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Work, race and breastfeeding:

A quantitative study of mothers in the United States

DISSERTATION

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DOCTOR OF PHILOSOPHY
in Public Health

by

Margaret D. Whitley

Dissertation Committee:
Associate Professor Annie Ro, Chair
Professor Ulrike Luderer
Professor Scott Bartell

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CURRICULUM VITAE

MARGARET WHITLEY, MPH
Program in Public Health
University of California, Irvine

EDUCATION

PhD Candidate in Public Health, School of Health Sciences (2021), University of California, Irvine.

- Dissertation: *Work, race and breastfeeding: A quantitative study of mothers in the United States*
- Committee: Annie Ro, Chair. Ulrike Luderer. Judy Treas. Additional members for advancement to candidacy: BongKyoo Choi. Dean Baker. Judy Treas.

Master in Public Health, Community Health Sciences (2011), University of California, Los Angeles.

- Internship: Adolescent reproductive health, Mexican Secretariat of Health (Secretaría de Salud)

Bachelor of Arts, Social Welfare (2007), University of California, Berkeley.

- Spanish Language and Culture program, Universidad de Córdoba, Spain.

PROFESSIONAL EXPERIENCE

Policy Analyst, *RAND Corporation* 2014 – present
Santa Monica, CA

Project Manager &Analyst, *UCLA Department of Pediatrics & Medicine* 2011 – 2014
Los Angeles, CA

Health Educator, *Berkeley High School Health Center & AmeriCorps* 2007 – 2008
Berkeley, CA

Workshop Leader & Writing Tutor, *UC Berkeley Student Learning Center* 2006 – 2007

FELLOWSHIPS AND GRANTS

- Doctoral Research Training Fellowship, National Institute for Occupational Safety and Health, Southern California Education and Research Center. Grant Num. T42 OH008412. (2018-2021)
- Panel Study of Income Dynamics Small Grant, University of Michigan (2020-2021)
- UC Irvine Program in Public Health Intramural Dissertation Fellowship (2019-2021)
- UC Irvine Provost PhD Fellowship (2016-2017)

PUBLICATIONS

Selected Peer-Reviewed Manuscripts (out of 14)

Full list available on Google Scholar

Whitley MD, Ro A, Palma A. Work, race and breastfeeding outcomes for mothers in the United States. *PLOS ONE*, 2021: 16(5):e0251125.

Whitley MD, Ro A, Choi B. Workplace breastfeeding support and job satisfaction among working mothers in the United States. *American Journal of Industrial Medicine,* 2019: 1-11.

Whitley MD, Payán D, Williams M, Flórez K, Wong E, Branch C, Derose KP. Feasibility and acceptability of a healthy living messaging program within a church-based intervention to promote healthy weight among African Americans and Latinos. *Health Informatics Journal,* 2019: 1-17.

Herman PM, **Whitley MD**, Ryan GW, Hurwitz EL, Coulter ID. The impact of patient preferences and costs on the appropriateness of spinal manipulation and mobilization for chronic low back pain and chronic neck pain. *BMC Musculoskeletal Disorders,* 2019: 20(1), 519.

Sherbourne CD, Ryan GW, **Whitley MD**, Gutierrez CI, Hays RD, Herman PM, Coulter ID. Coping and management techniques used by chronic low back pain patients receiving treatment from chiropractors. *Journal of Manipulative and Physiological Therapeutics,* 2019: 42(8), 582-593.

Derose KP, Williams MV, Flórez KR, Griffin BA, Payán DD, Seelam R, Branch C, Hawes-Dawson J, Mata MM, **Whitley MD,** Wong EC. Pilot cluster randomized controlled trial of a multi-level church-based intervention to address obesity among African Americans and Latinos. *American Journal of Health Promotion*. 2018: *33*(4), 586-596.

Slusser W, **Whitley MD**, Izadpanah N, Sion K, Ponturo D. Multidisciplinary pediatric obesity clinic via telemedicine with Los Angeles Metropolitan Area. *Clinical Pediatrics.* 2016: 55(3), 251-259.

Manuscripts in Preparation

Whitley MD, Herman PM, Aliyev G, Sherbourne C, Ryan GW, Coulter ID. Income as a predictor of self-efficacy for managing pain and for coping with symptoms among chronic low back pain patients. (Accepted pending revision)

Selected Conference Abstracts

Whitley M, Ro A**.** Race, employment/occupation and breastfeeding duration: Path analysis using the Panel Study on Income Dynamics. Interdisciplinary Association for Population Health Science. Oral Presentation. Virtual conference, 2 October 2020.

Whitley, Ro A. Do employment status and occupation explain racial differences in breastfeeding duration for families in the United States? American Public Health Association Annual Meeting. Oral Presentation. Virtual conference, 26 October 2020.

Whitley M, Ro A, Choi B. Women's job satisfaction before and after the birth of a child. Interdisciplinary Association for Population Health Science. Seattle, WA. Poster Presentation, 3 October 2019.

Whitley M, Ro A, Choi B. Workplace support for breastfeeding and job satisfaction among working mothers: Findings from the Infant Feeding Practices Study II. American Public Health Association Annual Meeting, San Diego, CA. Poster Presentation, 12 November 2018.

Whitley M, Coulter I, Ryan G, Sherbourne C. Relationship between income and self-efficacy for coping with chronic low back pain in a national sample of chiropractic patients. American Public Health Association Annual Meeting, Atlanta GA. Oral Presentation, 7 November 2017.

Whitley M, Ryan G, Hilton L, Coulter I. Care-seeking histories and coping strategies among chiropractic patients with low back and neck pain. American Public Health Association Annual Meeting, Atlanta GA. Oral Presentation, 6 November 2017.

Whitley M, Hilton L, Ryan G, Sherbourne C, Coulter I. A Framework of patient experiences with chronic pain. American Public Health Association Annual Meeting, Denver CO, Oral Presentation, 31 October 2016.

Whitley M, Williams M, Flórez K, Payán D, Branch C, Lathos D, Derose KP. Feasibility and acceptability of a healthy living messaging intervention as part of a multi-ethnic, faith-based obesity and diabetes prevention program. American Public Health Association Annual Meeting, Denver CO. Roundtable Presentation, 1 November 2016.

Kim SL, Craddock M, Izadpanah N, **Whitley M,** Herman D, Slusser W. (2016). Evaluation of the "Reducing Obesity in Childcare Settings in Los Angeles County" (LA ROCCS) Project: The Effectiveness of BMI parent letter. *Pediatrics* [abstract published in an online e-supplement].

Slusser W, **Whitley M**, Izadpanah N, Harmon C. Salad bars at LAUSD elementary schools are associated with improvements in vegetable consumption and Body Mass Index. Southern California Public Health Association Conference, Los Angeles CA. Poster presentation. 10 December 2012.

PROFESSIONAL CONTRIBUTIONS AND MEMBERSHIPS

Ad hoc Reviewer: Archives of Environmental and Occupational Health (Taylor & Francis)
Breastfeeding Medicine (Mary Ann Liebert, Inc)
Complementary Therapies in Clinical Practice journal (Elsevier)

Member, American Public Health Association (APHA), 2011-Present
Abstract reviewer in 2017 (Integrative Medicine section) and 2018 (Medical Care section)

President, Health and Justice Advocates at UC Irvine student organization, 2016-President

Member, Interdisciplinary Association for Population Health Science (IAPHS), 2017-Present

Member, Phi Beta Kappa Academic Honor Society, UC Berkeley chapter, 2007-Present

ABSTRACT OF THE DISSERTATION

Work, race and breastfeeding:

A quantitative study of mothers in the United States

By

Margaret D. Whitley

Doctor of Philosophy in Public Health

University of California, Irvine, 2021

Associate Professor Annie Ro, Chair

Background: Most US mothers initiate breastfeeding (BF), but many stop BF earlier than recommended. Mothers' occupation and working conditions are understudied drivers of BF behaviors, and they may partly explain persistent inequities in BF by race. Further, work-related BF experiences may influence working mothers' psychosocial wellbeing.

Methods: Chapter 1 is a review of the population health and social science literature about BF. I identify gaps in this literature about how occupation and employment relate to BF among White compared to Black mothers, the role of low job control in BF, and how BF experiences relate to job satisfaction. I then propose a theoretical framework to guide this inquiry. Chapter 2 presents a study of n=970 mothers from the Panel Study of Income Dynamics (PSID). I use zero-inflated negative binomial regression models to compare BF initiation and duration for non-working mothers compared to those in professional/managerial jobs or in service/manual labor jobs. I assess whether those relationships vary for White compared to Black mothers. Chapter 3 presents a study of n=631 working mothers from the PSID, augmented by a job exposure matrix for low job control. I use path analytic models to determine whether low job

control mediates the relationship between race and short-term (less than six months) as well as long-term BF (six months or more). Chapter 4 presents a longitudinal study of n=265 mothers from the Infant Feeding Practices Study II. Using logistic regression, I assess whether work-related BF problems (e.g., lack of space or time to pump, or criticism from colleagues) at three months postpartum predicted low job satisfaction at 12 months postpartum.

Results: The theoretical framework in Chapter 1 posits that structural racism influences mothers' employment status and occupation options, which in turn influence workplace BF experiences and BF outcomes, as well as psychosocial wellbeing. Results of the following studies explicate those pathways. In Chapter 2, I show that not working predicts longer BF duration, but only in comparison to service/labor work. Also, those relationships vary by race. Among White women, non-working mothers breastfeed longest (5.9 months on average) compared to the two employed categories, while among Black mothers, those in professional/managerial work breastfeed longest (4.7 months). In Chapter 3, I show that low job control is associated with 40% lower odds of longer-term (at least six months) BF. Low job control explained about 31% of the Black-White inequity for both shorter term and longer-term BF. In Chapter 4, I show that women who report three or more work-related problems with BF have nearly 7 times the odds of developing low job satisfaction at 12 months postpartum.

Discussion: These studies demonstrate that occupation type and psychosocial working conditions predict BF outcomes and likely contribute to longstanding BF inequities by race. BF problems are work are predictive of low job satisfaction among working mothers. This underscores the need for programmatic and policy solutions, perhaps through collaboration among experts in occupational health, BF and health disparities, to better accommodate working mothers of infants in the US.

CHAPTER 1

Overview: Literature review about breastfeeding racial inequities and occupation

This dissertation examines the ways that mothers' paid work – in particular, employment status, occupation and working conditions – relate to their breastfeeding (BF) behaviors. It explores how the relationship between work and BF intersects with longstanding inequities in BF among Black and White mothers. Lastly, it examines how women's experiences with BF can affect their wellbeing. I utilize quantitative methods and datasets of women from across the United States (US), and I frame these inquiries in the specific social and policy contexts of the US. The overarching aim of this dissertation is to contribute to the literature about work as a fundamental determinant of BF disparities and related outcomes.

Population-level BF inequities can contribute to other health inequities later in life, for both the child and the mother.[1-3] In addition, BF is considered a human rights issue by the United Nations[4,5] as well as many BF advocates and scholars.[6-8] In that light, removing barriers and ensuring equitable access to BF is necessary to promote basic rights for children and women. Perez-Escamilla and Sellen summarized this perspective, stating, "any social, economic, political, legal, or biomedical factors that prevent women from implementing their choice and right to breastfeed can be framed as a fundamental social injustice that needs to be understood through an equity lens."[8(p 12)] Promoting fair access to BF across the US population requires that practitioners, researchers and other stakeholders understand both *what* the population level inequities are, and *why* those inequities exist. There is far more consensus and clarity about the former point than the latter.[9]

The present study aims to address this gap in the literature, with a focus on the role of maternal work in connection with racial inequities in BF. By enhancing empirical evidence and theoretical approaches about work as a structural determinant of BF, I hope to lend support to stronger policy and practice approaches that more effectively address the underlying barriers and facilitators to this consequential health behavior.

Introduction

This chapter discusses existing research and theory related to BF in connection to maternal employment and race. I highlight gaps in the literature and present the groundwork for the empirical studies presented in Chapters 2, 3 and 4.

First, I provide a brief review of the epidemiological evidence about the health effects of BF for infants and mothers. I then outline the public health case for promoting BF and for reducing BF disparities, and I review the population distribution of BF behaviors in the US, with a focus on inequities related to race and employment. I describe gaps in the literature with respect to how BF outcomes vary for not employed mothers compared to those in professional as opposed to service occupations, and whether those relationships vary for Black versus White mothers. I also identify low job control as a relevant but understudied potential mediator between race and BF outcomes, and lastly, low job satisfaction as a potential sequela of a lack of BF accommodations in the workplace. I highlight existing theory that undergirds my understanding of these constructs and relationships, and then I propose my own conceptual model for understanding the interrelationships among work, race, and BF outcomes. Finally, I introduce three research questions and methodological approaches that I will employ to fill the aforementioned gaps in the literature.

Health benefits of BF for infants and mothers

The research studies in this manuscript are motivated by substantial epidemiologic evidence for the "constellation"[10] health benefits from BF for children and mothers.[a] For infants and children, BF is associated with decreased likelihood of sudden infant death syndrome[11-15] and postnatal deaths in general.[16] It is also associated with decreased incidence of diarrhea and lower respiratory infection,[17-21] gastrointestinal infections,[11,20,22-24] otitis media[18,22,25-30] and allergic rhinitis.[31-35] BF may be protective against overweight and obesity among children[36-39] and type 2 diabetes.[38,40,41]

There are very few health risks to children associated with BF. BF beyond 12 months may increase the risk of dental caries.[42] BF can expose children to contaminants, such as polychlorinated biphenyls,[43] certain infections,[44] and medications[45] when present in the mother's body. In the case of environmental contaminants, the benefits of BF are thought to outweigh potential risks.[46,47] For some infections, like human immunodeficiency virus, BF is discouraged.[48]

In addition to the benefits to infant and child health, BF can benefit the health of mother. Women who breastfeed have lower risk of breast and ovarian cancer,[11,49-55] type 2 diabetes,[11,56-59] and cardiovascular disease.[60-63] Because BF can cause lactational amenorrhea, it can support healthy birth spacing.[49] There is some evidence that BF is associated with healthier body mass

[a] A review of the mechanisms through which BF impacts infant and maternal health outcomes is beyond the scope of this paper. For more information on the advantages of breast milk compared to alternative infant foods, the impact of breastmilk on the infants' immune system and related topics, see: Victora CG, Bahl R, Barros AJ, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *The Lancet*. 2016;387(10017):475-490, and Andreas NJ, Kampmann B, Mehring Le-Doare K. Human breast milk: A review on its composition and bioactivity. *Early Human Development.* 2015;91(11):629-635.
For the impacts of BF on maternal health, including reduction of breast cancer risk, see González-Jiménez E, García PA, Aguilar MJ, Padilla CA, Álvarez J. Breastfeeding and the prevention of breast cancer: a retrospective review of clinical histories. *Journal of clinical nursing*. 2014;23(17-18):2397-2403, and Hahn-Holbrook J, Schetter CD, Haselton MA. Breastfeeding and maternal mental and physical health. *Women's Health Psychology*. 2013:414-39.

index and postpartum weight loss among mothers[64,65] although others found it was not related.[11] Researchers have observed reduced risk of depression among mothers who breastfeed,[11,66,67] although other evidence suggests that relationship is not significant.[49] BF cessation can worsen symptoms of anxiety and depression; however, anxiety and depression may themselves contribute to earlier BF cessation.[68-70]

As with infants, there are few risks associated with BF for mothers, but BF can be a complicated behavior to initiate and maintain.[71] A poor latch or other problems can lead to breast pain[72] as well as mastitis, or infection of the breast tissue.[73,74] Pain during BF has been associated with increased depression among new mothers.[72,75]

In addition to direct impacts on the physical and mental health of mothers, BF is imbued with social and personal significance for many mothers.[76] This adds another set of health implications, both for mothers who do and mothers who do not breastfeed, depending on their own values and circumstances. BF-related interactions with healthcare providers can be positive, helpful experiences, but some mothers report feeling ignored, judged or treated in a discriminatory manner when receiving clinical BF support.[77] Furthermore, BF is now the normative form of infant feeding in the US; most women intend to BF for six months, although the majority do not, as discussed below.[78] Mothers who do not meet their personal BF goals may feel guilty or ashamed, particularly if they believe others are negatively judging them.[79,80] Among working women, who experience additional barriers to continued BF,[81] experiencing problems combining BF with working may result in negative work-related psychosocial outcomes, such as low job satisfaction, although the literature is inconclusive.[82,83]

Methodological considerations and evolving evidence: BF has been operationalized and measured in many ways. In general, results for "more" BF, whether longer duration, any BF as opposed to no BF, or exclusive BF as opposed to mixed feeding, show consistent health benefits. There is also evidence of a dose response effect. For many outcomes, such infant weight,[84] maternal postpartum weight,[85] and maternal breast cancer,[86] each additional month of BF is associated with increased health benefits. This suggests it is valuable to assess BF behaviors using a continuous or interval measure of duration.

Breastfeeding Recommendations: In light of the health benefits from BF for infants and mothers, the American Academy of Pediatrics[87] and the World Health Organization (WHO)[88] recommend exclusive BF until infants reach six months of age, and continued BF along with supplemental feeding until at least 12 months (24 months, in the case of WHO). In the US, the Healthy People 2030 national public health objectives include increasing the proportion of infants exclusively BF until six months and the proportion continuing to BF at 12 months.[89]

Racial inequities in breastfeeding

Among births in the US, 83% of mothers initiated BF, yet only 25% exclusively breastfeed until six months.[78] Also, 36% continued some BF through 12 months (not taking exclusivity into account).[78] BF prevalence in the US has steadily increased over time in the past half century. In the 1960s and 70s, fewer than half of infants were breastfed at all, and that proportion has increased steadily up to the present.[78,90]

BF behaviors vary by most sociodemographic characteristics. Mother's age, educational attainment, and household income are all positively associated with initiating BF and BF duration.[91] Foreign-born mothers are more likely to BF than US-born mothers.[92] Geographically, BF is more common in an urban areas compared to rural areas,[93] as well as in the Northeast,

Northwest and Southwest regions compared to the Southeast and Midwest regions of the US.[91] BF is more common with first born children than with subsequent births.[93]

BF also varies by race.[b] In the US, infants who are Asian, White or Latina are more likely to be breastfed at all and to reach six months of exclusive BF, while infants who are Black and American Indian or Alaskan Native are less likely. Specifically, among infants born in 2015, 86% of White infants were breastfed, compared to 69% of Black infants, 89% of Asian American infants, 85% of Latinx infants, and 76% of American Indian or Alaskan Native infants (crude rates, based on National Immunization Survey data).[78] Similar patterns emerge for exclusive BF until six months: 30% of White infants meet this target, compared to 17% of Black infants, 30% of Asian American mothers, 21% of Latina mothers, and 20% of American Indian or Alaskan Native mothers.[78] BF rates have increased over time for most race groups, but some of the gains were unequal. Between 2009 and 2015, Black and White infants saw a similarly-sized increase in BF initiation, but the increase in exclusive BF for six months for Black infants was only half the size of the increase observed among White infants.[78] Thus, while BF duration has increased across the board in the past decade, the White-Black disparity in duration for six months has widened.

In a 2011 Call to Action to Support BF report, the US Surgeon General stated that it is a public health priority to establish equity across sociodemographic groups in meeting BF recommendations.[9] Inequities in BF, particularly racial inequities, are recognized as a serious

[b] BF is a dyadic activity between a mother and infant, and racial differences in BF outcomes can be presented as infant health disparities or a maternal health disparities. In this paper, I cite bodies of literature that use both approaches. BF patterns by race are generally consistent whether the point of reference is the child's race or mother's race. However, infant race and mother's race do not always match; for instance, as a result of interracial unions, some children racially identify differently than their mothers. Over 90% of infants born to White mothers and of infants born to Black mothers have fathers of the same race and identify using the same race as their mother. (See Brunsma, Interracial families and the racial identification of mixed-race children: Evidence from the Early Childhood Longitudinal Study. *Social Forces*. 2005;84(2):1131-1157.) The assumption that mother's and child's race are the same applies to the majority of the population, albeit not everyone.

and persistent public health problem facing the US.[9,78,91,94-97] Accordingly, there is strong public health interest in understanding why racial inequities in BF persist,[9,97] and this question will be the focus of a later section in this chapter. While inequities among all the aforementioned groups are important public health concerns, I am focusing on the inequities between Black and White mothers. This narrow focus allows for a more specific and informative examination of race, racism and occupation for these two groups of women. It also allowed for more rigorous multivariate analyses in the following chapters.

Race is a social construct[98] and it relates to most health outcomes, including BF behaviors, because it determines exposures to other causal factors.[99] There is nothing intrinsic to any race group that determines BF outcomes (indeed, there are examples from communities within and outside the US where Black mothers BF more than White mothers.[c]) Rather, differences in BF behaviors are related to structural racism and white supremacy, which have treated White Americans preferentially and treated Black Americans harmfully in many aspects of their lives.[100] Structural racism refers to racial discrimination implemented by institutions, often through rules or policies that can be intentionally discriminatory, or discriminatory in their effect.[101,102] The bulk of research addressing racism and discrimination has focused on interpersonal racism, which has to do with interactions between individuals, as opposed to structural discrimination, even though both are essential for understanding and ameliorating health inequities.[101] In the case of BF, there is little quantitative work attempting to identify

[c] In Minnesota, for instance, a higher proportion of Black mothers initiate BF (91%) and continue through 12 months (40%) than White mothers (88% and 36%, respectively). (See Anstey and colleagues. Racial and geographic differences in breastfeeding—United States, 2011–2015. *Morbidity and Mortality Weekly Report*. 2017;66(27):723). Also, in the United Kingdom, Black mothers are far more likely to BF than White mothers. (See Kelly and colleagues. Racial/ethnic differences in breastfeeding initiation and continuation in the United Kingdom and comparison with findings in the United States. *Pediatrics.* 2006;118(5):e1428-e143.) Birthplace may play a role in those patterns. (See Bonuck et al, Country of origin and race/ethnicity: impact on breastfeeding intentions. *Journal of Human Lactation.* 2005;21(3):320-326.)

which mediating pathway(s), whether through interpersonal racism, structural racism, or something else, link race to disparities in BF among US mothers. This is a limitation for finding solutions to those disparities.

