of psychometric properties of workplace lactation support instruments has not been previously reported. Findings from the systematic review of literature in Chapter Two provide occupational health practitioners and researchers with insight on the scope, conceptual definitions, and reliability and validity of the four instruments for measuring nursing mothers' perceptions of workplace lactation support. Next, this is the first psychometric analysis of the IFPS II *Breastfeeding and Employment Scale*. The 9-item *Breastfeeding and Employment Scale* was reliable and valid in a sample of employed breastfeeding mothers in the United States who participated in the IFPS II. The low respondent burden of the 9-item *Breastfeeding and Employment Scale* was the main strength of this brief scale, and this instrument can be used with subsequent populations in the U.S. and abroad for measuring employed mothers' perceptions of workplace lactation support. Findings in Chapter Four were congruent with existing literature regarding smoking status, prenatal breastfeeding intention, employment status (part-time vs full-time) and perceived level of breastfeeding support in the workplace and breastfeeding practices in employed mothers. Employed women who were nonsmokers were more likely to breastfeed compared to smokers and

those who did not initially intend to breastfeed. These findings support the need for comprehensive workplace policies and programs to promote tobacco treatment efforts for employed breastfeeding mothers. Similar findings were noted with employed mothers who expressed intention in the prenatal period to breastfeed compared to those who did not initially intend to breastfeed. Breastfeeding intention is a well-established predictor in breastfeeding initiation and duration (Colaizy et al., 2012; Donath et al., 2003; Linares et al., 2015). Similarly, findings are congruent with existing literature on the impact of employment status (part- or full-time) on breastfeeding intention, initiation, and duration (Fein & Roe, 1998; Mandal et al., 2010). Women who were employed part-time were more likely to breastfeed/feed pumped milk compared to women who were employed full-time. Finally, this study demonstrated that women who reported higher levels of perceived support for breastfeeding in the workplace were more likely to breastfeed/feed pumped milk at all time points compared to mothers who reported a low level of perceived breastfeeding support in the workplace. These findings are consistent with previous literature on the positive influence of workplace lactation support on breastfeeding duration in employed mothers (Sattari et al., 2013; Wambach & Britt, 2018; Vilar-Compte et al., 2021).

5.4 Future Implications

5.4.1 Research

The systematic review of literature emphasizes the importance of reliable and valid instruments to measure maternal perceptions of workplace lactation support. While three out of the four identified instruments (*Workplace Breastfeeding Support Scale*; *Employee Perceptions of Breastfeeding Support Questionnaire* and *Perceived*

Breastfeeding Support Assessment Tool) were shown to be reliable and valid measurements of maternal perceptions of workplace lactation support, further psychometric testing on all four instruments is needed to strengthen the adaptation and applicability of the measures in more racially, ethnically and socioeconomically diverse populations. Additionally, further psychometric testing of the modified 18-item *Workplace Breastfeeding Support Scale* including construct and predictive validity is warranted. Given that low rates of breastfeeding exist globally as well in the US, it is important that instruments used for measuring workplace lactation support be validated in populations throughout the world. Finally, given the time frame between the development of the instruments included in this review and the current state of workplace lactation support policy in the U.S., a new or revised workplace lactation support instrument may be needed to measure the workplace lactation support construct more accurately.

Chapter Three findings revealed that the 9-item IFPS II *Breastfeeding and Employment Scale* was reliable and valid in a sample of employed mothers in the U.S. who participated in the IFPS II. Further research and application of the instrument in the U.S. as well as abroad is needed to document the reliability and validity of the instrument in more diverse populations of employed mothers. While post hoc reliability analysis and factor analysis results indicated a one-factor solution (barriers to breastfeeding in the workplace), further construct validity testing is warranted with a more racially, ethnically, and socioeconomically diverse sample. Additional psychometric testing is also needed with diverse occupation types (professional vs. other industries such as service, manufacturing, etc.). Contrary to findings in Chapter Three, the 9-item *Breastfeeding and Employment Scale* may indeed have two factors, or subscales, related to 1) psychosocial

issues (e.g., coworker support, employer/supervisor support and feelings of worry or embarrassment); and 2) structural breastfeeding issues (e.g., break time for breastfeeding or pumping milk, locating a place to breastfeed, breast milk storage location and ability to carry equipment needed for breastfeeding) and further psychometric testing and research is needed. As a unidimensional scale with a relatively low number of items, the 9-item *Breastfeeding and Employment Scale* could be helpful in reducing participant burden in future workplace lactation support studies.

Additional research is needed to identify determinants, beyond individual and organizational factors, that influence breastfeeding duration in employed mothers. Future research needs to examine not only the individual and organizational dimensions but also the interpersonal, community, and public policy components of the Socio-Ecological Model to better understand the complex processes involved in breastfeeding practices in the workplace. For example, studies examining the influence of coworker support, employer support, and the presence of workplace lactation policies on breastfeeding practices in employed mothers are needed (Johnston & Esposito, 2007; Vilar-Compte et al., 2021). It is important to understand from the nursing mothers' perspective which factors influence breastfeeding practices in employed mothers. Understanding the association between multi-level factors of workplace lactation support and breastfeeding practices in employed mothers is essential for the development, implementation, evaluation, and enforcement of workplace lactation programs and policies to improve maternal and child health outcomes.