Quantitative studies that assess what factors explain the variation in BF among mothers of different races are needed. The first step is considering which variables could plausibly mediate this relationship between race and BF. Existing research highlights factors from the intra- and interpersonal to the systemic level that can influence BF behaviors among Black and/or White mothers. A family history of BF,[103,104] BF experience with a previous child,[77] supportive family members and partners,[71,77,103] positive attitudes and beliefs about BF,[103,105] medical conditions that make BF more appealing (e.g., infant struggled to digest formula),[103] support from healthcare providers,[71,77,103] and for those who work, having a job that accommodates lactation breaks[103] are all facilitators of BF. On the other hand, healthcare providers who were not supportive or gave incorrect or insufficient information about BF,[103,104] medical issues with BF (e.g., problems with latch),[103] and lack of support from one's partner or other family members,[77,104] are barriers to BF. Notably, lactation consultants are more likely to be White than Black,[106] and some White lactation consultants have provided Black patients with lower quality or discriminatory treatment.[107,108]

Thus, there are many drivers of BF behaviors that can vary in conjunction with race; many of these, including lower quality healthcare and barriers to BF at certain jobs, are closely linked to structural racism. Yet, the quantitative evidence to show which of these might mediate racial differences in BF is limited. To the best of my knowledge, only two peer-reviewed studies conducted mediation analysis for potential pathways between Black compared to White race and

BF outcomes among term infants in the US. [d] Both considered employment, albeit in limited ways. First, McKinney and colleagues quantitatively assessed an array of potential mediators, including health beliefs, health conditions, BF family history, and employment status at one month postpartum to determine which explained variation in BF initiation and duration among Hispanic, White and Black mothers.[109] Regarding the Black-White disparity, they found that demographic variables like poverty, education and marital status explained the initiation disparity, and that those variables plus formula feeding in-hospital explained the difference in duration. History of BF in the family explained higher BF initiation among Hispanic compared to White mothers.[109] Employment rate did not vary significantly among the racial/ethnic groups in the study, and that variable was not included in the full mediation analysis.[109] Because the study operationalized employment through a dichotomous variable for employed or not, and it did not take into account the type of occupation or working conditions that have been linked to BF,[110-118] the findings about work as a mediator are limited.

Similarly, Safon and colleagues also examined whether multiple variables including maternal employment during pregnancy (dichotomous variable), sociodemographic variables like age, and BF-related attitudes and perceived norms mediated the relationship between White and Black race/nativity and BF outcomes.[119] They found that the BF disparities between US-born Black compared to US-born White mothers were partly explained by age, education, infant birthweight, family caregiving arrangement, participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), use of infant care information, BF-related

[d] A third study focused on mediators of the racial disparities in BF at time of discharge among infants born with very low birth weight. (See Patel, A.L., Schoeny, M., Hoban, R. et al. Mediators of racial and ethnic disparity in mother's own milk feeding in very low birth weight infants. Pediatric Research. 2019; 85, 662–670.) Also, a dissertation study examined the effect of Baby-Friend Hospital Initiative practices on racial and ethnic disparities in BF in the state of Illinois. (See Bennett, A. C. (2014). Racial/Ethnic Disparities in Breastfeeding and Potential Mediation by Hospital Practices (Doctoral dissertation, University of Illinois at Chicago).

attitudes, and employment status.[119] US-born Black mothers were less likely to be employed in pregnancy and less likely to be exclusively BF at follow up than US born White mothers, and path analysis showed that being employed during pregnancy was associated with decreased likelihood of exclusive BF at follow-up.[119] As with the study by McKinney and colleagues,[109] the study by Safon and colleagues did not consider occupation type or working conditions.

A number of other studies, while not conducting mediation analysis per se, have quantitatively examined interrelationships between race and other characteristics in connection with BF outcomes. For instance, Li and colleagues examined interrelationships among race and other predictors of BF. The authors used nationally representative data to produce race-specific rates of BF initiation and exclusive duration to six months, both crude and adjusted by infant age, birth order, participation in WIC, maternal marital status, maternal education, and household poverty level.[120] The racial differences in BF remained in the adjusted model, and the authors concluded that racial inequities in BF were independent of socio-demographic characteristics, and instead were due to health care system problems.[78] They did not take into account occupation or any work-related differences. Also, Ryan and colleagues found that mothers working full time work had shorter BF duration compared to those who worked part-time or not at all. They also found that Black women were both more likely to work full time and were less likely to BF until six months when compared to White mothers.[121]

In short, a small number of prior studies have considered how employment status may mediate or otherwise interrelate with the association between race and BF outcomes. These studies paint a mixed picture of the role of maternal work with BF, and most did not consider the type of occupation or the working conditions to which mothers are exposed.

Employment, occupation and working conditions as drivers of breastfeeding behaviors

Employment status and occupation are known predictors of BF.[81] More than 25% of new mothers are working by the time the infant reaches three months, and more than half by six months.[122] The proportion of mothers who engage in paid employment within one year of giving birth has increased substantially during the past five decades; only 14% of new mothers were working at six months postpartum in the 1960s, compared to 57% in the early 2000s.[122] Continuing to breastfeed while physically separated from the infant requires that mothers regularly express (or pump) breastmilk, store it at a sufficiently cool temperature, and transport it home each day.[103,104,123] These demands make it challenging for working mothers to continue BF. Currently, women who are not employed typically breastfeed longer than those who are, particularly those working full-time.[121,124,125] BF-related problems with work or school are commonly cited reasons for BF cessation.[126] Returning to work sooner after giving birth is associated with shorter BF duration.[127,128]

It is not just a mother's employment status that matters for BF, but also whether her job is accommodating of BF. Women who work in jobs that are hazardous, inflexible, lack parental leave benefits and/or do not have lactation accommodations tend to breastfeed for shorter duration,[113-118,129] as do women working non-professional jobs, such as administrative, service and manual labor jobs.[110-112,128,130] Yet, the evidence is mixed regarding whether, at the population level, mothers in more accommodating jobs breastfeed for longer than mothers who do not work at all.

Only two studies have compared BF duration for non-working mothers with mothers in a variety of occupation types using US-wide data. First, Kimbro and colleagues utilized a racially diverse, mostly low-income sample of births from 1998-2000, and found that mothers who did not work breastfed longer than mothers in administrative or manual work, but not more than

mothers in service occupations.[110] An earlier study by Visness and colleagues, using a representative sample of US births, found that among White mothers, those who did not work breastfed longer than mothers who did, regardless of occupation. Among Black mothers that relationship was similar, except that those in service/manufacturing work did not have significantly different BF outcomes from mothers who did not work at all.[111]

In sum, the literature does not present a clear picture of whether working at all during the postpartum period is consistently associated with shorter or less BF, or whether, for instance, professional/managerial working mothers may have comparable BF outcomes to mothers that are not working. Furthermore, those relationships may differ among Black and White mothers, and this would have implications about how to target workplace BF interventions in order to reduce racial inequities in BF. Visness and colleagues found that among Black mothers, at least one occupation group did not differ significantly in BF outcomes from mothers who did not work, but that was based on births from 1988, and a more recent study is needed.

Working conditions: The literature also presents an incomplete picture about which working conditions are relevant for BF, and how those conditions may relate to racial differences in BF. Working conditions refers to a broad range of factors, including psychosocial conditions, physical conditions, hours, breaks, schedules and pay, that characterize people's relationship to their paid work.[131] Psychosocial working conditions encompass the interaction among individuals in a workplace, and how that interaction relates to the way workers do their jobs.[132,133] Qualitative findings illustrate how psychosocial working conditions, including control over taking breaks and support from supervisors and colleagues, can determine whether working mothers continue BF. For instance, some mothers describe not being able to take pumps breaks when they needed and as a consequence losing their milk supply, while others describe having support from colleagues that enabled them to take pump breaks whenever they needed.[103,104]

Low Job Control: One psychosocial working condition that may be particularly relevant to BF is low job control. Low job control, defined by Karasek,[134] describes jobs that offer workers little or no decision-making discretion and intellectual authority.[e] Jobs characterized by both low job control and high demands produce job strain,[134,135] which is associated with heart disease[136,137] and other adverse health outcomes.[138-143] Low job control is also associated with decreased physical activity[144] and poor diet among workers,[145] and low job control among pregnant working mothers has been linked to low birth weight for their infants.[146] Low job control is similar to job inflexibility, which has been linked to shorter BF duration,[118] but I am aware of no prior research linking the construct of low job control to BF behaviors.

High physical workload: High physical workload is another commonly studied health risk in the workplace, and it includes lifting, pushing, pulling and other repetitive physical motions[147] as well as long periods standing[148] performed as part of one's job. Women who are exposed to high physical workload while pregnant have higher risk of adverse birth outcomes, including preeclampsia,[57] preterm birth,[149-151] low birthweight,[150,151,] and smaller fetal head circumference.[148] To the best of my knowledge, there is no research linking physical workload to BF outcomes; this is to be expected because it is not very plausible that physical workload would impact a mother's ability to express milk throughout her work day. However, because physical workload is a commonly-studied occupational health exposure in other maternal health topics,[147,150] and may also be affected by occupational segregation by race,[152] as described below, it provides a useful contrasting perspective analyzed alongside job control.

Job satisfaction: Job satisfaction refers to a person's judgment about to what degree their job fulfills their work-related ideals and values.[153] Unlike low job control and high physical

[e] Low job control, as well as high physical workload, are characteristics of the job, not of the worker.

workload, which are characteristics of the job that can predict health behaviors and health outcomes, job satisfaction is an appraisal made by the worker that reflects their general socio-emotional wellbeing.[154] Job satisfaction is associated with mental and physical health,[154,155] and experiencing conflict between one's work and family responsibilities can lead to decreased job satisfaction.[156-158] BF may be one source of such conflict, particularly when workplaces are not accommodating of a mothers BF-related needs.[159,160] There is some evidence that workplace BF support relates to job satisfaction among women in the US,[82,83] although the two published studies on this topic operationalized workplace BF support in limited ways.

Can working conditions help explain racial inequities in BF?

Thus, occupation and working conditions are important factors that influence BF behaviors. Occupation is of particular interest in explaining population-level BF disparities in the US because occupation is racially patterned, or segregated.[161,162] Disparities in education, in hiring, firing and layoffs and other systemic barriers have benefited White Americans and disadvantaged Black Americans when it comes to job opportunities.[163-165] These dynamics have impacted working mothers. White women are disproportionately likely to work in professional or management positions, while Black women are disproportionately likely to work in service occupations or transportation, in inflexible jobs[161,166] and jobs that do not offer paid maternity leave.[167] Even within the same occupation, Black women can face additional BF barriers than White women,[168] including racist treatment from a supervisor.[168-172]

Given these differences, work is likely to be interrelated with racial disparities in BF, potentially as a mediator or as a moderator. However, existing research paints an incomplete picture. The US Surgeon General's 2011 report on BF noted that low rates of BF among Black mothers were "not well understood, but employment may play a role." [9 (page 8)] As noted earlier, the few studies that assessed whether work variables mediate BF outcomes between Black and

White women had mixed results, and assessed employment in limited ways.[109,119] One found that employment status (measured dichotomously, at one month postpartum) did not differ sufficiently among White, Black and Hispanic mothers to be included in full mediation analysis.[109] Another study assessed employment status during pregnancy and found that Black mothers were less likely than White mothers to work, but they were also less likely to exclusively BF at follow-up. Path analysis found that employment in pregnancy related to less exclusive BF at follow-up.[119] Neither study examined occupation type or working conditions.

In short, there are gaps in the empirical literature about the interrelationships between racial inequities in BF, mother's employment status, occupation and working conditions, and also about psychosocial outcomes of workplace BF experiences. Next, I outline a set of existing theoretical models that inform my approach to examining these interrelationships and filling the gaps in the literature. Then, I propose a conceptual framework that will serve as the foundation for three research studies addressing the interrelationships among race, work and BF outcomes.

Theoretical grounding

Work as a structural determinant of health

A number of established theories serve as the foundation for my conceptual model. First, this study is grounded on the perspective of structural racism as a *Fundamental Cause* of health outcomes and health disparities.[173] Phelan and Link describe how structural forces, including access to power in institutions like education, government and industry, are a primary way racism has worked to unfairly advantage White Americans. Accordingly, one pathway linking an individual's race to their health outcomes is by way of socioeconomic status, including occupation.[173] I extend this idea by connecting occupation to working conditions and in turn to the ability to engage in BF.

Relatedly, the *Social Ecological Theory* emphasizes the role of higher-level institutional, community and policy factors, such as one's occupation and the policies and institutional factors that shape working conditions, in explaining why people do or do not engage in health behaviors like BF. These are in addition to the more commonly studied intrapersonal and interpersonal factors.[174] A similar theory, albeit more geared towards direct practice, exists in occupational health. The *Hierarchy of Controls* model posits that to protect the health of workers, it its more effective to address the fundamental, structural features of a job, rather than focusing on things like administrative changes, which rely on individuals to implement them.[175] While the Hierarchy of Controls model is more often applied to physical, chemical and electrical hazards[176] as opposed to health behaviors like BF, it highlights the necessity of addressing underlying working conditions relevant to a specific health outcome. In the case of BF, that points towards examining working conditions such as job control that can make BF difficult, and not solely focusing on lower-level, circumscribed interventions like creating accessories for a lactation space.[177]

Theory related to psychosocial working conditions are also central to this study. The term psychosocial working conditions often refers to psychosocial stress at work,[178-180] but more formally, psychosocial working conditions are defined as the interactions among factors like the work environment, organizational conditions, job content, and the characteristics of the workers[132,133,181] Low job control is a psychosocial working condition of particular interest here. It is part of the *Job Demand-Control* model, [52] and describes jobs with low decision-making discretion and low intellectual authority for workers. Combined with high demands, low job control leads to job strain,[134,135] and is thought to impact a variety of health outcomes through the stress pathway.[136,137] Low job control may also impact health by impacting health behaviors.[144,145] In Chapter 3, I examine whether low job control is predictive of BF behaviors.

Integration of work and family

An additional area of theoretical grounding comes from social theories about the integration of work and family roles. I will highlight two distinct perspectives.

First, the *Work-Family Conflict theory* emphasizes conflicts between workers' roles at home and their roles at their job.[182] In addition, the theory of *Intensive Mothering* posits that idealized motherhood requires substantial investment of time and resources, frequently at the expense of mother's professional priorities.[183,184] Taken together, Work-Family Conflict and Intensive Mothering suggest that mothers' paid work necessarily presents barriers to BF and will be very difficult to reconcile.

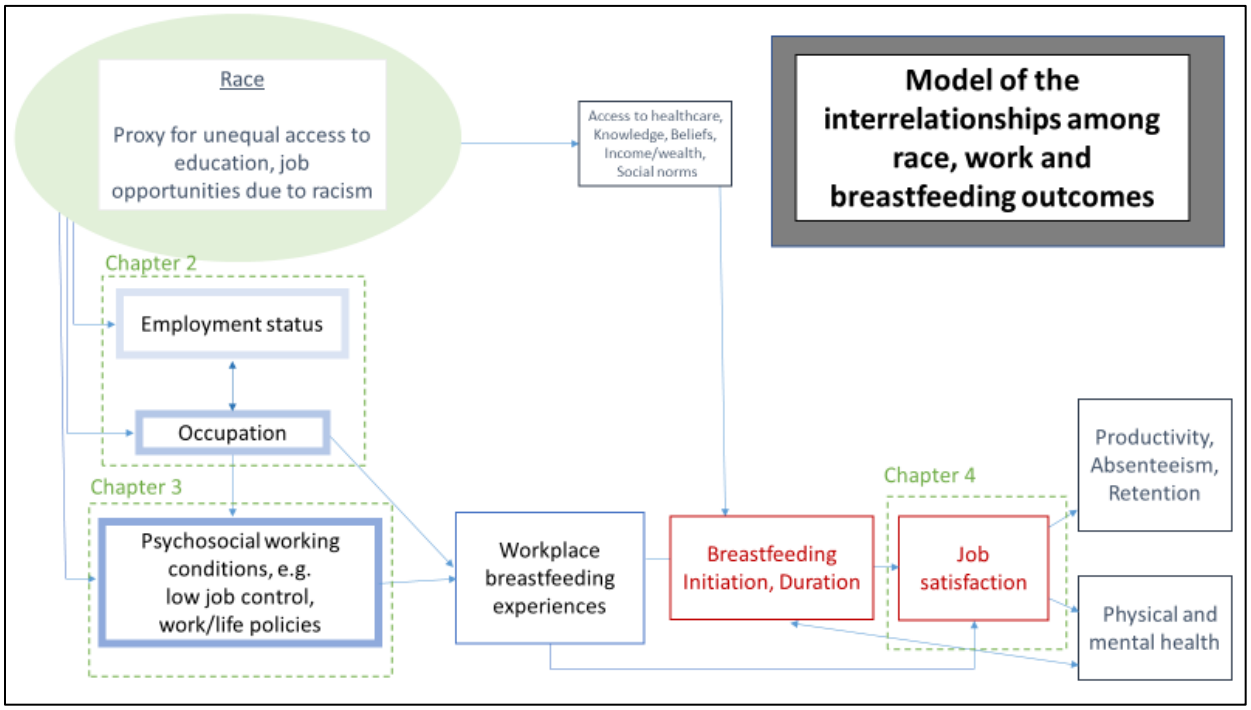
Second, and in contrast, Dow's *Market-Family Matrix* framework postulates that women's work and family roles can be integrated in many ways, either conflicting or mutually beneficial, depending on the characteristics of each.[185] This theory grew out of qualitative research about motherhood among middle class Black women, which found that Black women may perceive more benefits and fewer drawbacks with combining work and family in comparison to White women, and in an apparent contradiction to traditional work-family theory.[185] The BF behaviors under study here serve as a topical focus within the broader range of family roles that parents hold. By exploring to what degree working at all, as well as working in jobs that are more or less accommodating of BF, may be associated with BF outcomes, I hope to provide information about whether and how some mothers successfully combine work and BF.

Proposed conceptual framework

Inspired by the above theories, and motivated to examine the interrelationships among race, work and BF outcomes, I am proposing the conceptual model shown in Figure 1.1. The framework shows that race functions as a proxy for exposure to unequal access to education and job opportunities on account of structural racism. Those in turn influence employment status,

occupation and psychosocial working conditions experienced by working mothers. Those conditions determine a mother's workplace BF experiences and can be determinants of BF initiation and duration. Workplace BF experiences can influence job satisfaction, both by way of BF experiences and though separate pathways. I also propose that job satisfaction predicts work-related outcomes like productivity as well as physical and mental health outcomes.

Figure 1.1 Conceptual model for race, work and breastfeeding



Dissertation overview

The framework shown in Figure 1.1 guides three empirical research studies to contribute to scientific knowledge about the interrelations among work, race and BF outcomes. The dashed green boxes identify which work-related variables are addressed in each chapter.

Chapter 2: The impact of work on BF behaviors among mothers: Do patterns differ for White compared to Black mothers?

Maternal employment status and occupation type are recognized predictors of BF outcomes. Not working is predictive of longer BF duration, but among mothers who do work, holding a professional/managerial job is predictive of longer BF duration compared to working in a manual labor or service job. There is a gap in the literature about whether not working at all is still associated with longer BF when compared to working in a professional/managerial job. Furthermore, Dow's Market-Family Matrix model indicates that Black and White mothers may have district experiences integrating work with BF, and it is unknown whether broad patterns about the relationship between employment and occupation type and BF outcomes are the same for both Black and White mothers.

For these reasons, in Chapter 2 I have addressed two questions: first, how do employment status *and* occupation type, considering non-working mothers along with those in professional/managerial jobs and those in service/labor jobs, relate to BF initiation and BF duration? Of particular interest was whether mothers who did not work at all would have different outcomes from mothers in professional/managerial jobs, which tend to be more accommodating of BF. Second, do the relationships between employment status, occupation and BF outcomes differ for White versus Black mothers? Work-family conflict theory implies that not working would consistently be associated with longer BF, but the Market-Family Matrix model implies that in some cases, working may be associated with longer BF, particularly among Black mothers.

I used data from the Panel Study of Income Dynamics (PSID) to address these questions. Information about maternal employment status, occupation and maternal race self-identification came from the PSID Main Study, and this was linked to BF outcome data in the PSID Child

Development Supplement. I categorized maternal work into three categories: not working during the postpartum period, working in a professional//management job or working in a service/labor job. Maternal race was operationalized as Black, White or other races. The BF outcome was BF duration in months. I included maternal age, maternal educational attainment (four-year college degree or not), marital status, and whether or not the infant had low birthweight infant as control variables.

For multivariate statistical modeling, I created two zero-inflated negative binomial models, which enabled me to model both BF (non) initiation and BF duration in months as outcomes. Both models used race and employment/occupation and independent variables, and both controlled for the full set of control variables. The first model indicated whether BF outcomes were significantly different for mothers in those three employment/occupation categories. The second model differed in that it included an interaction term between race and employment/occupation. The model with the interaction term indicated whether the relationship between employment/occupation may differ for women who identify as White, Black or other races. Contrasts of marginal linear predictions by race and employment/occupation illustrate the implications of the model for BF outcomes.

Chapter 3: Low job control and racial disparities in BF

The disparity in BF outcomes between White and Black mothers is a frequently studied public health issue. Occupational segregation and the fact that Black mothers tend to hold jobs that are less flexible and less accommodating for BF than the jobs held by White mothers may explain lower BF rates among Black mothers, but this question has not been adequately addressed in existing literature. Psychosocial working conditions, and in particular low job control, may be an informative construct to help understand variations in BF. Although low job

control was originally theorized as a way to operationalize stressful work,[134] and has most often been studied in that regard (e.g., work by Kivimäki and colleagues[136]), it has also been used to understand why workers in certain jobs engage in less healthy behaviors.[144,145] If low job control is predictive of shorter BF duration, it will further support the application of that construct to understand health behaviors among workers. Also, if low job control is predictive of BF behaviors, and if there is a disparity by race in which mothers are exposed to low job control, it may function as a mediator of racial inequities in BF.

Accordingly, in Chapter 3 I have addressed the question of whether low job control mediates the relationship between Black versus White race and BF initiation and duration outcomes. Like Chapter 2, Chapter 3 also uses PSID data. Data on mother's self-identified race (Black, White, or other), employment status, occupation, and other characteristics come from the PSID Main Study and were linked to BF initiation status and duration in months in the PSID Child Development Supplement. Estimates for working conditions like low job control were linked from a job exposure matrix. As control variables, I used maternal age, education attainment (college degree or not), marital status, whether the infant had low birth weight, and the mother's hours worked per week (less than 20, 20 to 40 hours, or more than 40).

I applied two approaches to mediation analysis. First, following the Baron and Kenny approach to mediation analysis,[186] I created a set of zero-inflated negative binomial models to assess whether the explanatory power of the indicator variable for Black vs White race was reduced when low job control was added to the model. Second, I created a path analytic model. The path model had direct paths between race and BF outcomes as well as an indirect path via low job control, taking control variables into account. The BF outcomes in the path model were

no BF, BF for less than six months, and BF for six months or more. I calculated the direct and indirect effects, and the percent of variation in BF explained by low job control.