5.4.2 Practice

Findings from Chapter Two reveal that the use of reliable and valid measurements of maternal lactation support are needed. Occupational health practitioners can utilize knowledge about the scope, conceptual definitions, reliability and validity to choose the most appropriate workplace lactation support instrument for a given population. Occupational health practitioners can use the chosen workplace lactation support instrument to guide development, implementation, evaluation, and enforcement of lactation support policies and programs. Evidence-based tobacco treatment approaches and smoke-free workplace policies need to be implemented to foster non-smoking in employed breastfeeding mothers. Flexible scheduling such as part-time employment during the first year postpartum is one method employers can use to promote continued breastfeeding in employed mothers (Johnston & Esposito, 2007). Balkam et al. (2011) found that women who joined a workplace lactation program prior to giving birth had an increased rate of breastfeeding at six months compared to women who joined the program after returning to work, suggesting the importance of involving women in workplace lactation programs during the prenatal period. Workplace lactation support programs, including the presence of a written lactation policy that at least meets minimum federal requirements; reasonable break time allotment for milk expression; availability of a clean and private (non-bathroom) space for milk expression; a working sink with an outlet in the designated lactation space and communication of lactation support to all employees, that are offered during the prenatal as well as postpartum periods, positively influence a woman's breastfeeding intention as well as increase rates of breastfeeding initiation and duration (Patnode et al., 2016; Oliveira et al., 2017).

Additionally, workplace lactation support programs yield employer benefits including cost savings as well as additional benefits. Occupational health practitioners can act as liaisons between employers and employees to encourage, promote, and encourage continued breastfeeding. Participants in workplace lactation programs typically incur lower insurance costs, decreased number of sick days, increased job satisfaction, and increased job retention (Ball & Wright, 1999; Ortiz et al. 2004; Waite & Christakis, 2015). As key members of the workplace wellness team, occupational health practitioners have a professional responsibility to provide and promote supportive workplace environments that promote continued breastfeeding in employed mothers, consistent with national and international breastfeeding recommendations.

5.4.3 Policy

Breastfeeding employees in the U.S. receive some protection at the federal level under the Patient Protection and Affordable Care Act [ACA] (U.S. Department of Labor, 2010). Under the ACA, the Fair Labor Standards Act (FLSA) and the new federal law (titled the Break Time for Nursing Mothers Act) require employers to provide ‘reasonable’ break time and a private, non-bathroom place for nursing mothers to express breast milk during the workday for up to one year after the child’s birth (Abdulloeva & Eyler, 2013). Additionally, stipulations under the FLSA restrict applicability to all U.S. workers. For example, salaried workers and workplaces with fewer than 50 employees may not be subject to the FLSA if the employer can demonstrate that compliance would impose an undue hardship (U.S. Department of Labor, n.d). Currently, almost one in four nursing mothers are not covered by the Break Time law including certain groups such as salaried workers and other groups of employees excluded from protections including

teachers (U.S. Department of Labor, 2010). Additionally, issues with implementation, compliance, and enforcement may exist under the jurisdiction of local and state agencies with the current Break Time law. Passage of additional proposed breastfeeding accommodation legislation such as the Providing Urgent Maternal Protection (PUMP) for Nursing Mothers Act would strengthen the Break Time law by providing the following: additional coverage for salaried workers as well as other employees currently excluded from protections; clarification on break time pay if pumping occurs during working hours; and remedies for employed breastfeeding mothers similar to those available for other violations of the Fair Labor Standards Act (Maloney, 2021). Enactment of state-specific breastfeeding accommodation legislation would also strengthen breastfeeding supportive environments for employed mothers.

5.5 Conclusions

In summary, this dissertation adds to the body of research involving workplace lactation support and breastfeeding practices in employed mothers. Dissertation findings can be used to inform occupational health practitioners, researchers and policymakers on the importance of breastfeeding supportive workplace environments. These findings can be used to develop, implement, and evaluate workplace lactation support programs and guide public health policy to promote continued breastfeeding in employed mothers to improve maternal and child health outcomes.

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Vita

Education

Institution	Degree	Date Conferred	Field of Study
Univ of Kentucky	MSN	May 2009	Nursing
Univ of Kentucky	BSN	December 2003	Nursing

Professional Experience

Year	Employer	Title
2020-present	University of Kentucky College of Nursing	Clinical coordinator, Community and public health nursing
2010-present	University of Kentucky College of Nursing	Clinical Instructor, Community and public health nursing
2004-2010	Baptist Health Lexington, Lexington, Kentucky	Staff nurse (labor and delivery)

Honors and Awards:

- PhD poster winner, University of Kentucky College of Nursing Scholarship Showcase, 2021
- PhD poster winner, University of Kentucky College of Nursing Scholarship Showcase, 2019
- NIOSH trainee in the Occupational/Environmental Health Nursing (OEHN) core of the Central Appalachian Regional Education and Research Center (CARERC), University of Kentucky, 2017-present

Publications:

Ray, R. (2020). Analysis of Pregnancy Anti-Discrimination Policy in Kentucky: Application of Kingdon's Multiple Streams Framework. *Policy, Politics, and Nursing Practice*, 21(4), 244-253. <https://doi.org/10.1177/1527154420957303>

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