Chapter 4: Workplace BF support and job satisfaction among working mothers

Job satisfaction is an indication of the overall wellbeing of workers, and it is a relevant outcome from both a health standpoint and an employer's standpoint. The experience of work-life conflict is associated with lower job satisfaction, and it is likely that experiencing problems combining work and BF would also be associated with a decrease in job satisfaction for working mothers. However, prior studies have provided limited evidence on this topic.

Based on that preliminary information, in Chapter 4 I have examined whether experiencing BF-related problems at work, assessed at three months postpartum, was associated with a reduction in job satisfaction at nine and 12 months postpartum among working mothers. To study this question, I used data from the longitudinal Infant Feeding Practices Study II. I assessed how many problems women reported with BF, out of a list of items that included not having a space to express milk, not having time, or receiving negative comments from coworkers or supervisors. I grouped responses about BF-related problems two ways: by the number of problems reported, and also singling out problems with space and time to pump, which have specific policy implications, and comparing them to any other problems reported. Job satisfaction was assessed with a single item, asked at multiple points. I controlled for maternal age, annual household income, mother's race/ethnicity, hours worked per week, and work setting.

I used multivariate logistic regression models predicting low job satisfaction scores. The first set were cross-sectional models, examining whether BF problems at work were predictive of concurrent low job satisfaction, all at three months postpartum. The second set of models were

longitudinal in nature, using BF problems at three months to predict low job satisfaction at 12 months, and controlling for low job satisfaction at three months as a covariate.

Chapter 5: Conclusion

In Chapter 5, I review the studies and their findings and highlight the theoretical contributions and implications for policy

References

1. Monasta L, Batty G, Cattaneo A, et al. Early-life determinants of overweight and obesity: a review of systematic reviews. *Obesity Reviews.* 2010;11(10):695-708.
2. Bartick MC, Jegier BJ, Green BD, Schwarz EB, Reinhold AG, Stuebe AM. Disparities in breastfeeding: impact on maternal and child health outcomes and costs. *The Journal of Pediatrics.* 2017;181:49-55. e46.
3. Woo JG, Dolan LM, Morrow AL, Geraghty SR, Goodman E. Breastfeeding helps explain racial and socioeconomic status disparities in adolescent adiposity. *Pediatrics.* 2008;121(3):e458-e465.
4. Joint statement by the UN Special Rapporteurs on the Right to Food, Right to Health, the Working Group on Discrimination against Women in Law and in Practice, and the Committee on the Rights of the Child in Support of Increased Efforts to Promote, Support and Protect Breast-feeding [press release]. 2016.
5. Grummer-Strawn LM, Zehner E, Stahlhofer M, et al. New World Health Organization guidance helps protect breastfeeding as a human right. *Maternal & Child Nutrition.* 2017;13(4):e12491.
6. Stuebe A. How might we protect, promote, and support the human right to breastfeed? *Breastfeeding Medicine.* 2020;15(12):814-815.
7. Allers KS. The False and the furious: countering misinformation and negative messaging in breastfeeding support. *Clinical Lactation.* 2018;9(4):164-170.
8. Pérez-Escamilla R, Sellen D. Equity in breastfeeding: where do we go from here? *Journal of Human Lactation.* 2015;31(1):12-14.
9. Office of the Surgeon General, Centers for Disease Control and Prevention, Office on Women's Health. Publications and Reports of the Surgeon General. In: *The Surgeon*

General's Call to Action to Support Breastfeeding. Rockville (MD): Office of the Surgeon General (US); 2011.

10. Pérez-Escamilla R. Breastfeeding in the 21st century: How we can make it work. *Social Science & Medicine.* 2020;244:112331.
11. Ip S, Chung M, Raman G, Trikalinos TA, Lau J. A summary of the Agency for Healthcare Research and Quality's evidence report on breastfeeding in developed countries. *Breastfeeding Medicine.* 2009;4(S1):S-17-S-30.
12. Hauck FR, Thompson JMD, Tanabe KO, Moon RY, Vennemann MM. Breastfeeding and reduced risk of Sudden Infant Death Syndrome: a meta-analysis. *Pediatrics.* 2011;128(1):103-110.
13. Vennemann MM, Bajanowski T, Brinkmann B, et al. Does breastfeeding reduce the risk of Sudden Infant Death Syndrome? *Pediatrics.* 2009;123(3):e406-e410.
14. Thompson JMD, Tanabe K, Moon RY, et al. Duration of breastfeeding and risk of SIDS: an individual participant data meta-analysis. *Pediatrics.* 2017;140(5):e20171324.
15. Alm B, Wennergren G, Norvenius SG, et al. Breast feeding and the sudden infant death syndrome in Scandinavia, 1992–95. *Archives of Disease in Childhood.* 2002;86(6):400-402.
16. Chen A, Rogan WJ. Breastfeeding and the risk of postneonatal death in the United States. *Pediatrics.* 2004;113(5):e435-e439.
17. Quigley MA, Kelly YJ, Sacker A. Breastfeeding and hospitalization for diarrheal and respiratory infection in the United Kingdom Millennium Cohort Study. *Pediatrics.* 2007;119(4):e837-e842.
18. Scariati PD, Grummer-Strawn LM, Fein SB. A longitudinal analysis of infant morbidity and the extent of breastfeeding in the United States. *Pediatrics.* 1997;99(6):e5-e5.

19. Oddy WH, Sly PD, de Klerk NH, et al. Breast feeding and respiratory morbidity in infancy: a birth cohort study. *Archives of Disease in Childhood.* 2003;88(3):224-228.

20. Duijts L, Jaddoe VWV, Hofman A, Moll HA. Prolonged and exclusive breastfeeding reduces the risk of infectious diseases in infancy. *Pediatrics.* 2010;126(1):e18-e25.

21. Horta BL, Victora CG. *Short-Term Effects of Breastfeeding: A Systematic Review of the Benefits of Breastfeeding on Diarhoea and Pneumonia Mortality.* Geneva: World Health Organization;2013.

22. Frank NM, Lynch KF, Uusitalo U, et al. The relationship between breastfeeding and reported respiratory and gastrointestinal infection rates in young children. *BMC Pediatrics.* 2019;19(1):339.

23. Fisk CM, Crozier SR, Inskip HM, et al. Breastfeeding and reported morbidity during infancy: findings from the Southampton Women's Survey. *Maternal & Child Nutrition.* 2011;7(1):61-70.

24. Duijts L, Ramadhani MK, Moll HA. Breastfeeding protects against infectious diseases during infancy in industrialized countries. A systematic review. *Maternal & Child Nutrition.* 2009;5(3):199-210.

25. Brennan-Jones CG, Eikelboom RH, Jacques A, et al. Protective benefit of predominant breastfeeding against otitis media may be limited to early childhood: results from a prospective birth cohort study. *Clinical Otolaryngology.* 2017;42(1):29-37.

26. Kørvel-Hanquist A, Koch A, Lous J, Olsen SF, Homøe P. Risk of childhood otitis media with focus on potentially modifiable factors: A Danish follow-up cohort study. *International Journal of Pediatric Otorhinolaryngology.* 2018;106:1-9.

27. Kaur R, Morris M, Pichichero ME. Epidemiology of acute otitis media in the postpneumococcal conjugate vaccine era. *Pediatrics.* 2017;140(3):e20170181.

28. van Ingen G, le Clercq CMP, Touw CE, et al. Environmental determinants associated with acute otitis media in children: a longitudinal study. *Pediatric Research.* 2020;87(1):163-168.

29. Bowatte G, Tham R, Allen K, et al. Breastfeeding and childhood acute otitis media: a systematic review and meta-analysis. *Acta Paediatrica.* 2015;104:85-95.

30. Kørvel-Hanquist A, Djurhuus BD, Homøe P. The Effect of breastfeeding on childhood otitis media. *Current Allergy and Asthma Reports.* 2017;17(7):45.

31. Han DH, Shin J-M, An S, et al. Long-term breastfeeding in the prevention of allergic rhinitis: Allergic Rhinitis Cohort Study for Kids (ARCO-Kids Study). *Clinical and Experimental Otorhinolaryngology.* 2019;12(3):301-307.

32. Wang X, Liu W, Hu Y, Zou Z, Shen L, Huang C. Home environment, lifestyles behaviors, and rhinitis in childhood. *International Journal of Hygiene and Environmental Health.* 2016;219(2):220-231.

33. Tamay Z, Akçay A, Ergin A, Güler N. Prevalence of allergic rhinitis and risk factors in 6- to 7-year-old children in İstanbul, Turkey. *Turkish Journal of Pediatrics.* 2014;56(1).

34. Lodge CJ, Tan D, Lau M, et al. Breastfeeding and asthma and allergies: a systematic review and meta-analysis. *Acta Paediatrica.* 2015;104:38-53.

35. Bloch AM, Mimouni D, Mimouni M, Gdalevich M. Does breastfeeding protect against allergic rhinitis during childhood? A meta-analysis of prospective studies. *Acta Paediatrica.* 2002;91(3):275-279.

36. Modrek S, Basu S, Harding M, et al. Does breastfeeding duration decrease child obesity? An instrumental variables analysis. *Pediatric Obesity.* 2017;12(4):304-311.

37. Wallby T, Lagerberg D, Magnusson M. Relationship between breastfeeding and early childhood obesity: results of a prospective longitudinal study from birth to 4 years. *Breastfeeding Medicine.* 2017;12(1):48-53.

38. Horta BL, Loret de Mola C, Victora CG. Long-term consequences of breastfeeding on cholesterol, obesity, systolic blood pressure and type 2 diabetes: a systematic review and meta-analysis. *Acta paediatrica.* 2015;104:30-37.

39. Giugliani ER, Horta BL, Loret de Mola C, Lisboa BO, Victora CG. Effect of breastfeeding promotion interventions on child growth: a systematic review and meta-analysis. *Acta Paediatrica.* 2015;104:20-29.

40. Mamun AA, O'Callaghan MJ, Williams GM, Najman JM, Callaway L, McIntyre HD. Breastfeeding is protective to diabetes risk in young adults: a longitudinal study. *Acta Diabetologica.* 2015;52(5):837-844.

41. Young TK, Martens PJ, Taback SP, et al. Type 2 Diabetes Mellitus in Children: Prenatal and Early Infancy Risk Factors Among Native Canadians. *Archives of Pediatrics & Adolescent Medicine.* 2002;156(7):651-655.

42. Tham R, Bowatte G, Dharmage SC, et al. Breastfeeding and the risk of dental caries: a systematic review and meta-analysis. *Acta Paediatrica.* 2015;104:62-84.

43. She J, Holden A, Sharp M, Tanner M, Williams-Derry C, Hooper K. Polybrominated diphenyl ethers (PBDEs) and polychlorinated biphenyls (PCBs) in breast milk from the Pacific Northwest. *Chemosphere.* 2007;67(9):S307-S317.

44. Young SL, Mbuya MN, Chantry CJ, et al. Current knowledge and future research on infant feeding in the context of HIV: basic, clinical, behavioral, and programmatic perspectives. *Advances in Nutrition.* 2011;2(3):225-243.

45. Lanza di Scalea T, Wisner KL. Antidepressant medication use during breastfeeding. *Clinical Obstetrics and Gynecology.* 2009;52(3):483-497.

46. Mead MN. Contaminants in Human Milk: Weighing the risks against the benefits of breastfeeding. *Environmental Health Perspectives.* 2008;116(10):A426.

47. LaKind JS, Lehmann GM, Davis MH, et al. Infant dietary exposures to environmental chemicals and infant/child health: a critical assessment of the literature. *Environmental Health Perspectives.* 2018;126(9):096002.

48. Kennedy VL, Loutfy MR, Brophy J. Issues in applying a harm reduction approach to breastfeeding in the context of maternal HIV. *Clinical Infectious Diseases.* 2015;60(4):672-674.

49. Chowdhury R, Sinha B, Sankar MJ, et al. Breastfeeding and maternal health outcomes: a systematic review and meta-analysis. *Acta Paediatrica.* 2015;104:96-113.

50. Collaborative Group on Hormonal Factors in Breast Cancer. Breast cancer and breastfeeding: collaborative reanalysis of individual data from 47 epidemiological studies in 30 countries, including 50 302 women with breast cancer and 96 973 women without the disease. *The Lancet.* 2002;360(9328):187-195.

51. Zhou Y, Chen J, Li Q, Huang W, Lan H, Jiang H. Association between breastfeeding and breast cancer risk: evidence from a meta-analysis. *Breastfeeding Medicine.* 2015;10(3):175-182.

52. Babic A, Sasamoto N, Rosner BA, et al. Association Between Breastfeeding and Ovarian Cancer Risk. *JAMA Oncology.* 2020;6(6):e200421-e200421.

53. Fortner RT, Sisti J, Chai B, et al. Parity, breastfeeding, and breast cancer risk by hormone receptor status and molecular phenotype: results from the Nurses' Health Studies. *Breast Cancer Research.* 2019;21(1):1-9.

54. Tan M-M, Ho W-K, Yoon S-Y, et al. A case-control study of breast cancer risk factors in 7,663 women in Malaysia. *PloS one.* 2018;13(9):e0203469.

55. Modugno F, Goughnour SL, Wallack D, et al. Breastfeeding factors and risk of epithelial ovarian cancer. *Gynecologic Oncology.* 2019;153(1):116-122.

56. Ley SH, Chavarro JE, Li M, et al. Lactation duration and long-term risk for incident type 2 diabetes in women with a history of gestational diabetes mellitus. *Diabetes Care.* 2020;43(4):793-798.

57. Ziegler A-G, Wallner M, Kaiser I, et al. Long-term protective effect of lactation on the development of type 2 diabetes in women with recent gestational diabetes mellitus. *Diabetes.* 2012;61(12):3167-3171.

58. Jäger S, Jacobs S, Kröger J, et al. Breast-feeding and maternal risk of type 2 diabetes: a prospective study and meta-analysis. *Diabetologia.* 2014;57(7):1355-1365.

59. Aune D, Norat T, Romundstad P, Vatten LJ. Breastfeeding and the maternal risk of type 2 diabetes: A systematic review and dose–response meta-analysis of cohort studies. *Nutrition, Metabolism and Cardiovascular Diseases.* 2014;24(2):107-115.

60. Schwarz EB, Ray RM, Stuebe AM, et al. Duration of lactation and risk factors for maternal cardiovascular disease. *Obstetrics and Gynecology.* 2009;113(5):974-982.

61. Peters SA, Yang L, Guo Y, et al. Breastfeeding and the risk of maternal cardiovascular disease: a prospective study of 300 000 Chinese women. *Journal of the American Heart Association.* 2017;6(6):e006081.

62. Nguyen B, Gale J, Nassar N, Bauman A, Joshy G, Ding D. Breastfeeding and cardiovascular disease hospitalization and mortality in parous women: evidence from a large Australian cohort study. *Journal of the American Heart Association.* 2019;8(6):e011056.

63. Nguyen B, Jin K, Ding D. Breastfeeding and maternal cardiovascular risk factors and outcomes: A systematic review. *PloS one.* 2017;12(11):e0187923.

64. Jarlenski MP, Bennett WL, Bleich SN, Barry CL, Stuart EA. Effects of breastfeeding on postpartum weight loss among U.S. women. *Preventive Medicine.* 2014;69:146-150.

65. da Silva MdCM, Oliveira Assis AM, Pinheiro SMC, de Oliveira LPM, da Cruz TRP. Breastfeeding and maternal weight changes during 24 months post-partum: a cohort study. *Maternal & Child Nutrition.* 2015;11(4):780-791.

66. Dias CC, Figueiredo B. Breastfeeding and depression: A systematic review of the literature. *Journal of Affective Disorders.* 2015;171:142-154.

67. Hahn-Holbrook J, Haselton MG, Dunkel Schetter C, Glynn LM. Does breastfeeding offer protection against maternal depressive symptomatology? *Archives of Women's Mental Health.* 2013;16(5):411-422.

68. Ystrom E. Breastfeeding cessation and symptoms of anxiety and depression: a longitudinal cohort study. *BMC pregnancy and childbirth.* 2012;12(1):1-6.

69. Dennis C-L, McQueen K. The relationship between infant-feeding outcomes and postpartum depression: a qualitative systematic review. *Pediatrics.* 2009;123(4):e736-e751.

70. Hahn-Holbrook J, Schetter CD, Haselton M. Breastfeeding and maternal mental and physical health. *Women's health psychology.* 2013:414-439.

71. Pounds L, Fisher CM, Barnes-Josiah D, Coleman JD, Lefebvre RC. The role of early maternal support in balancing full-time work and infant exclusive breastfeeding: A qualitative study. *Breastfeeding Medicine.* 2017;12(1):33-38.

72. Watkins S, Meltzer-Brody S, Zolnoun D, Stuebe A. Early breastfeeding experiences and postpartum depression. *Obstetrics & Gynecology.* 2011;118(2):214-221.

73. Foxman B, D'Arcy H, Gillespie B, Bobo JK, Schwartz K. Lactation mastitis: occurrence and medical management among 946 breastfeeding women in the United States. *American Journal of Epidemiology*. 2002;155(2):103-114.

74. Barbosa-Cesnik C, Schwartz K, Foxman B. Lactation Mastitis. *JAMA.* 2003;289(13):1609-1612.

75. Brown A, Rance J, Bennett P. Understanding the relationship between breastfeeding and postnatal depression: the role of pain and physical difficulties. *Journal of Advanced Nursing.* 2016;72(2):273-282.

76. Leeming D, Williamson I, Lyttle S, Johnson S. Socially sensitive lactation: exploring the social context of breastfeeding. *Psychology & Health.* 2013;28(4):450-468.

77. Lutenbacher M, Karp SM, Moore ER. Reflections of black women who choose to breastfeed: influences, challenges and supports. *Maternal and Child Health Journal.* 2016;20(2):231-239.

78. Li R, Perrine CG, Anstey EH, Chen J, MacGowan CA, Elam-Evans LD. Breastfeeding trends by race/ethnicity among US children born from 2009 to 2015. *JAMA Pediatrics.* 2019;173(12):e193319-e193319.

79. Fahlquist JN. Experience of non-breastfeeding mothers: norms and ethically responsible risk communication. *Nursing Ethics.* 2014;23(2):231-241.

80. Bresnahan M, Zhuang J, Goldbort J, Bogdan-Lovis E, Park S-Y, Hitt R. Made to feel like less of a woman: The experience of stigma for mothers who do not breastfeed. *Breastfeeding Medicine.* 2020;15(1):35-40.

81. Roe B, Whittington LA, Fein SB, Teisl MF. Is there competition between breast-feeding and maternal employment? *Demography.* 1999;36(2):157-171.

82. Jantzer AM, Anderson J, Kuehl RA. Breastfeeding support in the workplace: the relationships among breastfeeding support, work–life balance, and job satisfaction. *Journal of Human Lactation.* 2017:0890334417707956.

83. Waite WM, Christakis D. Relationship of maternal perceptions of workplace breastfeeding support and job satisfaction. *Breastfeeding Medicine.* 2015;10(4):222-227.

84. Rogers SL, Blissett J. Breastfeeding duration and its relation to weight gain, eating behaviours and positive maternal feeding practices in infancy. *Appetite.* 2017;108: 399-406.

85. Waits A, Guo C-Y, Chang Y-S, Chien L-Y. Dose-response relationships between breastfeeding and postpartum weight retention differ by pre-pregnancy body-mass index in Taiwanese women. *Nutrients.* 2020;12(4):1065.

86. Unar-Munguía M, Torres-Mejía G, Colchero MA, González de Cosío T. Breastfeeding mode and risk of breast cancer: a dose–response meta-analysis. *Journal of Human Lactation.* 2017;33(2):422-434.

87. Eidelman AI, Schanler RJ. Breastfeeding and the use of human milk. *Pediatrics.* 2012;129(3):e827-e841.

88. World Health Organization. Infant and young child feeding. https://www.who.int/en/news-room/fact-sheets/detail/infant-and-young-child-feeding. Published 2020. Accessed Nov 3, 2020.

89. United States Health and Human Services. Health People 2030: Nutrition and Healthy Eating. https://health.gov/healthypeople/objectives-and-data/browse-objectives/nutrition-and-healthy-eating. Accessed Feb 28, 2021.

90. Ryan AS. The resurgence of breastfeeding in the United States. *Pediatrics.* 1997;99(4):e12-e12.

91. Anstey EH, Chen J, Elam-Evans LD, Perrine CG. Racial and geographic differences in breastfeeding—United States, 2011–2015.*Morbidity and Mortality Weekly Report.* 2017;66(27):723.

92. Bonuck KA, Freeman K, Trombley M. Country of origin and race/ethnicity: impact on breastfeeding intentions. *Journal of Human Lactation.* 2005;21(3):320-326.

93. Centers for Disease Control and Prevention. Racial and socioeconomic disparities in breastfeeding--United States, 2004. *Morbidity and Mortality Weekly Report.* 2006;55(12):335.

94. Santhanam L. Racial disparities persist for breastfeeding moms. Here's why. In: PBS NewsHour; 2019.

95. Beauregard JL, Hamner HC, Chen J, Avila-Rodriguez W, Elam-Evans LD, Perrine CG. Racial disparities in breastfeeding initiation and duration among US infants born in 2015. *Morbidity and Mortality Weekly Report.* 2019;68(34):745.

96. Department of Health and Human Services, Office on Women's Health. *Breastfeeding: HHS Blueprint for Action on Breastfeeding.* 2000.

97. Eidelman AI. Racial disparities in breastfeeding—A continuing shame of our healthcare system. *Breastfeeding Medicine.* 2015;10.

98. Yudell M, Roberts D, DeSalle R, Tishkoff S. Taking race out of human genetics. *Science.* 2016;351(6273):564-565.

99. Williams DR, Mohammed SA, Leavell J, Collins C. Race, socioeconomic status, and health: complexities, ongoing challenges, and research opportunities. *Annals of the New York Academy of Scieneces.* 2010;1186:69-101.

100. Wilkerson I. *Caste: The Origins of Our Discontents.* New York: Random House; 2020.

101. Krieger N. Discrimination and Health Inequities. *International Journal of Health Services.* 2014;44(4):643-710.

102. Bailey ZD, Krieger N, Agénor M, Graves J, Linos N, Bassett MT. Structural racism and health inequities in the USA: evidence and interventions. *The Lancet.* 2017;389(10077):1453-1463.

103. Gross TT, Davis M, Anderson AK, Hall J, Hilyard K. Long-term breastfeeding in African American mothers. *Journal of Human Lactation.* 2017;33(1):128-139.

104. Spencer B, Wambach K, Domain EW. African American women's breastfeeding experiences: cultural, personal, and political voices. *Qualitative Health Research.* 2015;25(7):974-987.

105. Jefferson UT. Breastfeeding exposure, attitudes, and intentions of African American and Caucasian college students. *Journal of Human Lactation.* 2017;33(1):149-156.

106. Payne SL. A Call to action: lactation equity through professional diversification. *Journal of Human Lactation.* 2014;30(4):396-397.

107. Thomas EV. "Why even bother; they are not going to do it?" The structural roots of racism and discrimination in lactation care. *Qualitative Health Research.* 2018;28(7):1050-1064.

108. Davis R, Williams J, Chetwynd E. Increasing diversity in the field of lactation: an interview with the directors of Pathway 2 IBCLC programs at Historically Black Colleges and Universities. *Journal of Human Lactation.* 2021;0(0):0890334421995108.

109. McKinney CO, Hahn-Holbrook J, Chase-Lansdale PL, et al. Racial and ethnic differences in breastfeeding. *Pediatrics.* 2016;138(2):e20152388.

110. Kimbro RT. On-the-job moms: work and breastfeeding initiation and duration for a sample of low-income women. *Maternal and Child Health Journal.* 2006;10(1):19-26.

111. Visness CM, Kennedy KI. Maternal employment and breast-feeding: findings from the 1988 National Maternal and Infant Health Survey. *American Journal of Public Health.* 1997;87(6):945-950.

112. Snyder K, Hansen K, Brown S, Portratz A, White K, Dinkel D. Workplace breastfeeding support varies by employment type: the service workplace disadvantage. *Breastfeeding Medicine.* 2018;13(1):23-27.

113. Lauer EA, Armenti K, Henning M, Sirois L. Identifying barriers and supports to breastfeeding in the workplace experienced by mothers in the New Hampshire Special Supplemental Nutrition Program for Women, Infants, and Children utilizing the Total Worker Health framework. *International Journal of Environmental Research and Public Health.* 2019;16(4):529.

114. Whipps MDM, Honoroff J. Time off work after childbirth and breastfeeding supportive workplaces: associations with near-exclusive breastfeeding trajectory membership. *Women's Health Issues.* 2019;29(6):506-512.

115. Calnen G. Paid maternity leave and its impact on breastfeeding in the United States: an historic, economic, political, and social perspective. *Breastfeeding Medicine.* 2007;2(1):34-44.

116. Spitzmueller C, Zhang J, Thomas CL, et al. Identifying job characteristics related to employed women's breastfeeding behaviors. *Journal of Occupational Health Psychology.* 2018;23(4):457.

117. Jacknowitz A. The role of workplace characteristics in breastfeeding practices. *Women & health.* 2008;47(2):87-111.

118. Guendelman S, Kosa JL, Pearl M, Graham S, Goodman J, Kharrazi M. Juggling work and breastfeeding: effects of maternity leave and occupational characteristics. *Pediatrics.* 2009;123(1):e38-e46.

119. Safon CB, Heeren TC, Kerr SM, et al. Disparities in breastfeeding among us black mothers: identification of mechanisms. *Breastfeeding Medicine.* 2021.

120. Li R, Rock VJ, Grummer-Strawn L. Changes in public attitudes toward breastfeeding in the United States, 1999-2003. *Journal of the American Dietetic Association.* 2007;107(1):122-127.

121. Ryan AS, Zhou W, Arensberg MB. The effect of employment status on breastfeeding in the United States. *Women's Health Issues.* 2006;16(5):243-251.

122. Laughlin LL. *Maternity leave and employment patterns of first-time mothers: 1961-2008.* US Department of Commerce, Economics and Statistics Administration; 2011.

123. Berggren K. *Working Without Weaning: A Working Mother's Guide to Breastfeeding* Hale Publishing; 2006.

124. Attanasio L, Kozhimannil KB, McGovern P, Gjerdingen D, Johnson PJ. The impact of prenatal employment on breastfeeding intentions and breastfeeding status at 1 week postpartum. *Journal of Human Lactation.* 2013;29(4):620-628.

125. Lubold AM. Breastfeeding and employment: A propensity score matching approach. *Sociological Spectrum.* 2016;36(6):391-405.

126. Ahluwalia IB, Morrow B, Hsia J. Why do women stop breastfeeding? Findings from the Pregnancy Risk Assessment and Monitoring System. *Pediatrics.* 2005;116(6):1408-1412.

127. Chatterji P, Frick KD. Does returning to work after childbirth affect breastfeeding practices? *Review of Economics of the Household.* 2005;3(3):315-335.

128. Dagher RK, McGovern PM, Schold JD, Randall XJ. Determinants of breastfeeding initiation and cessation among employed mothers: a prospective cohort study. *BMC Pregnancy and Childbirth.* 2016;16(1):194.

129. Johnson KM, Salpini C. Working and nursing: navigating job and breastfeeding demands at work. *Community, Work & Family.* 2017;20(4):479-496.

130. National Institute for Occupational Safety and Health Surveillance Program. *Supplement report: analysis of New Hampshire Pregnancy Risk Assessment Monitoring System (PRAMS) to better understand breastfeeding initiation and duration by industry category.* 2020.

131. International Labour Organization. Working conditions. https://www.ilo.org/global/topics/working-conditions/lang--en/index.htm. Published 1996-2021. Accessed March 31, 2021.

132. Jacobs K, Hellman M, Markowitz J, Wuest E. Psychosocial work environment. In: Gellman MD, Turner JR, eds. *Encyclopedia of Behavioral Medicine.* New York, NY: Springer New York; 2013:1587-1587.

133. Rugulies R. What is a psychosocial work environment? *Scandinavian Journal of Work, Environment & Health.* 2019(1):1-6.

134. Karasek Jr RA. Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative science quarterly.* 1979:285-308.

135. Karasek R, Brisson C, Kawakami N, Houtman I, Bongers P, Amick B. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. *Journal of Occupational Health Psychology.* 1998;3(4):322.

136. Kivimäki M, Nyberg ST, Batty GD, et al. Job strain as a risk factor for coronary heart disease: a collaborative meta-analysis of individual participant data. *The Lancet.* 2012;380(9852):1491-1497.

137. Xu W, Zhao Y, Guo L, Guo Y, Gao W. Job stress and coronary heart disease: a case-control study using a Chinese population. *Journal of Occupational Health.* 2009;51(2):107-113.

138. Saijo Y, Chiba S, Yoshioka E, et al. Synergistic interaction between job control and social support at work on depression, burnout, and insomnia among Japanese civil servants. *International Archives of Occupational and Environmental Health.* 2015;88(2):143-152.

139. Johnson JV, Hall EM. Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *American Journal of Public Health.* 1988;78(10):1336-1342.

140. Juvani A, Oksanen T, Virtanen M, et al. Clustering of job strain, effort− reward imbalance, and organizational injustice and the risk of work disability: a cohort study. *Scandinavian Journal of Work, Environment & Health.* 2018;44(5):485-495.

141. Knardahl S, Johannessen HA, Sterud T, et al. The contribution from psychological, social, and organizational work factors to risk of disability retirement: a systematic review with meta-analyses. *BMC Public Health.* 2017;17(1):1-31.

142. Kim E, Park H, Hong Y-C, et al. Effect of maternal job strain during pregnancy on infant neurodevelopment by gender at 6 and 12 months: Mothers and Children's Environmental Health (MOCEH) study. *Annals of Occupational and Environmental Medicine.* 2015;27(1):1-10.

143. Kuper H, Yang L, Theorell T, Weiderpass E. Job strain and risk of breast cancer. *Epidemiology.* 2007:764-768.

144. Smith P, Frank J, Mustard C, Bondy S. Examining the relationships between job control and health status: a path analysis approach. *Journal of Epidemiology & Community Health.* 2008;62(1):54-61.

145. Tsutsumi A, Kayaba K, Yoshimura M, et al. Association between job characteristics and health behaviors in Japanese rural workers. *International Journal of Behavioral Medicine.* 2003;10(2):125-142.

146. Meyer JD, Warren N, Reisine S. Job control, substantive complexity, and risk for low birth weight and preterm delivery: an analysis from a state birth registry. *American Journal of Industrial Medicine.* 2007;50(9):664-675.

147. Mozurkewich EL, Luke B, Avni M, Wolf FM. Working conditions and adverse pregnancy outcome: a meta-analysis. *Obstetrics and Gynecology.* 2000;95(4):623-635.

148. Snijder CA, Brand T, Jaddoe V, et al. Physically demanding work, fetal growth and the risk of adverse birth outcomes. The Generation R Study. *Occupational and Environmental Medicine.* 2012;69(8):543-550.

149. van Beukering MDM, van Melick MJGJ, Mol BW, Frings-Dresen MHW, Hulshof CTJ. Physically demanding work and preterm delivery: a systematic review and meta-analysis. *International Archives of Occupational and Environmental Health.* 2014;87(8):809-834.

150. Cai C, Vandermeer B, Khurana R, et al. The impact of occupational activities during pregnancy on pregnancy outcomes: a systematic review and metaanalysis. *American journal of Obstetrics and Gynecology.* 2020;222(3):224-238.

151. Bell JF, Zimmerman FJ, Diehr PK. Maternal work and birth outcome disparities. *Maternal and Child Health Journal.* 2008;12(4):415-426.

152. Shockey TM, Luckhaupt SE, Groenewold MR, Lu M-L. frequent exertion and frequent standing at work, by industry and occupation group - United States, 2015. *Morbidity and Mortality Weekly Report.* 2018;67(1):1-6.

153. Locke EA. What is job satisfaction? *Organizational Behavior and Human Performance.* 1969;4(4):309-336.

154. Faragher EB, Cass M, Cooper CL. The relationship between job satisfaction and health: a meta-analysis. *Occupational and Environmental Medicine.* 2005;62(2):105-112.

155. Dirlam J, Zheng H. Job satisfaction developmental trajectories and health: A life course perspective. *Social Science & Medicine.* 2017;178:95-103.

156. Wang YC, Peng JX. Work-family conflict and depression in Chinese professional women: the mediating roles of job satisfaction and life satisfaction. *International Journal of Mental Health and Addiction.* 2017;15(2):394-406.

157. Kossek EE, Ozeki C. Work-family conflict, policies, and the job-life satisfaction relationship: A review and directions for organizational behavior human resources research. *Journal of Applied Psychology.* 1998;83(2):139-149.

158. Grandey AA, Cordeiro BL, Crouter AC. A longitudinal and multi-source test of the work-family conflict and job satisfaction relationship. *Journal of Occupational and Organizational Psychology.* 2005;78:305.

159. Bruk-Lee V, Albert D, Stone KL. Lactation and the working woman: Understanding the role of organizational factors, lactation support, and legal policy in promoting breastfeeding success. In: *Research perspectives on work and the transition to motherhood.* Springer; 2016:217-239.

160. Spitzmueller C, Wang Z, Zhang J, et al. Got milk? Workplace factors related to breastfeeding among working mothers. *Journal of Organizational Behavior.* 2016;37(5):692-718.

161. United States Bureau of Labor Statistics CPS. *Labor force characteristics by race and ethnicity, 2018.* 2019.

162. Alonso-Villar O, del Río C. The occupational segregation of african american women: its evolution from 1940 to 2010. *Feminist Economics.* 2017;23(1):108-134.

163. Pager D, Shepherd H. The sociology of discrimination: Racial discrimination in employment, housing, credit, and consumer markets. *Annual Review of Sociology.* 2008;34:181-209.

164. Tomaskovic-Devey D, Thomas M, Johnson K. Race and the accumulation of human capital across the career: A theoretical model and fixed-effects application. *American Journal of Sociology.* 2005;111(1):58-89.

165. Wrigley-Field E, Seltzer N. Unequally insecure: rising black/white disparities in job displacement, 1981-2017. *Washington Center for Equitable Growth Working Paper Series Washington, DC.* 2020.

166. Golden L. Limited access: Disparities in flexible work schedules and work-at-home. *Journal of Family and Economic Issues.* 2008;29(1):86-109.

167. Hawkins D. Disparities in the usage of maternity leave according to occupation, race/ethnicity, and education. *American Journal of Industrial Medicine.* 2020;63: 1134-1144.

168. Griswold MK, Crawford SL, Perry DJ, et al. Experiences of racism and breastfeeding initiation and duration among first-time mothers of the Black Women's Health Study. *Journal of Racial and Ethnic Health Disparities.* 2018;5(6):1180-1191.

169. Ortiz SY, Roscigno VJ. Discrimination, women, and work: processes and variations by race and class. *The Sociological Quarterly.* 2009;50(2):336-359.

170. Fekedulegn D, Alterman T, Charles LE, et al. Prevalence of workplace discrimination and mistreatment in a national sample of older U.S. workers: The REGARDS cohort study. *SSM Popul Health.* 2019;8:100444-100444.

171. Dalianis EA. *Multi-level Analysis of the Role of the Workplace and Employment in Racial Disparities in Breastfeeding Practices*. Philadelphia, PA: Public Health, Drexel University; 2016.

172. Ahonen EQ, Fujishiro K, Cunningham T, Flynn M. Work as an inclusive part of population health inequities research and prevention. *American Journal of Public Health.* 2018;108(3):306-311.

173. Phelan JC, Link BG. Is racism a fundamental cause of inequalities in health? *Annual Review of Sociology.* 2015;41(1):311-330.

174. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health Education Quarterly.* 1988;15(4):351-377.

175. Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. Hierarchy of Controls. https://www.cdc.gov/niosh/topics/hierarchy/. Published 2015. Accessed.

176. Manuele FA. Risk assessment & hierarchies of control. *Professional Safety.* 2005;50(5):33-39.

177. US Department of Health and Human Services. Supporting nursing moms at work: what employers need to know. https://www.womenshealth.gov/supporting-nursing-moms-work/what-law-says-about-breastfeeding-and-work/what-employers-need-know. Published 2018. Accessed March 6, 2021.

178. Rosengren A, Hawken S, Ôunpuu S, et al. Association of psychosocial risk factors with risk of acute myocardial infarction in 11 119 cases and 13 648 controls from 52 countries (the INTERHEART study): case-control study. *The Lancet.* 2004;364(9438):953-962.

179. Nilsen C, Andel R, Darin-Mattsson A, Kåreholt I. Psychosocial working conditions across working life may predict late-life physical function: a follow-up cohort study. *BMC Public Health.* 2019;19(1):1125.

180. Berkman LF, Treder K. Work and Health: A Gender Perspective. *Handbook of Socioeconomic Determinants of Occupational Health: From Macro-level to Micro-level Evidence.* 2020:1-18.

181. International Labour Organization. *Psychosocial factors at work: Recognition and control.* Geneva, 1984.

182. Greenhaus JH, Beutell NJ. Sources of conflict between work and family roles. *Academy of Management Review.* 1985;10(1):76-88.

183. Hays S. *The Cultural Contradictions of Motherhood.* New Haven and London: Yale University Press; 1996.

184. Afflerback S, Carter SK, Anthony AK, Grauerholz L. Infant-feeding consumerism in the age of intensive mothering and risk society. *Journal of Consumer Culture.* 2013;13(3):387-405.

185. Dow DM. *Mothering While Black: Boundaries and Burdens of Middle-Class Parenthood.* Oakland, CA: University of California Press; 2019.

186. Baron RM, Kenny DA. The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology.* 1986;51(6):1173.

CHAPTER 2

Occupation, race and breastfeeding outcomes[f]

Abstract

Background

In the United States, mothers' employment status and occupation are related to breastfeeding (BF). However, it is unclear whether not working leads to longer BF duration even when compared to professional/managerial jobs, which tend to accommodate BF better than service/manual labor jobs. Furthermore, occupation and BF are racially patterned, and it is possible that race could moderate the relationships between mother's work and BF.

Methods

Using data from the Panel Study of Income Dynamics (PSID), we modeled BF duration based on mother's employment/occupation (not working, professional/managerial work, or service/labor work) during the first six months postpartum, as well as mother's race (White, Black or other) and other potential confounders. We used zero-inflated negative binomial regression models and tested an interaction between employment/occupation type and race. Predictive margins were used to compare BF duration among subgroups.

Results

In a sample of n=970 cases from the PSID, mothers working in service/labor occupations had the shortest BF duration of the three employment/occupation groups, and there was no significant difference in duration between not working and professional/managerial occupation. White

[f] Whitley MD, Ro A, Palma A. Work, race and breastfeeding outcomes for mothers in the United States. *PLOS ONE*, 2021: 16(5):e0251125.

mothers had longer BF duration than Black mothers on average. When we included an interaction between employment/occupation and race, we found that among White mothers, non-working mothers breastfed the longest, while mothers in service/labor work breastfed for the shortest duration, but among Black mothers, mothers in professional/managerial work breastfed for longer than mothers in the other two work categories.

Discussion

Race moderated the relationship between employment status/occupation type and BF such that, for White mothers, not working was the most advantageous circumstance for BF, in line with traditional work-family conflict theory. In contrast, for Black mothers, professional/managerial work was the most advantageous circumstance. These findings support the idea of the Market-Family Matrix, which allows that different work scenarios may be more or less advantageous for parenting behaviors like BF, depending on mothers' circumstances.

Introduction

Empirical background

BF is beneficial to the health of mothers and children.[1-3] For this reason, health organizations recommend exclusive BF until infants reach six months of age, and continued BF along with supplemental feeding until at least 12 months.[2,4] In the United States (US), 79% of new mothers initiate BF, yet only 20% exclusively breastfeed until six months.[5] BF behaviors can be influenced by employment status and occupation type.[6] For instance, mothers who do not work breastfeed longer on average than those who do work, especially those who work full-time.[7-9] Returning to work sooner after giving birth is associated with shorter BF duration.[10,11] Over 25% of new mothers are working by the time the infant reaches three months,[12] and issues

with work or school are common reason for BF cessation.[13] Mothers who work in jobs that are hazardous, inflexible, lack parental leave benefits and/or do not have lactation accommodations tend to breastfeed for shorter duration.[14-20] Mothers working non-professional jobs, such as administrative, service and manual labor jobs also have shorter BF duration,[11,21-24] possibly because mothers working in those occupations experience more work-related barriers to BF, like not having time or an appropriate place to pump.[25]

Given that working exposes mothers to many barriers to continued BF,[25] mothers who do not work might be expected to breastfeed longer, even compared to mothers in relatively accommodating jobs. However, the literature presents a mixed picture. A New Hampshire study that examined BF by employment and industry category found that working mothers were less likely than non-working mothers to breastfeed at least four months regardless of industry category.[24] A California study that compared non-working mothers with mothers from three occupation groups found no difference in BF initiation rates, after accounting for other socioeconomic variables.[26] To our knowledge only two studies examined this question using US-wide data and using BF duration, as opposed to initiation, as an outcome. Kimbro and colleagues, using a racially diverse and mostly low-income sample of US births from 1998-2000, found that women who were not working breastfed longer than those in administrative or manual work, but not those in other occupations.[21] Visness and colleagues, using a representative sample of US births from 1988, found that non-working women breastfed longer than working women, regardless of the type of occupation, though among Black women this relationship was not consistent.[22] These studies established that the relationship between work and BF may vary considerably by occupation and by race.

There are persistent disparities in BF in the US by mother's race: 64% of Black mothers initiate and 14% breastfeed exclusively at six months, compared to 82% and 23% among White mothers.[5] Race-based differences in BF have been linked to factors at many levels, including mothers' beliefs and knowledge about BF,[27-29] family norms,[30] exposure to stressful life events,[31,32] healthcare encounters[30] and insurance,[33] formula advertising and promotion,[32,34,35] issues related to work and school,[7,36] and norms and policies at the state and region level.[37] Race is a social construct, and it relates to BF only because it determines mothers' and infants' exposure to other causal factors.[38,39] Differences in BF outcomes between White and Black mothers have arisen in large part because of structural racism, both current and historical.[38,40,41] For instance, that Black women have more negative perceptions of BF and positive perceptions of formula feeding than White women,[27,42,43] has been linked to lingering stigma and trauma from the slavery-era history of forced wet nursing and separation from one's own infant.[34,44,45] Louis-Jacques and colleagues identified labor conditions as a major historical antecedent of current BF disparities.[35] In the present study we examine how present-day labor conditions continue to be intertwined with BF disparities between Black and White mothers in the US.

Occupation type, like BF behaviors, is racially patterned. Longstanding disparities in educational opportunities, hiring, firing and layoff practices and other structural barriers have greatly advantaged White Americans and disadvantaged Black Americans in their work opportunities.[46-48] White women, for example, are more likely to work in management or professional positions than Black women, while Black women are more likely to work in service occupations or transportation, in jobs that offer less flexibility[49,50] and jobs without paid maternity leave.[51] Also, within a given occupation, Black mothers may face additional barriers to

BF than White mothers,[52] such as discriminatory treatment from a supervisor on the basis of their race.[52-56]

Theory

We consider two distinct theories specific to work and family that paint distinct pictures of how employment and occupation may relate to BF and how this might vary by race. On the one hand, the Work-Family Conflict theory suggests that women's work responsibilities can conflict with responsibilities related to BF, an activity tied to the family realm.[57] In addition, the concept of Intensive Mothering implies that idealized child rearing requires large amounts of time and resources from mothers, often at the expense of their professional priorities.[58,59] Both of these suggest that mothers who do not work would have an advantage in BF over mothers who work, regardless of mother's occupation or race.

On the other hand, Dow's Market-Family Matrix framework posits that work and family responsibilities do not necessarily have to be in conflict, and that they can integrate in beneficial ways if circumstances make that possible.[60,61] This framework grew from qualitative research with middle class Black mothers the US which showed that, whereas White mothers held positive perceptions of not working while their children were young,[62] Black mothers were more likely to have negative perceptions about not working, and more positive perceptions of being a working parent.[60,63] For instance, Dow described how the middle class African American mothers in her study tended to believe that "working is a duty of motherhood and does not detract from one's identity as a mother," (page 165). She contrasted that with the notion, based on beliefs among middle class White women, that working necessarily impedes a woman's ability to be a good mother.[60] Extending Dow's Market-Family Matrix framework to BF, we consider that employment status could be differentially associated with BF outcomes, and that

whether employment is associated with more or less BF may vary based on mother's race and on the kind of job they hold.

In sum, existing theories about work-family integration suggest two distinct possibilities about maternal work and BF outcomes: one, that maternal employment would consistently be associated with less BF, or two, that there may be instances when working mothers have comparable or better BF outcomes than mothers who do not work, particularly among professional Black mothers. There is little existing research that has comprehensively examined race as well as occupation type in connection with BF outcomes, but older evidence may support the latter perspective. Visness and colleagues' found that for Black mothers, not working did not confer an advantage for BF duration as consistently as it does among White mothers.[22] However, the births included in the Visness paper occurred in 1988, and the prevalence and duration of BF[64] and of maternal employment[12] in the US have increased substantially since then. New evidence is needed to reexamine these relationships.

Study objectives

To fill these gaps in the literature and contribute to theory around work, family, race and health behaviors, we used a national data set of US families, including births from 2008-2013, to examine two questions. First, we examined how employment status and occupation type were related to BF duration, particularly when included alongside race in a multivariate model. We hypothesized that not working would be associated with the longest average BF duration compared to both professional/managerial occupations and to service/labor occupations. We also hypothesized that among those who work, a professional/managerial occupation would be associated with longer BF duration than working in a service/labor occupation.

Second, we wanted to explore whether employment status and occupation type related to BF duration differentially for White versus Black mothers. We hypothesized that race would moderate the relationship between employment/occupation type and BF, and we considered different possible scenarios for that relationship. In one scenario, not working (compared to working) would be associated with more BF among White mothers, but with less BF among Black mothers, particularly when compared to working in professional jobs. This is based on prior research[22] and on qualitative work and theory.[60] It could be the result of greater social support for working mothers in Black versus White communities, as well as differential selection into employment among mothers of young children, in part because of different preferences.[60] An alternative scenario would be that not working is associated with more BF among both groups of mothers, regardless of the occupation of mothers in the comparison groups, and that the difference is larger among Black mothers than among White mothers. This could happen because working creates additional barriers to BF for Black mothers than it does for White mothers, such as discriminatory treatment at work.[53]

Findings with regard to these questions would inform theoretical understandings about the interplay between work, family and race. They would also provide newer quantitative estimates of the degree of these relationships from a sample of US mothers. Also, the findings could help inform public health policy efforts to increase BF among all US mothers and reduce BF disparities.[65]

Methods

Data set

The Panel Study of Income Dynamics is a longitudinal, nationally representative survey of US families conducted at the University of Michigan, which has followed multiple

generations of the same families since as early as 1968.[66,67] The survey includes extensive information about socioeconomic variables, family characteristics and other topics, and refresher samples have been added to the dataset since its inception to increase representativeness. The Panel Study of Income Dynamics collected Child Development Supplement data in 2014 to obtain more detailed information on development, health and other topics for the children of the main sample members. We linked data on children's health outcomes, including BF, from the 2014 Child Development Supplement with data on their biological mother's sociodemographic and work characteristics from the main study (waves 2007 through 2015). Data were collected using computer-assisted telephone interviews. Most of the data are publicly available online.[67]

Inclusion criteria

Respondents had to be the biological mother of a child in the 2014 Child Development Supplement and have complete information on employment and occupation for the five months after the month when the child was born. Because Panel Study of Income Dynamics respondents were labeled only as male or female, we have no information about other gender identities.[68]

Of the 4,333 children in the Panel Study of Income Dynamics' Child Development Supplement, 3019 were excluded because they were over age 5 at the time of data collection. Of the remaining 1314, an additional 6 were excluded because we could not link the child to their biological mother. Of the remaining 1308, 338 were excluded due to missing information on one or more key variables. The most commonly missing data was employment and occupation type for the first six months postpartum (n=283). After these exclusions, we had an analytic sample of n=970 cases.

Because there were siblings among the 970 children in the analytic sample, there were 802 unique mothers included. For all variables except for race, we used responses specific to the time period when that child was born. For mother's race, we used the most recent response available. Sensitivity analyses were used to address potential clustering effects among children with the same biological mother.

Our study was reviewed by the University of California, Irvine Human Research Projections Program and determined to not qualify as human subjects research. The data that we received and used for this secondary analysis did not contain identifying information for study participants. To note, the researchers who originally collected the Panel Study of Income Dynamics data obtained informed consent from all study participants.[67]

Measures

BF initiation and duration: Respondents were asked if participating children age 5 years or less were breastfed at all, and if so, at what age (in months) did the child stop BF. BF duration ranged between 1 and 60 months; responses of 13 months or more were top-coded to 12 months, given the recommendations and evidence about BF for that duration.[2] All mothers who were still BF at the time of data collection had already breastfed more than 12 months, so we did not have any instances of censored BF data.

Mother's race: Respondents could select up to three races; we used the first race mentioned. We collapsed Latino/Hispanic, Asian, Native Hawaiian or Pacific Islander, and Other into a single category, Other Races, and left White and Black as additional categories.

Occupation: In all waves of the survey, adults reported employment status every month. We obtained the mother's employment status for the first through fifth months

following the month when the child was born. Mothers who reported either not working or being unemployed for all five months were categorized as not working for this analysis. For those who reported working at least one of those five months, whether in their primary or secondary job, we considered them employed in the analyses and obtained the occupation code associated with that job. Occupation codes were in 3-digit, US Census 2000 format [66,69]. We classified codes 01-354 as professional/managerial occupations – this included Education, Training, and Library Occupations (codes 220-255) and Healthcare Practitioners and Technical Occupations (300-354). We categorized codes 360 through 983 as service/manual labor occupations; these included Office and Administrative Support Occupations (500-593) and Personal Care and Service Occupations (430-465).

Self-employment was categorized like other jobs. Mothers whose employment status did not fit these categories, for instance because they were students and did not report working, were excluded from analysis because they did not have an occupation code. The survey did not specifically assess maternity leave. If a mother was on maternity leave for the five months after giving birth (or left her job) and described herself as not working in the survey, then she was classified as not working. However, if a mother had maternity leave for any length of time but still listed herself as working for a given job during at least one of those five months, then she was categorized as working in that job.

Covariates: We controlled for other variables that were shown to be associated with maternal race and BF behaviors in the literature and in our bivariate analyses. Specifically, we controlled for maternal age at delivery (continuous);[70,71] educational attainment[71-73] dichotomized at 16 or more years, approximately equivalent to having a bachelor's degree; mother's marital status[74,75] from a variable classifying adults as either

the wife/spouse or, if not married, the "head of house"; and whether the child was born with low birth weight[76,77], defined as below 88 ounces (5.5 lbs).

Analysis

Descriptive statistics

We conducted descriptive statistics for all variables, specifically, weighted means and standard deviations for continuous variables and weighted proportions for categorical variables, for the overall sample and stratified by race and by employment status. All statistical analyses were conducted in Stata 16.1 MP. Alpha of 0.05 was used to determine statistical significance.

Multivariate models

We used zero-inflated negative binomial regression models to estimate BF duration ratios, where BF duration was modeled as a count of the total number of months that the child was reported to have been breastfed. This modeling approach was chosen since BF involves both the choice to initiate BF and to maintain BF once initiated. Although zero-inflated negative binomial models can allow for different sets of covariates in the duration and initiation models, we used the same set of variables based on the literature and our bivariate analyses which suggested that they are related in similar ways to both BF outcomes. We conducted a Vuong test to confirm that there was overdispersion of zero values and that a zero-inflated model was appropriate. All models accounted for sampling weights.

We created two nested multivariate zero-inflated negative binomial regression models, both predicting BF duration and initiation. The first model included the main effects for maternal race and employment/occupation type, adjusted for covariates, and the second model included

those same variables as well as an interaction between race and occupation type. In both models, race was modeled using a categorical variable with three categories: White race (reference group), Black race and Other races. White was used as the reference group because it is the largest race group in this sample. Occupation type was also modeled as a categorical variable with three categories: not working (reference group), professional/managerial jobs and service/labor jobs. Not working was used as the reference group so that we could compare outcomes for mothers exposed to distinct employment situations to mothers who are not employed.

From these models, we estimated predicted BF duration by maternal race and occupation and graphed those predictions for the models without and with an interaction term. We used contrasts of marginal linear predictions to test which pairwise comparisons of occupation groups by race, and of race by occupation groups resulted in statistically significant differences.

We accounted for the sampling design by using the main child sample weights for the Child Development Supplement (based on child's sex, birth year, race/ethnicity and geographic region), as well as the stratum and cluster weights for the main Panel Study of Income Dynamics survey. It should be noted that the weights were not designed for our specific subsample (e.g. mothers of children younger than 5).

Sensitivity analyses

We used alternative modeling approaches to account for potential clustering effects for children born to the same mother. These included running the models with only one child per mother and using multilevel models with a random intercept for the mother. We also ran the models with robust standard errors.

Results

Descriptive statistics

The characteristics of the study sample are shown in Table 2.1. Overall, 71% of mothers initiated BF, and this was notably lower for Black mothers (54%) and those working in service or labor occupations (63%). Among those who breastfed, average duration was 6.9 months; when stratified by race, BF duration was longest among White mothers at 7.3 months, followed by mothers of other races at 6.3 months, while Black mothers had shortest average duration, with 5.1 months. By employment and occupation type, mothers who did not work or who worked in professional/managerial occupations had similar duration, 7.3 and 7.4 months respectively, while those in service/labor occupations had 5.9 months average duration.

Approximately two thirds of mothers in the sample were employed during the first six months postpartum, with 35% in service/manual labor occupations and 31% in managerial/professional occupations. Among Black and White mothers, 34% reported not working, for mothers of other races, 35% reported not working. White mothers were overrepresented for managerial/professional occupations, as 34% of those workers were White, while Black women were overrepresented for service/manual labor occupations, among whom 47% were Black.

Table 2.1. Weighted sociodemographic characteristics, health outcomes and occupational characteristics for analytic sample of mothers and infants

	Total n= 970	By employment status/ occupation type			By race		
		Not working n=340	Managerial/ professional n=252	Service/ manual labor n=378	White n=510	Black n=354	Other n=106
Mother's socio-demographic characteristics							
Race							
White, %	69.1	69.0	76.9	62.4			
Black, %	13.6	13.5	8.5	18.2			
Other races, %	17.3	17.6	14.6	19.4			
Age, mean (SD) years	29.1 (5.4)	27.9 (5.7)	31.0 (4.4)	28.7 (5.6)	29.7 (5.2)	26.5 (4.8)	28.9 (6.1)
Education (bachelors degree or higher), %	42.0	28.0	76.3	25.2	50.4	19.2	26.1
Mother is not married, %	15.1	13.5	8.8	22.1	9.5	51.8	8.5
Health outcomes and BF behaviors							
BF behaviors							
Child initiated BF, %	71.4	71.4	80.0	63.6	74.0	54.1	74.4
BF duration, mean (SD) months[a] (Among the n=628 who initiated)	6.9 (4.0)	7.3 (4.1)	7.4 (3.9)	5.9 (3.9)	7.3 (4.0)	5.1 (3.4)	6.3 (4.2)
Infant born with low birth weight, %	6.2	6.5	5.6	6.3	6.3	8.9	3.5
Mother's employment and occupation, first 6 months postpartum							
Not working, %	34.2				34.2	34.0	34.8
Managerial/professional occupation, %	30.9				34.4	19.4	26.1
Service/manual labor occupation, %	34.9				31.5	46.6	39.2

[a]BF duration was top-coded at 12 months.
SD=standard deviation.
Proportions (%), means, and standard deviations take Panel Study of Income Dynamics survey weights into account.

Work and BF duration

The results of the regression model without the occupation by race interaction are provided in Table 2.2. We did not find any significant differences in odds of BF initiation by occupation or race.

Mothers in a service/labor occupation had the shortest average BF duration of the three groups. After accounting for potential differences in BF initiation by work status, in Model 1 we found that working in a service/labor occupation was associated with significantly shorter BF duration compared to not working during the first six months postpartum (ratio [95% CI]=0.84 [0.72, 0.99]), after accounting for potential confounders. Working in a professional/managerial occupation was not significantly different from not working (ratio [95% CI]=0.95 [0.82,1.12]). These findings indicate that women working in a service/labor occupation stopped BF 16% earlier than their non-working counterparts. These relationships were also apparent in the predicted duration by race in Figure 2.1, where BF duration was similar for mothers who did not work and those in professional/management jobs, and notably lower for those in service/labor jobs.

Model 1 also showed that Black mothers had BF duration that was roughly three-quarters that of White mothers (ratio [95% CI] = 0.78 [0.66, 0.93]). In other words, after accounting for potential differences in BF initiation by race, Black mothers stopped BF 22% earlier than their White counterparts. Women of other races did not have significantly different average BF duration compared to White women in the fully adjusted model. This appears in Figure 2.1 as well, where predicted BF duration for Black mothers is the lowest for all groups, consistently below four months, while White mothers had the longest duration, followed closely by mothers of other races.

Of the other covariates included in Model 1, older age was positively associated with duration, while the mother being not married was significantly and negatively associated with duration (see Supplemental Table S2.1).

Model 2 included an interaction between employment/occupation type and race. The interactions for Black versus White race and both occupation groups were statistically significant, indicating that the relationship between employment/occupation type and BF duration differed by race. There was a strong interaction effect for Black mothers in professional jobs compared to white mothers who did not work, ratio [95% CI] =1.72 [1.10, 2.69], and for Black mothers in a service/labor job compared to white mothers who did not work, ratio [95% CI] =1.55 [1.02, 2.34]. This was apparent in the predicted duration values shown in Figure 2.1 (and Supplemental Table S2.2). For White mothers, not working was still associated with the longest duration (predicted duration [95% CI]=5.94 months [5.15, 6.73]), followed by managerial/professional work (duration [95% CI]=5.29 months [4.16, 6.43]), with service/labor workers having the shortest average duration (duration [95% CI]=4.37 months [3.40, 5.34]). However, for Black mothers, BF duration was longest among those working in a managerial/professional occupation (predicted duration [95% CI]=4.68 months [2.28, 7.08]), and shorter for mothers who do not work (duration [95% CI]=2.97 months [2.13, 3.80]) and who work in a service/labor occupation (duration [95% CI]=3.11 months [2.23, 3.99]). A similar if attenuated pattern emerged for women of other races, where managerial/professional work was associated with the longest average BF duration.

Contrasts of marginal linear predictions showed that the lines representing BF duration across the three occupation groups were not parallel for Black and White mothers (p=0.029), and in particular among mothers who did not work, predicted duration was significantly longer for

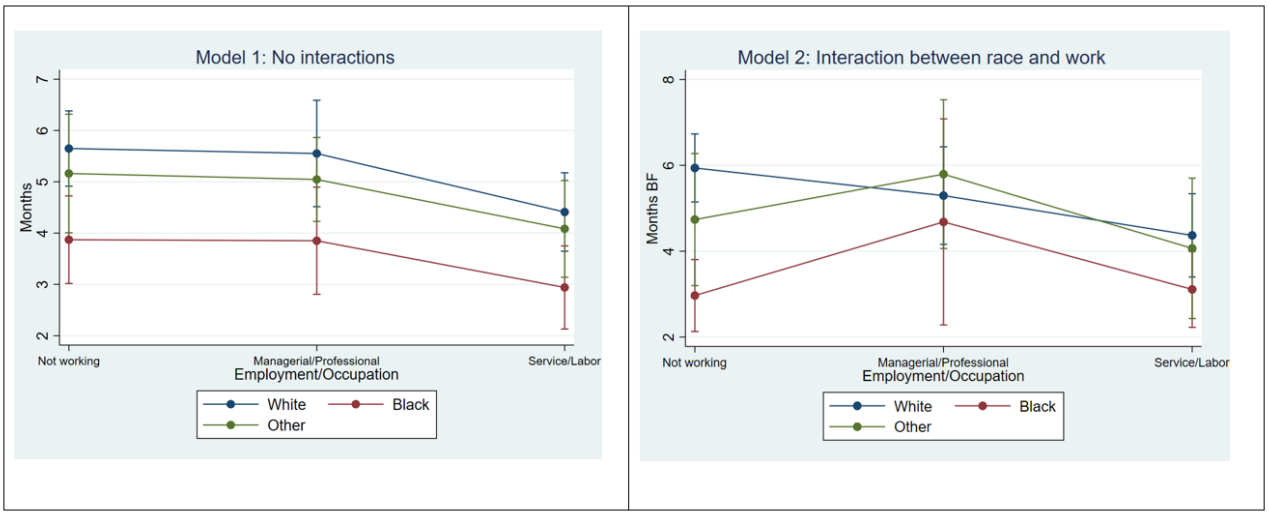
White mothers than Black mothers (p<0.001). Within race groups, predicted duration was significantly different comparing managerial/professional jobs versus not working among Black mothers (p=0.030) and comparing service/labor jobs versus not working among White mothers (p=0.015).

Table 2.2. Breastfeeding duration and initiation by mother's employment status/occupation type and race

	Model 1		Model 2	
BF initiation	**Ratio**	**(95% CI)**	**Ratio**	**(95% CI)**
Occupation type (Not working = ref)				
Professional/managerial	1.146	(0.642, 2.046)	0.942	(0.463, 1.920)
Service/labor	0.747	(0.438, 1.274)	0.735	(0.379, 1.425)
Race (White = ref)				
Black race	0.620	(0.374, 1.028)	0.641	(0.278, 1.476)
Other race	1.294	(0.750, 2.232)	0.926	(0.325, 2.638)
Occupation type * Race				
Black race & professional/managerial			1.114	(0.260, 4.784)
Black race & service/labor			0.868	(0.320, 2.359)
Other race & professional/managerial			5.860	(0.429, 79.967)
Other race & service/labor			1.170	(0.192, 7.142)
BF duration	**Duration Ratio**	**(95% CI)**	**Duration Ratio**	**(95% CI)**
Occupation type (Not working = ref)				
Professional/managerial	0.953	(0.815, 1.115)	0.904	(0.762, 1.072)
Service/labor	0.843*	(0.716, 0.993)	0.795*	(0.663, 0.954)
Race (White = ref)				
Black race	0.783*	(0.658, 0.933)	0.562*	(0.444, 0.712)
Other race	0.865	(0.744, 1.004)	0.812	(0.590, 1.118)
Occupation type * Race (White and not working = ref)				
Black race & professional/managerial			1.720*	(1.101, 2.686)
Black race & service/labor			1.546*	(1.020, 2.343)
Other race & professional/managerial			1.083	(0.672, 1.746)
Other race & service/labor			1.122	(0.670, 1.877)

CI = Confidence Interval. *P-value <0.05. Both models are zero-inflated negative binomial models (ZINB) with n=970 participants. Coefficients displayed here have been exponentiated. The ratios in the top half of the table represent the odds of initiating BF; we obtained these by exponentiating and then inverting the original coefficients from the ZINB model. The ratios in the bottom half represent ratios for BF duration. Models included survey weights. Both models control for mother's age in years at time of child's birth (range 15.6 to 45.8 years), mother's educational attainment (college graduate versus not), mother's marital status, and whether the infant is was born with low birth weight or not.

Figure 2.1. Predicted breastfeeding duration by mother's employment status/ occupation type and race



The predicted margins for BF duration are based on two adjusted zero-inflated negative binomial regression models: Model 1 predicted BF duration based on mother's employment status/occupation type and race with no interaction term, while Model 2 included an interaction between race and employment status/occupation type. Predicted values and confidence intervals are shown in supplemental tables.

Sensitivity analyses

The models that accounted for potential clustering among children born to the same mother did not produce notably different results. Table S3 shows the results of interaction models for BF initiation and duration without and with random effects for siblings born to the same mother. The relationships between race, occupation and BF outcomes are consistent in terms of direction and statistical significance even when potential clustering among siblings was included. One exception was that in the BF duration models that accounting for clustering among siblings, the coefficient for the interaction between Black (vs White) race and professional/managerial work (vs not working) was no longer statistically significant, although it remained similar in magnitude. Conversely, the coefficient for the interaction between Black (vs White) race and service/labor work (vs not working) became statistically significant in the model that accounted or sibling clustering; the magnitude of this coefficient was also similar compared to the original model.

Discussion

Main finding

We found that among US mothers, working in a service/labor job was associated with about one month less BF compared to not working or professional/management work. When we considered race as a potential moderator, we found that while not working was associated with the longest BF duration among White mothers, working in a professional/management job was associated with the longest BF duration among Black mothers.

Our hypothesis that not working would be associated with longer duration overall was supported, but only in comparison to service/labor occupations, which are typically less accommodating of BF.[25] Not working was not significantly different from professional/managerial work, which is more likely to accommodate BF. This aligns with the findings of Kimbro and colleagues, who found that working in an administrative or manual job was associated with one-third higher odds of quitting BF than not working, while they found no significant differences between not working and the other occupations.[21] Our findings also corroborate literature showing that professional and managerial jobs are associated with longer BF duration than administrative, manual or service jobs.[11,23]

When we considered differences by race, the presumptive advantage of not working on BF only held for White women. Not working was *not* associated with an apparent advantage in BF duration among Black women or women of other races; in fact, among Black women, working in professional/managerial jobs was associated with the longest BF duration on average across our three occupation categories. This contrasted with the results of Visness and colleagues in that they found not working to be advantageous for BF duration for White and Black mothers. However, they found this advantage to be stronger and more consistent among

White mothers than among Black mothers.[22]

There are multiple possible explanations for the finding that, among Black mothers, the longest BF duration occurred among those in professional/management work, while among White mothers, the longest duration occurred among those who did not work. In general, this aligns with the thrust of Dow's Market-Family Matrix framework, that paid work and motherhood responsibilities can sometimes be mutually beneficial and sometimes come into conflict.[60] Exposure to institutional racism[78] and the impact of BF policies[78] differentially affect women by race, and this could contribute to the moderating effect by race. Alternatively, there may be differential selection into not working that influenced BF among Black and White mothers. This selection could be driven by different preferences, ideals and concerns about staying at home versus working while one's child is young.[60,79] These differences in norms and preferences could feed into distinct decision-making processes about employment/occupation and BF for White and Black mothers. It is also possible that Black professional mothers who overcame racial adversity in the workplace were better resourced or had better health.

To note, even in the subgroups that had the highest BF rates, such as mothers in management/professional occupations, a large proportion of mothers were not meeting the six-month BF recommendation.[2] Even among the mothers in professional/management jobs, 20% did not initiate BF, and among those who did initiate, the average duration of 7.4 and a standard deviation of nearly four months indicated that many had duration far below the six month target. These findings align with the idea that greater support is needed for continued BF for all populations of women in the US.[65]

Strengths and Limitations

This study had some limitations. The Panel Study of Income Dynamics Child Development Supplement did not collect data about whether BF was exclusive or not. The BF advantage associated with not working may be stronger if exclusive BF is the outcome of interest. In addition, prior research suggests Black mothers are more likely than White mothers to supplement with formula,[80] so a focus on exclusive BF could show larger racial disparities. Also, we operationalized work experiences using broad groupings of occupation codes, and this meant that we could not capture certain differences within these broad occupational categories that are important for BF, like schedule flexibility,[14] experiences specific to the worksite, or the unique pressures or stressors facing Black workers compared to White workers.[52,81] This could mean that we are underestimating the role of work on BF outcomes. Health selection into employment could complicate the relationship between not working and BF.[82] Finally, we could not account in a rigorous way for maternity leave, which may be related to BF duration.[19]

These limitations are counterbalanced with several strengths. PSID captured work data specifically for the period immediately following the child's birth. This was an advantage over other studies that relied on occupation during pregnancy.[25] Also, we used BF duration as an outcome, which provided more granularity and more statistical power than a dichotomous outcome, e.g. whether or not mothers achieved six months of BF.

The present work adds additional information to the established positive relationship between socioeconomic status and BF duration[26,71] by centering the unique role of occupational status.[5] Income, occupation, education are distinct but interrelated ways to measure socioeconomic status.[83,84] In the present study, we were interested in occupation not as a measure of socioeconomic status or social class, but rather as a proxy for working conditions[85,86] related

to BF, such barriers to taking lactation breaks and control over her schedule, that a mother might experience during working hours. Even after controlling for education, we found that occupation type was a significant predictor of BF duration. Future research should study whether occupation type mediates the relationship between income and BF duration. Also, future studies should examine whether other causal factors associated with education, income and occupation, such as quality of lactation care,[87] may explain some of the relationship between occupation type and racial differences in BF.

Conclusions

Our findings suggest it is important to take race into account when drawing broader conclusions about how work can affect parenting-related behaviors like BF. Particularly in the US, structural racism has had and continues to have a powerful impact on the parenting choices and work opportunities available to Black and White mothers. There are striking historical examples, particularly the legacy of slavery and of Black mothers being forced to nurse White infants, sometimes at the expense of feeding their own child.[35,44,45] Those factors continue to have ripple effects, and are layered on top of BF challenges Black mothers still may face, like racism on the job,[52] as well as innovative resources and strengths present in their communities.[60,88,89]

We found that the racial disparities in BF were smaller among women in managerial/professional occupations. However, there is a clear need to increase workplace supports for BF for all working women, and particularly those in labor and service jobs. Relevant interventions already exist,[89-91] including lactation programs for hospital employees[92] and corporate initiatives to reduce work-family conflict and increase schedule control.[93] These could be implemented more broadly and should be tailored to Black mothers. Future work

should consider specific working conditions like demands and controls[94] as well as union presence[95,96] and explore how they relate to both race and BF. Selection into employment and occupation should be further examined, potentially using propensity score matching.[9,97] Future research also needs to consider BF and work experiences among other groups of parents, in particular Latinx, Asian American and Native American/American Indian families, immigrants,[26,98] as well as trans-identified or other gender non-binary, breast or chest-feeding parents,[68] and lesbian and gay parents.[99]

Table S2.1. Full set of multivariate models predicting breastfeeding initiation and duration by mother's race and employment status/occupation type

	Minimal model: Unadjusted effects of work and race on BF		Model 1: Adjusted model, no interaction term		Model 2: Adjusted model, with interaction term	
Odds of initiation	**Ratio**	**95% CI**	**Ratio**	**(95% CI)**	**Ratio**	**(95% CI)**
Occupation type (compared to not working)						
Professional/managerial	1.582	(0.917, 2.732)	1.146	(0.642, 2.046)	0.942	(0.463, 1.920)
Service/labor	0.737	(0.435, 1.252)	0.747	(0.438, 1.274)	0.735	(0.379, 1.425)
Race (White = Ref)						
Black race	0.469*	(0.299, 0.735)	0.620	(0.374, 1.028)	0.641	(0.278, 1.476)
Other race	1.121	(0.666, 1.890)	1.294	(0.750, 2.232)	0.926	(0.325, 2.638)
Occupation type * Race, interaction (White and not working = ref)						
Black race & professional/managerial					1.114	(0.260, 4.784)
Black race & service/labor					0.868	(0.320, 2.359)
Other race & professional/managerial					5.860	(0.429, 79.967)
Other race & service/labor					1.170	(0.192, 7.142)
Age in years (range 15.6 to 45.8 years)			0.988	(0.942, 1.037)	0.988	(0.942, 1.036)
Education (bachelor's degree or higher)			2.119*	(1.203, 3.733)	2.091*	(1.182, 3.701)
Mother is not married			1.311	(0.641, 2.680)	1.296	(0.632, 2.658)
Low birth weight infant			0.807	(0.322, 2.023)	0.787	(0.313, 1.979)
BF duration	**Duration Ratio**	**95% CI**	**Duration Ratio**	**(95% CI)**	**Duration Ratio**	**(95% CI)**
Occupation type (Not working = ref)						

Professional/managerial	1.006	(0.868, 1.166)	0.953	(0.815, 1.115)	0.904	(0.762, 1.072)
Service/labor	0.816*	(0.688, 0.967)	0.843*	(0.716, 0.993)	0.795*	(0.663, 0.954)
Race (White = ref)						
Black race	0.690*	(0.593, 0.804)	0.783*	(0.658, 0.933)	0.562*	(0.444, 0.712)
Other race	0.870	(0.751, 1.008)	0.865	(0.744, 1.004)	0.812	(0.590, 1.118)
Occupation type * Race (White and not working = ref)						
Black race & professional/managerial					1.720*	(1.101, 2.686)
Black race & service/labor					1.546*	(1.020, 2.343)
Other race & professional/managerial					1.083	(0.672, 1.746)
Other race & service/labor					1.122	(0.670, 1.877)
Age in years (range 15.6 to 45.8 years)			1.022*	(1.007, 1.038)	1.022*	(1.007, 1.037)
Education (bachelor's degree or higher)			1.002	(0.881, 1.139)	1.002	(0.881, 1.139)
Mother is not married			0.755*	(0.596, 0.957)	0.758*	(0.597, 0.962)
Low birth weight infant			0.702	(0.489, 1.006)	0.712	(0.499, 1.014)

*P-value <0.05
CI = Confidence Interval.
Models 1 and 2 are the same models shown Table 2 of main manuscript, but here the covariates are also included. All models are zero-inflated negative binomial models (ZINB) that include n=970 respondents. Coefficients displayed here have been exponentiated. The odds ratios in bottom half of table represent the odds of initiating BF; we obtained these by exponentiating and then inverting the original coefficients from the ZINB model. Models included survey weights.

Table S2.2. Predicted breastfeeding duration based on mother's employment status/occupation type and race

	Model 1: Adjusted model without interaction term			**Model 2: Adjusted model with interaction between race and employment status/occupation type**		
Race	**Not working** **Duration (95% CI)**	**Managerial/ professional occupation** **Duration (95% CI)**	**Service/labor occupation** **Duration (95% CI)**	**Not working** **Duration (95% CI)**	**Managerial/ professional occupation** **Duration (95% CI)**	**Service/labor occupation** **Duration (95% CI)**
White	5.64 (4.91, 6.38)	5.55 (4.52, 6.59)	4.41 (3.65, 5.18)	5.94 (5.15, 6.73)	5.29 (4.16, 6.43)	4.37 (3.40, 5.34)
Black	3.87 (3.02, 4.72)	3.85 (2.81, 4.89)	2.94 (2.13, 3.75)	2.97 (2.13, 3.80)	4.68 (2.28, 7.08)	3.11 (2.23, 3.99)
Other	5.16 (4.01, 6.32)	5.05 (4.23, 5.86)	4.08 (3.14, 5.03)	4.74 (3.20, 6.27)	5.79 (4.06, 7.53)	4.07 (2.43, 5.70)

CI = Confidence Interval
The predicted margins for BF duration are based on two zero-inflated negative binomial regression models with n=970 respondents, both adjusted for potential confounders (mother's age, educational attainment, marital status, and whether or not the infant was born with low birth weight). Model 1 predicted BF duration based on mother's employment status/occupation type and race with no interaction term, while Model 2 included an interaction between race and employment status/occupation type.

Table S2.3. Sensitivity analyses to assess effects of clustering among siblings born to same mother

	1. BF initiation: Not accounting for sibling clusters		2. BF initiation: Accounting for sibling clusters		3. BF duration: Not accounting for sibling clusters		4. BF duration: Accounting for sibling clusters	
	OR	**95% CI**	**OR**	**(95% CI)**	**b**	**(95% CI)**	**b**	**(95% CI)**
Occupation type (Not working = ref)								
Professional/ managerial	1.059	(0.616, 1.821)	1.114	(0.280, 4.436)	-0.981*	(-1.919, -0.044)	-0.993*	(-1.952, -0.034)
Service/labor	0.702	(0.437, 1.126)	0.564	(0.171, 1.856)	-1.770*	-(2.730, -0.811)	-1.461*	(-2.411, -0.512)
Race (White = ref)								
Black race	0.421*	(0.251, 0.706)	0.123*	(0.031, 0.488)	-1.792*	(-3.005, -0.579)	-1.700*	(-2.910, -0.491)
Other race	1.068	(0.459, 2.486)	1.171	(0.146, 9.372)	-0.776	(-2.421, 0.868)	-0.426	(-2.064, 1.212)
Occupation type * Race (White and not working = ref)								
Black race & professional/ managerial	1.456	(0.622, 3.405)	1.816	(0.214, 15.441)	1.963*	(0.187, 3.738)	1.833	(-0.005, 3.670)
Black race & service/Labor	1.175	(0.604, 2.285)	0.781	(0.150, 4.063)	1.594	(-0.006, 3.194)	1.580*	(0.050, 3.111)
Other race & professional/ managerial	3.304	(0.596, 18.324)	11.326	(0.299, 428.695)	-0.499	(-2.752, 1.755)	-0.793	(-3.067, 1.481)
Other race & service/labor	0.888	(0.297, 2.659)	0.660	(0.044, 9.938)	0.871	(-1.388, 3.129)	0.289	(-1.911, 2.489)

OR = Odds ratio. b= Regression coefficient.

*P-value <0.05

The models for BF initiation (models 1 and 2) were based on logistic regression with n= 969 respondents. The models for BF duration (3 and 4) were based on multivariate linear regression models with n=627 respondents. The two models that control for clustering among siblings (2 and 4) were mixed models with random effects the mother. Models 1 and 3 are similar to the initiation and duration components of the interaction model shown in Table 2 of the main manuscript, but they are not identical because the models in Table 2 were estimated using a different modeling approach.

References

1. Ip S, Chung M, Raman G, Trikalinos TA, Lau J. A summary of the Agency for Healthcare Research and Quality's evidence report on breastfeeding in developed countries. *Breastfeeding Medicine.* 2009;4(S1):S-17-S-30.
2. Eidelman AI, Schanler RJ. Breastfeeding and the use of human milk. *Pediatrics.* 2012;129(3):e827-e841.
3. Victora CG, Bahl R, Barros AJ, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *The Lancet.* 2016;387(10017):475-490.
4. World Health Organization. Infant and young child feeding. https://www.who.int/en/news-room/fact-sheets/detail/infant-and-young-child-feeding. Published 2020. Accessed Nov 3, 2020.
5. Anstey EH, Chen J, Elam-Evans LD, Perrine CG. Racial and geographic differences in breastfeeding—United States, 2011–2015. *Morbidity and Mortality Weekly Report.* 2017;66(27):723.
6. Roe B, Whittington LA, Fein SB, Teisl MF. Is there competition between breast-feeding and maternal employment? *Demography.* 1999;36(2):157-171.
7. Ryan AS, Zhou W, Arensberg MB. The effect of employment status on breastfeeding in the United States. *Women's Health Issues.* 2006;16(5):243-251.
8. Attanasio L, Kozhimannil KB, McGovern P, Gjerdingen D, Johnson PJ. The impact of prenatal employment on breastfeeding intentions and breastfeeding status at 1 week postpartum. *Journal of Human Lactation.* 2013;29(4):620-628.
9. Lubold AM. Breastfeeding and employment: A propensity score matching approach. *Sociological Spectrum.* 2016;36(6):391-405.

10. Chatterji P, Frick KD. Does returning to work after childbirth affect breastfeeding practices? *Review of Economics of the Household.* 2005;3(3):315-335.

11. Dagher RK, McGovern PM, Schold JD, Randall XJ. Determinants of breastfeeding initiation and cessation among employed mothers: a prospective cohort study. *BMC Pregnancy and Childbirth.* 2016;16(1):194.

12. Laughlin LL. *Maternity leave and employment patterns of first-time mothers: 1961-2008.* US Department of Commerce, Economics and Statistics Administration; 2011.

13. Ahluwalia IB, Morrow B, Hsia J. Why do women stop breastfeeding? Findings from the Pregnancy Risk Assessment and Monitoring System. *Pediatrics.* 2005;116(6):1408-1412.

14. Johnson KM, Salpini C. Working and nursing: navigating job and breastfeeding demands at work. *Community, Work & Family.* 2017;20(4):479-496.

15. Guendelman S, Kosa JL, Pearl M, Graham S, Goodman J, Kharrazi M. Juggling work and breastfeeding: effects of maternity leave and occupational characteristics. *Pediatrics.* 2009;123(1):e38-e46.

16. Jacknowitz A. The role of workplace characteristics in breastfeeding practices. *Women & Health.* 2008;47(2):87-111.

17. Spitzmueller C, Zhang J, Thomas CL, et al. Identifying job characteristics related to employed women's breastfeeding behaviors. *Journal of Occupational Health Psychology.* 2018;23(4):457.

18. Calnen G. Paid maternity leave and its impact on breastfeeding in the United States: an historic, economic, political, and social perspective. *Breastfeeding Medicine.* 2007;2(1):34-44.

19. Whipps MDM, Honoroff J. Time off work after childbirth and breastfeeding supportive workplaces: associations with near-exclusive breastfeeding trajectory membership. *Women's Health Issues.* 2019;29(6):506-512.

20. Lauer EA, Armenti K, Henning M, Sirois L. Identifying barriers and supports to breastfeeding in the workplace experienced by mothers in the New Hampshire Special Supplemental Nutrition Program for Women, Infants, and Children utilizing the Total Worker Health framework. *International Journal of Environmental Research and Public Health.* 2019;16(4):529.

21. Kimbro RT. On-the-job moms: work and breastfeeding initiation and duration for a sample of low-income women. *Maternal and Child Health Journal.* 2006;10(1):19-26.

22. Visness CM, Kennedy KI. Maternal employment and breast-feeding: findings from the 1988 National Maternal and Infant Health Survey. *American Journal of Public Health.* 1997;87(6):945-950.

23. Snyder K, Hansen K, Brown S, Portratz A, White K, Dinkel D. Workplace breastfeeding support varies by employment type: the service workplace disadvantage. *Breastfeeding Medicine.* 2018;13(1):23-27.

24. National Institute for Occupational Safety and Health Surveillance Program. *Supplement report: analysis of New Hampshire Pregnancy Risk Assessment Monitoring System (PRAMS) to better understand breastfeeding initiation and duration by industry category.* 2020.

25. Whitley MD, Ro A, Choi B. Workplace breastfeeding support and job satisfaction among working mothers in the United States. *American Journal of Industrial Medicine.* 2019;62(8):716-726.

26. Heck KE, Braveman P, Cubbin C, Chavez GF, Kiely JL. Socioeconomic status and breastfeeding initiation among California mothers. *Public Health Reports.* 2006;121(1):51-59.

27. Jefferson UT. Breastfeeding exposure, attitudes, and intentions of African American and Caucasian college students. *Journal of Human Lactation.* 2017;33(1):149-156.

28. McCarter-Spaulding D, Gore R. Breastfeeding self-efficacy in women of African descent. *Journal of Obstetric, Gynecologic & Neonatal Nursing.* 2009;38(2):230-243.

29. Bai Y, Wunderlich SM, Fly AD. Predicting intentions to continue exclusive breastfeeding for 6 months: A comparison among racial/ethnic groups. *Maternal and child health journal.* 2011;15(8):1257-1264.

30. McKinney CO, Hahn-Holbrook J, Chase-Lansdale PL, et al. Racial and ethnic differences in breastfeeding. *Pediatrics.* 2016;138(2):e20152388.

31. McLaughlin KA, Alvarez K, Fillbrunn M, et al. Racial/ethnic variation in trauma-related psychopathology in the United States: a population-based study. *Psychological Medicine.* 2019;49(13):2215-2226.

32. Cricco-Lizza R. Infant-feeding beliefs and experiences of Black women enrolled in WIC in the New York metropolitan area. *Qualitative Health Research.* 2004;14(9):1197-1210.

33. Gurley-Calvez T, Bullinger L, Kapinos KA. Effect of the Affordable Care Act on breastfeeding outcomes. *American Journal of Public Health.* 2018;108(2):277-283.

34. Asiodu I, Flaskerud JH. Got milk? a look at breastfeeding from an African American perspective. *Issues in Mental Health Nursing.* 2011;32(8):544-546.

35. Louis-Jacques AF, Marhefka SL, Brumley J, et al. Historical antecedents of breastfeeding for African American women: from the pre-colonial period to the mid-twentieth century. *Journal of Racial and Ethnic Health Disparities.* 2020;7(5):1003-1012.

36. Johnson A, Kirk R, Rosenblum KL, Muzik M. Enhancing breastfeeding rates among African American women: a systematic review of current psychosocial interventions. *Breastfeeding Medicine.* 2015;10(1):45-62.

37. Hannan A, Li R, Benton-Davis S, Grummer-Strawn L. Regional variation in public opinion about breastfeeding in the United States. *Journal of Human Lactation.* 2005;21(3):284-288.

38. Williams DR, Mohammed SA, Leavell J, Collins C. Race, socioeconomic status, and health: complexities, ongoing challenges, and research opportunities. *Annals of the new York Academy of Sciences.* 2010;1186:69-101.

39. Yudell M, Roberts D, DeSalle R, Tishkoff S. Taking race out of human genetics. *Science.* 2016;351(6273):564-565.

40. Gee GC, Ford CL. Structural racism and health inequities: old issues, new directions. *Du Bois Review.* 2011;8(1):115-132.

41. Hardeman RR, Medina EM, Kozhimannil KB. Structural racism and supporting black lives — the role of health professionals. *New England Journal of Medicine.* 2016;375(22):2113-2115.

42. Li R, Rock VJ, Grummer-Strawn L. Changes in public attitudes toward breastfeeding in the United States, 1999-2003. *Journal of the American Dietetic Association.* 2007;107(1):122-127.

43. Nommsen-Rivers LA, Chantry CJ, Cohen RJ, Dewey KG. Comfort with the idea of formula feeding helps explain ethnic disparity in breastfeeding intentions among expectant first-time mothers. *Breastfeeding Medicine.* 2010;5(1):25-33.

44. West E, Knight RJ. Mothers' milk: slavery, wet-nursing, and black and white women in the antebellum South. *Journal of Southern History.* 2017;83(1):37-68.

45. Wong S-lC. Ch. 4: Divided mothering: representations of caregivers of color in the age of "multiculturalism". In: Glenn EN, Chang G, Forcey LR, eds. *Mothering: Ideology, experience, and agency.* New York, London: Routledge; 1994:67-91.

46. Pager D, Shepherd H. The sociology of discrimination: racial discrimination in employment, housing, credit, and consumer markets. *Annual Review of Sociology.* 2008;34:181-209.

47. Tomaskovic-Devey D, Thomas M, Johnson K. Race and the accumulation of human capital across the career: a theoretical model and fixed-effects application. *American Journal of Sociology.* 2005;111(1):58-89.

48. Wrigley-Field E, Seltzer N. Unequally insecure: rising black/white disparities in job displacement, 1981-2017. *Washington Center for Equitable Growth Working Paper Series Washington, DC.* 2020.

49. United States Bureau of Labor Statistics CPS. *Labor force characteristics by race and ethnicity, 2018.* 2019.

50. Golden L. Limited access: sisparities in flexible work schedules and work-at-home. *Journal of Family and Economic Issues.* 2008;29(1):86-109.

51. Hawkins D. Disparities in the usage of maternity leave according to occupation, race/ethnicity, and education. *Am J Ind Med.* 2020;63:1134-1144.

52. Griswold MK, Crawford SL, Perry DJ, et al. Experiences of racism and breastfeeding initiation and duration among first-time mothers of the Black Women's Health Study. *Journal of Racial and Ethnic Health Disparities.* 2018;5(6):1180-1191.

53. Ortiz SY, Roscigno VJ. Discrimination, women, and work: processes and variations by race and class. *The Sociological Quarterly.* 2009;50(2):336-359.

54. Fekedulegn D, Alterman T, Charles LE, et al. Prevalence of workplace discrimination and mistreatment in a national sample of older U.S. workers: The REGARDS cohort study. *SSM Popul Health.* 2019;8:100444-100444.

55. Dalianis EA. *Multi-level Analysis of the Role of the Workplace and Employment in Racial Disparities in Breastfeeding Practices*. Philadelphia, PA: Public Health, Drexel University; 2016.

56. Ahonen EQ, Fujishiro K, Cunningham T, Flynn M. Work as an inclusive part of population health inequities research and prevention. *American Journal of Public Health.* 2018;108(3):306-311.

57. Greenhaus JH, Beutell NJ. Sources of conflict between work and family roles. *Academy of Management Review.* 1985;10(1):76-88.

58. Hays S. *The Cultural Contradictions of Motherhood.* New Haven and London: Yale University Press; 1996.

59. Afflerback S, Carter SK, Anthony AK, Grauerholz L. Infant-feeding consumerism in the age of intensive mothering and risk society. *Journal of Consumer Culture.* 2013;13(3):387-405.

60. Dow DM. *Mothering While Black: Boundaries and Burdens of Middle-Class Parenthood.* Oakland, CA: University of California Press; 2019.

61. Dow DM. Integrated motherhood: beyond hegemonic ideologies of motherhood. *Journal of Marriage and Family.* 2016;78(1):180-196.

62. Collins C. *Making Motherhood Work: How Women Manage Careers and Caregiving.* Princeton, New Jersey: Princeton University Press; 2019.

63. Dow DM. Negotiating "The Welfare Queen" and "The Strong Black Woman": African American middle-class mothers' work and family perspectives. *Sociological Perspectives.* 2015;58(1):36-55.

64. Herrick KA, Rossen LM, Kit BK, Wang C-Y, Ogden CL. Trends in breastfeeding initiation and duration by birth weight among US children, 1999-2012. *JAMA Pediatrics.* 2016;170(8):805-807.

65. Office of the Surgeon General, Centers for Disease Control and Prevention, Office on Women's Health. Publications and Reports of the Surgeon General. In: *The Surgeon General's Call to Action to Support Breastfeeding.* Rockville (MD): Office of the Surgeon General (US); 2011.

66. University of Michigan, Institute for Social Research. *PSID Main Interview User Manual: Release 2019.* February 2019.

67. University of Michigan, Institute for Social Research. Survey Research Center,. Panel Study of Income Dynamics. https://psidonline.isr.umich.edu/. Published 2020. Accessed June 15,, 2020.

68. MacDonald T, Noel-Weiss J, West D, et al. Transmasculine individuals' experiences with lactation, chestfeeding, and gender identity: a qualitative study. *BMC Pregnancy and Childbirth.* 2016;16(1):106.

69. United States Census Bureau. Industry and occupation code lists & crosswalks. https://www.census.gov/topics/employment/industry-occupation/guidance/code-lists.html. Published 2020. Updated August 31, 2000. Accessed Oct 21, 2020.

70. Sullivan R. The age pattern of first-birth rates among US women: the bimodal 1990s. *Demography.* 2005;42(2):259-273.

71. Xiang AH, Chow T, Mora-Marquez J, et al. Breastfeeding persistence at 6 months: trends and disparities from 2008 to 2015. *The Journal of Pediatrics.* 2019;208:169-175.e162.

72. Yang Y, Morgan SP. How big are educational and racial fertility differentials in the US? *Social Biology.* 2003;50(3-4):167-187.

73. Musick K, England P, Edgington S, Kangas N. Education differences in intended and unintended fertility. *Social Forces.* 2009;88(2):543-572.

74. Li R, Darling N, Maurice E, Barker L, Grummer-Strawn LM. Breastfeeding rates in the United States by characteristics of the child, mother, or family: the 2002 National Immunization Survey. *Pediatrics.* 2005;115(1):e31-e37.

75. Fomby P, Cherlin AJ. Family instability and child well-being. *American Sociological Review.* 2007;72(2):181-204.

76. Flacking R, Nyqvist KH, Ewald U, Wallin L. Long-term duration of breastfeeding in Swedish low birth weight infants. *Journal of Human Lactation.* 2003;19(2):157-165.

77. Acevedo-Garcia D, Soobader M-J, Berkman LF. The differential effect of foreign-born status on low birth weight by race/ethnicity and education. *Pediatrics.* 2005;115(1): e20-e30.

78. Smith-Gagen J, Hollen R, Walker M, Cook DM, Yang W. Breastfeeding laws and breastfeeding practices by race and ethnicity. *Women's Health Issues.* 2014;24(1):

e11-e19.

79. Settles IH, Pratt-Hyatt JS, Buchanan NT. Through the lens of race: Black and White women's perceptions of womanhood. *Psychology of Women Quarterly.* 2008;32(4): 454-468.

80. Holmes AV, Auinger P, Howard CR. Combination feeding of breast milk and formula: evidence for shorter breast-feeding duration from the National Health and Nutrition Examination Survey. *The Journal of Pediatrics.* 2011;159(2):186-191.

81. McCluney CL, Rabelo VC. Conditions of visibility: An intersectional examination of Black women's belongingness and distinctiveness at work. *Journal of Vocational Behavior.* 2019;113:143-152.

82. Burgard SA, Lin KY. Bad jobs, bad health? How work and working conditions contribute to health disparities. *American Behavioral Scientist.* 2013;57(8):1105-1127.

83. Braveman PA, Cubbin C, Egerter S, Williams DR, Pamuk E. Socioeconomic disparities in health in the United States: what the patterns tell us. *American Journal of Public Health.* 2010;100(S1):S186-S196.

84. Geyer S, Hemström Ö, Peter R, Vågerö D. Education, income, and occupational class cannot be used interchangeably in social epidemiology. Empirical evidence against a common practice. *Journal of Epidemiology & Community Health.* 2006;60(9):804-810.

85. Warren JR, Hoonakker P, Carayon P, Brand J. Job characteristics as mediators in SES–health relationships. *Social Science & Medicine.* 2004;59(7):1367-1378.

86. Hauser RM, Warren JR. Socioeconomic indexes for occupations: a review, update, and critique. *Sociological Methodology.* 1997;27(1):177-298.

87. Davis R, Williams J, Chetwynd E. Increasing diversity in the field of lactation: an interview with the directors of Pathway 2 IBCLC programs at Historically Black Colleges and Universities. *Journal of Human Lactation.* 2021;0(0):0890334421995108.

88. Walker-Tibbs N, Boyd L, Camara T, Brooks-Floyd F. The Black Course: Birth, Lactation, Accomodation, Culture, Kinship. https://theblackcourse.com/. Published 2020. Accessed November 6, 2020.

89. Shipp G. *Understanding Breastfeeding Self-Efficacy & Social Support in a Breastfeeding Duration Intervention Focused on African American Women*, Michigan State University; 2020.

90. Dinour LM, Szaro JM. Employer-based programs to support breastfeeding among working mothers: a systematic review. *Breastfeeding Medicine.* 2017;12(3):131-141.

91. Hilliard ED. A review of worksite lactation accommodations: Occupational health professionals can assure success. *Workplace Health & Safety.* 2017;65(1):33-44.

92. Spatz DL, Kim GS, Froh EB. Outcomes of a hospital-based employee lactation program. *Breastfeeding Medicine.* 2014;9(10):510-514.

93. Moen P, Kelly EL, Tranby E, Huang Q. Changing work, changing health:can real work-time flexibility promote health behaviors and well-being? *Journal of Health and Social Behavior.* 2011;52(4):404-429.

94. Karasek Jr RA. Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly.* 1979:285-308.

95. Hagedorn J, Paras CA, Greenwich H, Hagopian A. The role of labor unions in creating working conditions that promote public health. *American Journal of Public Health.* 2016;106(6):989-995.

96. Finnigan R, Hale JM. Working 9 to 5? Union membership and work hours and schedules. *Social Forces.* 2018;96(4):1541-1568.

97. Kozhimannil KB, Attanasio LB, McGovern PM, Gjerdingen DK, Johnson PJ. Reevaluating the relationship between prenatal employment and birth outcomes: a policy-relevant application of propensity score matching. *Women's Health Issues.* 2013;23(2):e77-e85.

98. Fabiyi C, Peacock N, Hebert-Beirne J, Handler A. A Qualitative study to understand nativity differences in breastfeeding behaviors among middle-class African American and African-born women. *Maternal and Child Health Journal.* 2016;20(10):2100-2111.

99. Goldberg AE, Smith JZ. Work conditions and mental health in lesbian and gay dual-earner parents. *Family Relations.* 2013;62(5):727-740.

CHAPTER 3

Low job control and racial disparities in breastfeeding

Abstract

Background

Psychosocial working conditions can impact mothers' breastfeeding (BF) behaviors, and Black women are exposed to more psychosocial occupational hazards, such as low job control, than White women. However, no study has assessed whether low job control predicts BF outcomes, or whether it mediates racial BF disparities.

Methods

We linked questionnaire data on BF outcomes in the Panel Study of Income Dynamics (PSID) 2014 Child Development Supplement with mothers' occupation and race in the PSID Main Interview. Utilizing mothers' occupation title, we merged low job control scores from an original job exposure matrix (based on 5 items from the NIOSH Quality of Work Life questionnaire).

We assessed mediation two ways. First, applying the Baron and Kenny mediation approach, we created zero-inflated negative binomial (ZINB) models to assess whether including low job control reduced the relationship between Black vs White race and breastfeeding initiation/duration. Second, we created a path model for race, low job control, and odds of BF duration for less than six months and for at least six months (both compared to no BF), controlling for mother's education, working hours, marital status, and infant low birthweight.

Results

Among n=631 working mothers, 69% were White, 13.5% were Black and 17.5% identified with other races. Overall, 71% initiated BF, with average duration 6.7 months. Compared to White mothers, Black mothers breastfed less (5.6 months compared to 7.0 months).

In both modeling approaches, Black mothers had significantly more exposure to low job control than White mothers (in fully-adjusted regression model, $\beta=0.294$, $p<0.05$). Adding low job control to the ZINB model reduced some of the Black vs White variability in breastfeeding initiation. In the path models, low job control was associated with decreased odds of longer-term (less than six months) BF (OR=0.61, $p<0.05$). Low job control explained 31% of the Black vs White difference for both shorter term and longer-term BF.

Conclusion

This is the first study to demonstrate that low job control predicts BF outcomes, and that low job control partially explains racial inequities in BF among US mothers. We utilized a novel job exposure matrix for psychosocial working conditions. These findings indicate that addressing working conditions could improve BF promotion interventions and racial inequities.

Introduction

Empirical background

Breastfeeding: Breastfeeding (BF) has been associated with numerous health benefits including a stronger immune system and reduced risk of many infections for infants and young children,[1,2] and reduced risk of certain cancers among mothers.[3,4] Leading health organizations urge mothers to exclusively breastfeed until their child reaches six months of age, and to continue BF along with supplemental foods for at least the first year.[5,6] The majority of mothers

in the United States (US) intend to breastfeed and 79% of new mothers initiate BF.[7] However, only 20% of US mothers exclusively breastfeed until six months,[7] and there are notable racial disparities in BF rates. Among White mothers, 82% of White mothers initiate BF and 23% exclusively breastfeed for six months, while among Black mothers, 64% of Black mothers initiate and 14% breastfeed exclusively at six months.[7] This represents an inequity in vulnerable periods of the life course of both the child and the mother that can contribute to racial inequities in other outcomes later down the line.[1,8]

Racial inequities in BF and connection to work: Differing rates of BF among White and Black mothers are recognized as a major public health concern.[9] These inequities have been attributed to various predictors, such as differences in BF-related beliefs and knowledge,[10-12] stressful life events,[13,14] differing BF-related family norms,[15] access to health insurance[16] and healthcare quality.[15] Research has also examined how structural factors, like varying degrees of exposure to infant formula promotion,[14,17,18] and barriers due to work and/or school,[19,20] may contribute to racial inequities in BF. However, in the quantitative literature, more attention has been given to the role of attitudes, beliefs and culture (e.g.,[11,21,22]). Race is a social construct[23] and it cannot itself cause BF behaviors. Rather, race relates to BF by way of other, causal factors. People's exposures to those causal factors are shaped by racism-related processes, like structural racism in the past and currently.[24-26] Accurately understanding BF disparities – and effectively addressing them – requires that researchers and practitioners understand the modifiable causal factors linking race to BF behaviors.[9,27]

One example of a causal factor shaped by racism-related processes is work. Work-related factors are a major determinant of BF behaviors. Over a quarter of mothers return to work within three months of giving birth,[28] and BF-related problems at school and work are commonly cited

reasons for stopping BF.[29] Simply being employed, compared to not being employed, may predict less BF,[30] but the type of job an employed mother holds complicates that relationship.[31] Racial inequities in working women's exposure to psychologically and physically hazardous working conditions may contribute to differences in BF behaviors.[32,33] Numerous historical and present-day structural forces, including inequities in educational opportunities, inconsistent enforcement of civil rights legislation, stereotypical and discriminatory beliefs among employers, and unfair hiring and layoff practices have advantaged White Americans and men, and disadvantaged Black Americans and women, in their opportunities to obtain and maintain jobs that are safe, fulfilling and decently paid.[34-37]

Black women in particular have faced substantially more barriers to obtaining well-paid, safe jobs than other groups.[33,38] Black women are more likely to work in service occupations or transportation, in jobs that offer less flexibility[39,40] and jobs without paid maternity leave [41] in comparison to White women, who are more likely to work in management or professional positions. Further, Black workers may face more barriers to BF than their White counterparts even within the same occupation or workplace,[42] such as interpersonal racism and discrimination from colleagues or supervisors.[42-46]

We are aware of three studies that have examined employment status as a potential mediator between Black/White disparities in BF, and they present a mixed, sometimes contradictory set of findings about the differences in employment among Black compared to White mothers and how that relates to BF behaviors. Using a national sample of US mothers, Ryan and colleagues[19] found that women who full time work had shorter BF periods compared to those working either part-time or not at all. They also found that Black women were both more likely to work full time and were less likely to BF until six months, when compared to

White mothers, although they did not conduct a formal mediation analysis. Second, in a study using data from three US cities, McKinney and colleagues[15] considered whether employment status, among many other factors, may mediate the relationship between race/ethnicity and BF duration. Because the proportion of mothers employed at their point of assessment (four months postpartum) was similar across their four racial/ethnic groups, they did not present results of the formal mediation test.[47] Third, Safon and colleagues used a nationally-representative US sample to examine whether employment during pregnancy along with other sociodemographic and psychosocial variables mediated the relationship between race and BF outcomes. They found that Black mothers were less likely than White mothers to be employed, less likely to exclusively BF at follow-up, and that being employed was associated with decreased probability of BF at follow-up.[48] Thus, prior research has only considered employment status, and not working conditions, as a potential mediator for racial disparities in BF and has found mixed evidence for whether and how employment may explain BF inequities among Black and White mothers.

Occupation and working conditions: Beyond simply being employed, many elements of mother's work are predictive of BF outcomes, including occupation, access to BF accommodations, and working conditions.[31] This suggests that it is not simply a question of a mother being physically separated from her infant for a period of time that affects BF, but also whether her job accommodates regular expression of breastmilk throughout the work day to maintain a steady supply.[31] These exposures are interrelated – for instance, service/labor jobs are less likely to provide access to BF accommodations,[49] and more likely to include hazardous psychosocial working conditions.[50] Pinpointing which workplace exposures are related to BF outcomes can aid in the development of workplace BF interventions. Also, because continued

BF requires ability to consistently express milk, any barrier that is not addressed can permanently disrupt BF for that mother-child dyad.

Regarding occupation, mothers working in manual, service or administrative occupations,[30,49,51-54] or occupations that are hazardous or offer little autonomy[55] have reduced BF duration. In contrast, professional or managerial jobs predict longer BF duration.[51] Further, lactation-specific accommodations, such as the availability of a lactation room, lactation breaks, and supervisor support for BF at work, are predictive of more BF,[56-59] as are policies to support work-family integration more broadly, like employer-sponsored childcare and maternity leave.[56,60,61]

An important component of working conditions on BF is psychosocial factors. The psychosocial work environment refers to the interaction among people at a workplace and its connection to how individuals do their jobs.[62,63] Elements of the psychosocial work environment that may be deleterious to health include low job control (particularly coupled with high demands), lack of social support, job insecurity, low job influence and freedom, and workplace violence or harassment.[64-69] Existing research on BF has studied how flexibility and access to space and time to pump support continued BF,[57,60,70] but this literature has not integrated commonly-studied psychosocial working conditions. In particular, the degree of control and decision-making latitude workers have in a given occupation may be informative for understanding BF behaviors. Qualitative data point to the importance of this. For instance, in Spencer and colleagues' exploration of BF experiences among African American women, a mother who worked as a cashier in a retail store described the challenges of continuing to BF. "I had to go back to work so we could, um, survive…I couldn't just leave the register to pump when I needed….my milk supply dropped and I had to start formula." [71 (p 979)] This contrasts other

examples where working mothers were able to take breaks when they needed and could continue BF.[72] This ability to decide how to structure one's work day and how to complete tasks is related to the construct of low job control.

Low job control: Low job control is a widely studied psychosocial dimension of working conditions that could explain work-related differences in BF. A construct developed in the 1970s as part of Karasek's Job Demand-Control model,[73] low job control refers to jobs with low decision-making discretion and low intellectual authority for workers. When combined with high demands, or a heavy workload, low job control contributes to job strain,[73,74] which is predictive of coronary heart disease[68,75] and a variety of other physical and mental health outcomes.[67,76-80] Low job control among pregnant women has been linked to low birth weight in their offspring.[81] It has also been linked to unhealthy behaviors including decreased physical activity[82] and poor diet.[83] It is similar conceptually to job inflexibility, which has been connected to shorter BF duration.[60] However, we are not aware of any studies that tested whether BF outcomes may associated with this frequently studied working condition.

High physical workload: High physical workload, which can include frequent lifting, pushing, pulling and other repetitive physical motions[84] as well as long periods standing[85] is another commonly studied working condition, and distinct from the psychosocial conditions mentioned above. Pregnant women working in jobs with high physical workload have increased risk of adverse birth outcomes, including preterm birth,[86-88] low birthweight,[87,88] preeclampsia, [57,] and smaller fetal health circumference.[85] We are aware of no prior research examining high physical workload in conjunction with BF, and theoretically, physical workload is not likely to be impact a mother's ability to continue BF. However, high physical workload provides useful perspective in this study, as it is relevant to many other maternal health outcomes.[84,87] Scholars

have suggested that racial disparities in high physical workload may contribute to the racial disparities in small-for-gestational age and preterm birth,[89,90] and the present study makes a similar argument for low job control and BF outcomes.

Research Questions

In this study, we argue that psychosocial working conditions, namely low job control, can influence BF outcomes and contribute to racial inequities in BF. We hypothesize that low job control is predictive of less BF and that physical workload is not associated with BF outcomes. Then, we considered whether low job control mediates the relationship between race and BF outcomes. We hypothesize that Black mothers would have lower job control than White mothers, and that low job control would partially mediate the relationship between White vs Black race and BF outcomes. We contrast the job control patterns to high physical workload, another important working condition that we do not expect to affect BF.

Methods

Data set

We used data from the Panel Study of Income Dynamics (PSID), a nationally representative, longitudinal survey of American families.[91,92] The PSID includes data about socioeconomic, family, health and other characteristics. The surveys were conducted using computer-assisted telephone interviews. The PSID employs many approaches to minimize attrition across survey wave and reduce non-response, including incentives amounting to roughly $1 for each minute of the interview;[93] the study has a 91% overall response rate and 94% wave-to-wave response rate.[94]

We combined the 2007-2015 waves of the survey. Because of our focus on

working conditions, we only included mothers who reported working and had valid employment status and occupational code information within five months of having their child.[95]

We linked mothers' sociodemographic and work data to birth and BF information of their biological children using the 2014 Child Development Supplement, a supplemental survey for children of PSID respondents. Out of 4,333 total children surveyed, 1,314 were under 5 at the time of the survey and asked BF questions. We linked birth and breastfeed information for 1,308 mothers (six were unable to be linked). We excluded another 338 because of incomplete information on at least one key variable, leaving 970. The information most commonly missing was employment and occupation for the first six months postpartum (n=283).[g] Of the 970 women with complete data, we excluded 339 who reported not working during the first six months postpartum. After these exclusions, we had an analytic sample of n=631 mothers with employment, occupation, birth, and BF information.

There were repeat births (e.g. siblings) among the 631 mothers in the analytic sample; there were 382 unique mothers included. We conducted sensitivity analyses to examine potential clustering effects among children of the same mother, which are reported in the results section. The study was determined to not qualify as human subjects research by the University of California Irvine Institutional Review Board.

[gg] Our employment status variable was extracted from over 500 month- and year- specific PSID variables capturing respondents' employment status at their primary and (if relevant) secondary job, and whether they were out of the workforce or unemployed (all of which were listed separately depending on whether the mother was classified as the "head of house/reference person" or "wife/spouse.") We used information specific to the five months following the month when each mother gave birth. Some respondents were excluded from our sample because of contradictory employment responses, even if they had complete information for the relevant variables. For instance, respondents who reported working at their "Job 1" during a given month but also reported being unemployed at that time were excluded from our sample.

Measures

Breastfeeding initiation and duration: Study participants were asked whether each participating child, age 5 years or less, initiated BF or not. For those who did initiate, they were asked at what age in months the child stopped BF. In this sample, BF duration ranged from 1 to 60 months; we top-coded the variable at 12 months based on research and formal recommendations for duration up to one year.6 All mothers who were still BF at the time of data collection had already breastfed more than 12 months, so the variable did not have any censoring. The survey did not assess whether BF was exclusive.

Mother's race: Respondents were able to select up to three races; we used the first mentioned. Because of limited sample size, we collapsed Latino/Hispanic, Asian, Native Hawaiian or Pacific Islander, and Other into a single category, Other Races. We left Black and White as additional, separate categories.

Occupational Characteristics: In the main PSID study, all adult participants reported their employment status on a monthly basis. We identified the mother's employment status for the first through fifth months following the child's birth month, in order to capture the first six months postpartum during which exclusive BF is recommended.[6] Mothers who reported not working or being unemployed for all five months were classified as not working and excluded from this study. For those who reported working at least one of those five months, whether in their primary or secondary job, we obtained the occupation code associated with that job. Mothers who did not have an occupation code, such as students who did not report working, were excluded from this study. Self-employment was categorized like other jobs.

To obtain information about working conditions, we utilized a unique job exposure

matrix built from the General Social Survey - Quality of Worklife Questionnaire. Five waves of the General Social Survey (2002, 2006, 2010, 2014, and 2018) were used.[96] These responses were used to create a job exposure matrix for two working conditions: low job control and high physical workload,[97] and we were given access to this matrix for this analysis. Job exposure matrices are used to assign values for occupational exposures for which data would not otherwise be available, based on detailed occupation code.[98] A complete description of the creation of the job exposure matrix has been published separately.[97]

To integrate the job exposure matrix scores, we first converted the occupation codes in the PSID, which were in US Census 2000 format,[91,99] into the Standard Occupation Classification (SOC) format,[100] which was used in the General Social Survey. The matrix included estimates for low job control and high physical workload at the level of six-digit occupation codes. In cases where the matrix had fewer than four responses at that occupation code level, we linked scores for a higher, less-specific level. This job exposure matrix contained the same working conditions estimates for all workers within a given six-digit SOC occupation code, regardless of gender.

Low job control: The low job control score was calculated based on five General Social Survey-Quality of Worklife Questionnaire items covering two domains. There were three items about skill development, like whether the respondent has opportunities to develop and use special abilities and skills, as well as two items about decision making, like how often the respondent can decide how to do their work.[96] The Cronbach alpha was based were 0.67. The possible range for low job control was 5 to 20, with higher values indicating lower job control. The average low job control score in a general population of male and female US

workers (the General Social Survey sample from which the job exposure matrix was created), was 8.8, with a standard deviation of 2.6.[101]

High physical workload: High physical workload refers to the amount of physical movement that a job requires. This is a distinct concept from demands as described in Karasek's Job Demand-Control model.[73] Although the main working condition of interest in our study was low job control, we also assessed and analyzed high physical workload with respect to BF because it is a commonly assessed working condition.[102-104]

The high physical workload score was based on two items assessing whether the respondent engages in activities like lifting, pushing, or forceful hand movements at their job. The Cronbach alpha was 0.63, and the gamma coefficient was 0.76. High physical workload scores ranged from 2 to 4, with higher scores indicating lower physical workload. The average high physical workload score in a general population of male and female US workers was 3.0, with a standard deviation of 0.5.[101]

Covariates: We assessed and controlled for additional variables that were shown, both in the literature and in our bivariate analyses, to be associated with maternal race and BF behaviors. We controlled for mother's age at delivery (continuous variable),[105,106] mother's educational attainment,[106-108] categorized 16 or more years, approximately equivalent to a having a bachelor's degree versus less than 16 years; marital status,[109,110] based on two variables that identify whether a mother was a single "head of house" or a wife/spouse, and whether or not the child had low birth weight,[111,112] defined as less than 88 ounces (5.5 lbs). We also controlled for hours worked.[19,113] We categorized this variable as either less than 20 hours per week, 20 to 40, or more than 40 hours per week.

Analysis

We used Stata 16.1 MP for statistical analyses. To determine statistical significance, we used alpha of 0.05. We accounted for the sampling design by using the main child sample weights for the Child Development Supplement (based on child's sex, birth year, race/ethnicity and geographic region), as well as the stratum and cluster weights for the main PSID survey.

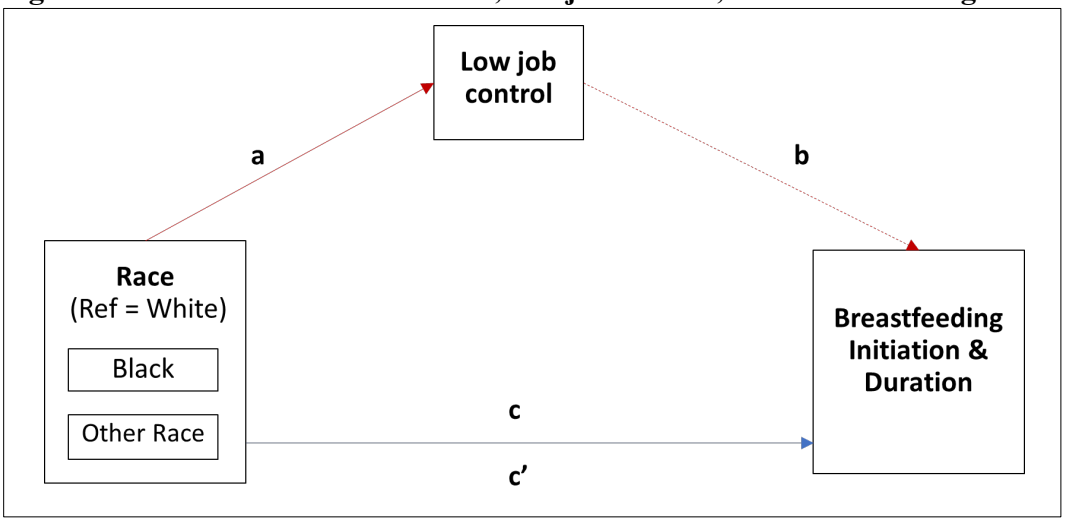
Descriptive statistics

We calculated descriptive statistics for all variables, for the overall sample and stratified by race. For continuous variables we calculated weighted means and standard deviations, and for categorical variables, weighted proportions.

Baron and Kenny-style mediation analysis

Mediation models for low job control Following the Baron and Kenny approach to mediation analysis,[114] we created four multivariate models each to assess whether low job control may mediate the relationship between race and BF. Part A assessed whether race was predictive of low job control, Part B assessed whether low job control was predictive of BF non-initiation and duration, Part C assessed to what degree race was predictive of BF initiation and duration when low job control was excluded, and Part C' assessed to what degree race *and* job control were predictive of BF non-initiation and duration. See Figure 3.1. All models adjusted for hours worked per week, mother's age, education, marital status, infant birthweight.

Figure 3.1 Mediation model for race, low job control, and breastfeeding



We used two different multivariate modeling approaches in accordance with the type of dependent variable. For Part A, which had low job control as a dependent variable, we used multiple linear regression. For Parts B, C and C', which had BF initiation and duration as a dependent variable, we used models zero-inflated negative binomial regression (ZINB) models. This enabled us to estimate BF duration as a count of the months of reported BF, and at the same time estimate a ratio for whether or not a mother initiated BF at all. ZINB models can accommodate different sets of covariates in the duration and initiation components. However, based on prior research and on our bivariate analyses, we used the same aforementioned set of covariates for both. For ease of interpretation, we exponentiated the coefficients so that they represented ratios (technically, interval rate ratios). We then inverted the ratios for non-initiation so they would represent odds of initiating BF. We conducted a Vuong test to confirm that there was overdispersion of zero values and that a zero- inflated model was appropriate. All of these models accounted for sampling weights.

To assess whether low job control mediated the relationship between race and BF, we compared the change in the coefficient for Black versus White race between Model C and Model

C', for both the initiation and the duration components using a Sobel test. Although it is conservative, particularly for a relatively small sample such as this,[115] a Sobel test can provide additional evidence of the strength of an indirect pathway. Because it was not possible to do a Sobel test for ZINB model, we conducted Sobel tests separately for a logistic regression model predicting BF initiation and a linear regression model predicting BF duration (for only the subsample that initiated).

Mediation models for high physical workload: We created the same set of multivariate models to assess whether high physical workload may mediate the relationship between race and BF initiation and duration. As low job control was our primary interest, we focus here on the results of the low job control mediation analyses.

Path analysis

We used path analysis, a subtype of structural equation modeling, to further assess whether and to what degree low job control may mediate the relationship between race and BF, and to better model interrelationships among all the variables under consideration. We created two path models. The purpose of the first model was to establish the extent of racial differences in BF outcomes without taking low job control into account. The second model integrated low job control and served to show whether low job control mediated the relationship between race and BF. Both models used a categorical outcome (no BF, BF less than six months, and BF at least six months), applying multinomial regression, and included the full analytic sample of n=631. The coefficients for the paths leading to the categorical BF outcomes were exponentiated to become odds ratios.

To determine whether low job control functioned as a mediator, we first examined whether there were statistically significant paths from the race variables to low job control, and then from low job control to the two BF outcomes. Then, we calculated direct and indirect effects and their p-values for those same relationships. We did separate calculations for Black race and other race (both compared to White), and also for the two BF outcomes – BF less than six months and BF at least six months (both compared to no BF). The indirect effects were calculated by multiplying the coefficients for the race to low job control path by the coefficient for the low job control to BF outcome path. The direct effects were estimated based on the race to BF outcome coefficient. For both direct and indirect effects, we exponentiated the resulting coefficient because the two BF outcome variables were fit as multinomial logistic. To obtain the proportion of the total effect mediated by low job control, specific to each of the two BF outcomes, we divided the (non-exponentiated) indirect effect by the sum of the indirect and direct effects (equivalent to the total effect). We conducted all path models in Stata 15.0 using the *gsem* command.

Results

Descriptive statistics

Table 3.1 displays the characteristics of the n=631 working mothers who comprise this study sample. Based on weighted univariate statistics, 69% of the sample was White, 14% was Black and 18% were of other races. Average age was just under 30 years, 49% of the sample had a bachelor's degree, and 16% of mothers were not married. Overall, 71% of the women initiated BF; the proportion was lower for Black mothers (54%) compared to White mothers (73%) and women of other races (78%). For those who breastfed, mean duration was 6.7 months overall.

Duration was longest among White mothers at 7.0 months, followed by mothers of other races at 6.1 months, and the among Black mothers, with average duration of 5.6 months.

In this sample, low job control scores ranged from 5.5 to 13.6 (maximum possible range 5 to 20, and higher scores indicate lower job control). The average weighted low job control score was 8.8 for the sample overall, with a standard deviation of 0.93. Low job control scores were higher on average for Black mothers (9.1) and mothers of other races (9.0) compared to White mothers (8.5). In the General Social Survey, which is nationally representative, the average job control score is 8.8, which is comparable to our sample.

For high physical workload, the scores in the sample ranged from 2 to 4, with a standard deviation of 0.41; lower scores indicate higher physical workload. Average physical workload score was 3.2 in the sample overall; scores were slightly higher for White mothers and mothers of other races (3.2 in both cases) than for Black mothers (average score 3.0). These scores were comparable to the general population average score of 3.0.

Table 3.1. Weighted sociodemographic characteristics, health outcomes and working conditions for analytic sample of mothers

	Total n= 631	By race		
		White n=333	Black n=223	Other n=75
Mother's socio-demographic characteristics				
Race				
White %	69.1			
Black %	13.5			
Other races %	17.5			
Age, mean (SD) years	29.7 (5.2)	30.2 (5.0)	26.8 (4.9)	29.9 (5.3)
Education (bachelors degree or higher), %	48.8	55.9	26.6	36.0
Mother is not married, %	15.7	10.3	48.1	12.3
Health outcomes and BF behaviors				
BF behaviors				
Mother initiated BF, %	71.3	73.1	54.0	77.8
BF duration, mean (SD) months[a] (Among the n=413 who initiated)	6.7 (4.0)	7.0 (3.9)	5.6 (3.7)	6.1 (4.3)
Infant born with low birth weight, %	5.9	6.5	7.2	2.6
Mother's job characteristics				
Hours (among those working)				
Less than 20 hours/week, %	10.4	13.5	5.6	2.0
20 to 40 hours/week, %	72.0	66.4	88.7	80.0
Over 40 hours/week, %	17.8	20.1	5.7	18.2
Working conditions, mean (SD) (among those working)				
Low job control score, possible range 5 to 20	8.8 (0.93)	8.5 (0.83)	9.1 (0.96)	9.0 (1.10)
High physical demand score, possible range 2 to 4	3.2 (0.41)	3.2 (0.40)	3.0 (0.38)	3.2 (0.43)

[a]BF duration was top-coded at 12 months.

Note – SD=standard deviation. Proportions (%), means, and standard deviations take Panel Study of Income Dynamics survey weights into account.

Mother's working conditions are based on job she reported during at least one of the first five months after giving birth. High physical workload and job control measures were linked to occupation codes from a job exposure matrix. Low physical workload score means high physical workload. Low job control score indicates high job control.

Baron and Kenny-style mediation analysis

Mediation models for low job control Table 3.2 shows the results of Baron and Kenny-style mediation models addressing whether race predicted low job control (Part A), whether low job control predicted BF (Part B), and whether low job control mediated the relationship between race and BF initiation/duration (Parts C and C').

Part A showed that Black mothers and mothers of other races had lower job control than White mothers (for Black compared to White mothers: beta [95% CI] = 0.294 [0.027, 0.561]; mothers of other races versus White mothers: beta [95% CI] = 0.338 [0.091, 0.584]).[h] Part B showed that each additional point of low job control was associated with a decrease of 30% in the odds of initiating BF (Ratio [95% CI] = 0.719 [0.567, 0.912]), and that low job control was not significantly associated with BF duration.

Part C and C' indicated whether the amount of variation in BF explained by the race indicator variables was reduced by adding low job control to a fully adjusted ZINB model. Overall, we found that the difference in BF initiation among Black and White mothers was accounted for after low job control was added. In Part C, when low job control was not included, Black mothers had significantly lower odds of initiating BF compared to White mothers (Ratio [95% CI]=0.574 [0.342, 0.965]). When low job control was included in the model in Part C', the Black-White difference in BF initiation was no longer statistically significant and low job control was associated with 31% lower rate of initiation (ratio [95% CI]=0.686 [0.542, 0.868) for each additional point on the low job control scale). The Sobel tests indicated a marginally significant change in the BF initiation coefficient for Black women from C to C'.

[h]Regarding the covariates in Part A (not shown in Table 3.2), working more than 40 hours per week (beta [95% CI]=-0.315 [-0.540, -0.090] and having a college degree (beta [95% CI] = -0.529 [-0.760, -0.298]) were significantly predictive of higher job control. Increased age was also associated with higher job control, but it narrowly missed the alpha=0.05 significance cut-off (beta [95% CI]=-0.018 [-0.038, 0.001]).

In contrast, there were no differences in BF duration between White and Black mothers (95% CI=0.733, 1.186) to mediate in Part C. Women of other races had no significant differences in BF initiation or BF duration to mediate compared to White women (95% CI=0.739, 1.117). The Sobel test for the change in Black women's BF duration coefficient between C and C' was not statistically significant (p=0.13). [i]

Mediation models for high physical workload: The results of the mediation analysis for high physical workload are shown in Supplemental Table 3.2. High physical workload did not differ by race (Part A), nor was it a significant predictor of BF initiation or duration. In Parts C and C', there was no significant difference in either BF initiation or BF duration after high physical workload was added to the model.

[i]Regarding the covariates in Part C' (not shown in Table 3.2), having a college degree was associated with significantly higher odds of BF initiation (ratio [95% CI]= 1.803 [1.004, 3.240]). For BF duration in the same model, working 20-40 hours per week (ratio [95% CI]=0.772 [0.624, 0.954]), working over 40 hours per week (ratio [95% CI]=0.697 [0.550, 0.884]), and being unmarried (ratio [95% CI]=0.745 [0.563, 0.984]) were all associated with significantly shorter BF duration.

Table 3.2. Low job control as a potential mediator between race and breastfeeding initiation and duration

	Part A: Race predicting low job control b (95% CI)	Part B: Low job control predicting BF Ratio (95% CI)	Part C: Race predicting BF (without low job control) Ratio (95% CI)	Part C': Race predicting BF, with low job control Ratio (95% CI)
BF Initiation				
Race: Black (vs White)			0.574* (0.342, 0.965)	0.640 (0.385, 1.065)
Race: Other races (vs White)			1.733 (0.740, 4.059)	2.119 (0.884, 5.078)
Low job control (higher value = lower job control)		0.719* (0.567, 0.912)		0.686* (0.542, 0.868)
BF Duration				
Race: Black (vs White)			0.933 (0.733, 1.186)	0.949 (0.754, 1.197)
Race: Other races (vs White)			0.909 (0.739, 1.117)	0.929 (0.753, 1.146)
Low job control (higher value = lower job control)		0.891 (0.787, 1.011)		0.896 (0.789, 1.018)
Low job control				
Race: Black (vs White)	0.294* (0.027, 0.561)			
Race: Other races (vs White)	0.338* (0.091, 0.584)			

*P-value <0.05

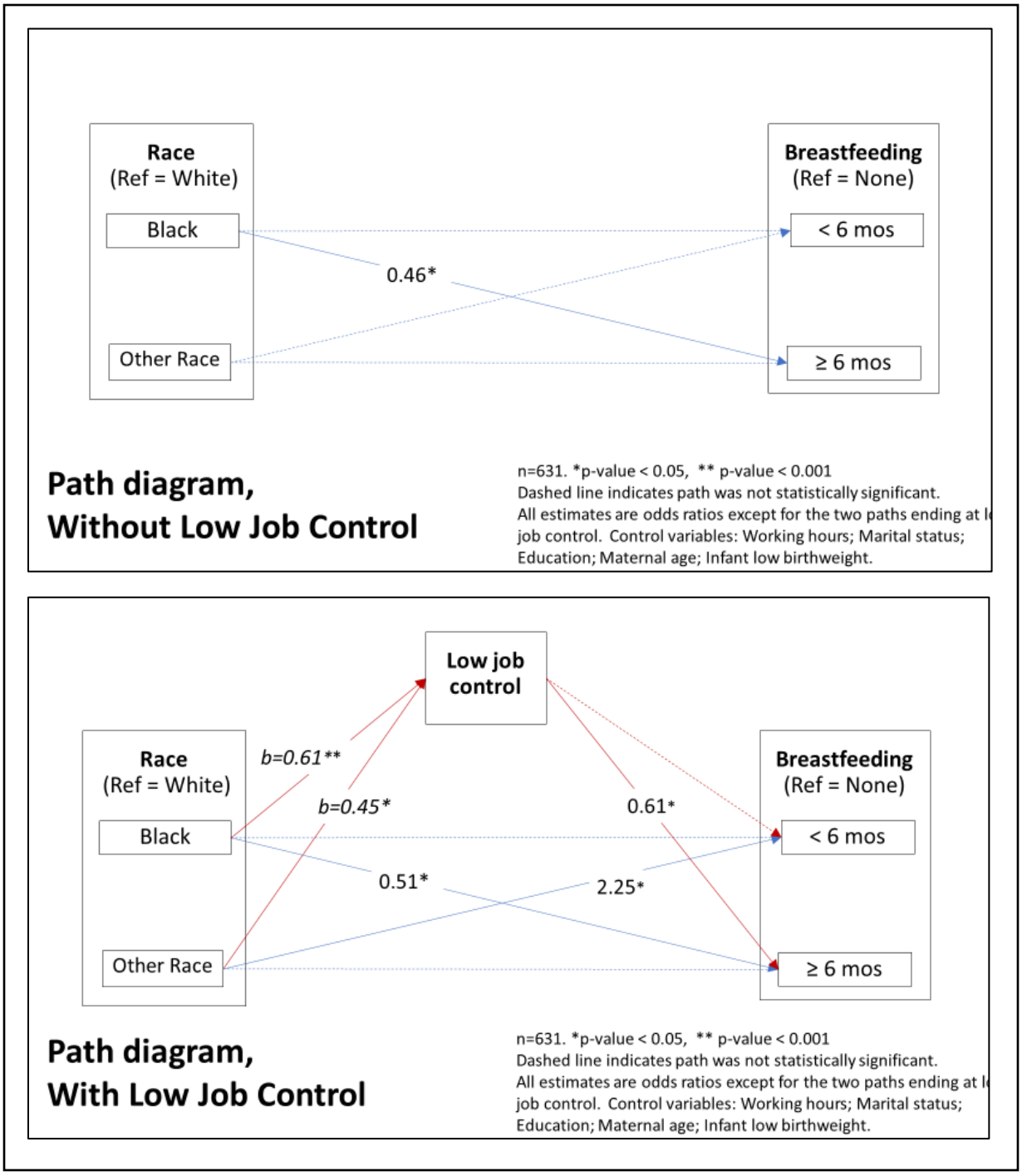
Notes: CI = Confidence Interval. n=631. Both models are zero-inflated negative binomial models (ZINB). Coefficients displayed here have been exponentiated. The odds ratios in bottom half of table represent the odds of initiating BF; we obtained these by exponentiating and then inverting the original coefficients from the ZINB model. Models included survey weights. Both models control for mother's age in years at time of child's birth (range 15.6 to 45.8 years), mother's educational attainment (college graduate versus not), mother's marital status, and whether the infant is was born with low birth weight or not.

Path analysis

Figure 3.2 shows the results of two path analytic models, the first without low job control and the second with. In the first model, the path between Black and White race and BF for at least six months showed that Black mothers were less likely to reach this longer-term BF outcome (OR=0.46 [95% CI=0.253, 0.847] even after taking other confounders into account (except for low job control). No other paths between race and BF were significant.

In the second path model, which included low job control, the components of the indirect path between race, low job control, and BF at least six months were significant. Specifically, the paths between race and low job control indicated that, compared to White mothers, both Black mothers and mothers of other races had lower job control (e.g., for Black compared to White, beta [95%CI]= 0.607 [0.313, 0.901]). Low job control was also associated with significantly decreased odds of long-term BF (compared to no BF) (odds ratio [OR] [95% CI]=0.612 [0.437, 0.858]). The path between low job control and BF for less than six months tended in the same direction but did not meet the statistical significance threshold (OR [95% CI] =0.786 [0.603, 1.025]). At the same time, the direct path from Black and White race to BF continued to show that Black mothers were significantly less likely to BF for at least six months, but the relationship was slightly attenuated (OR=0.514, 95%CI=[0.273, 0.965]) compared to the first model.

Figure 3.2 Path analytic models for race and breastfeeding, with and without low job control



Legend, Figure 3.2. Coefficients for path models with BF categorized as none, less than 6 months or at least 6 months. In the figure, the blue arrows represent direct pathways between race and BF, while the red arrows represent the indirect pathway by way of low job control. Estimates are shown only for statistically significant paths. The top path model does not include low job control, while the bottom path model does. The path model included working hours, marital status, education, maternal age and infant birthweight as control variables.

Table 3.3 shows the results of the decomposition of effects based on the second path model in Figure 3.2. It includes the odds ratios and p-values for the relationship between race and BF by way of low job control (indirect effects) as well as for race on BF independent of low job control (direct effects). The indirect effect of Black compared to White race on both BF outcomes by way of low job control was statistically significant, and low job control mediated an estimated 31% of the effect of Black versus White race on BF for less than six months, and 31% for BF of at least six months. The results for mothers of other races compared to White were not interpretable, likely due to the small sample size for the other race category (n=75).

Table 3.3. Decomposition of effects for Black compared to White race on breastfeeding with low job control as mediator

	BF <6 mos			**BF ≥ 6 mos**		
	OR for indirect effects, p-value	**OR, direct effects, p-value**	**% of total effect mediated**	**OR for indirect effects, p-value**	**OR, direct effects, p-value**	**% of total effect mediated**
Black vs White	0.86, p=0.045	0.72, p=0.260	31.16%	0.74, p=0.018	0.53, p=0.032	30.88%

Direct and indirect effects were calculated based on path model shown in bottom half of Figure 3.2.

Sensitivity analyses

Clustering by occupation code: To assess whether we needed to adjust our models for clustering at the occupation code level, we first assessed how large the clusters were. We then conducted likelihood ratio tests comparing two unspecified models predicting BF duration – one with an additional level for a random intercept for occupation, another without.

Scores for low job control and high physical workload were based on six-digit SOC occupation codes. Among the 631 respondents and 161 six-digit occupation codes represented

in the sample, the most populated six-digit occupation code had 27 observations (code 395012, representing hairdressers, hairstylists, and cosmetologists) and the second most populated had 26 (291111, representing registered nurses). We used likelihood ratio tests comparing unspecified models predicting BF duration, one that accounted for clustering by occupation code using a random intercept, and another that did not. We failed to reject the null hypothesis that the fuller model that accounted for occupation-level clustering made better predictions (p=0.095). For this reason, main models presented in this paper do not control for clustering at the occupation level.

Clustering among siblings: We used alternative modeling approaches to account for potential clustering effects for children born to the same mother. These included running the models with only one child per mother and using multilevel models with a random intercept for the mother. We also ran the models with robust standard errors.

The models that accounted for potential clustering among children born to the same mother did not produce notably different results. In some cases, our final models had attenuated results compared with the models that included just one sibling per family. One exception was that, in a sensitivity check with a logistic regression model for BF initiation (comparable to the inflate part of the ZINB models) with random effects for siblings, the coefficient for low job control was larger in magnitude than in our main results, yet did not reach statistical significance as it did in our model (Model C', Table 3.2). Otherwise, the same relationships between race, low job control and BF duration and initiation emerged, with minor if any differences in the magnitude or the statistical significance of those relationships.

Regression models stratified by race: Based on earlier findings that employment status and occupation can relate to BF in distinct ways for Black versus White mothers[51] we created

fully adjusted ZINB models predicting BF initiation and duration based on low job control separately for those two race groups. The results are shown in Supplement Table 3.1. For BF duration, low job control as a significant predictor of BF duration (ratio [95% CI]=0.881 [0.803, 0.968]) among Black mothers, but it was not significant among White mothers. Also, the coefficients for low job control predicting BF initiation were not statistically significant for either comparison. The direction of the coefficients was consistent for both race groups and did not differ notably in magnitude.

Path model specifications: To assess whether including correlated errors among all the covariates would change the model estimates of our path models, we created two sets of equivalent models using the SEM command, one each for Model 1 (categorical BF outcome) and Model 2 (continuous BF outcome): first, as similar as possible to the main models (and without correlated errors), and second, the same but with correlated errors. The estimates were the consistent across both models.

Also, given the recommendation to account for potential interaction effects between the independent variable and the mediator in calculated direct and indirect effects,[116] we did these calculations shown in Table 3.3 for a model that included interaction terms. The results were generally consistent. The percent of the total effect mediated in this sensitivity model was lower for short term BF (23%) and higher for longer term BF (39%).

Discussion

Main findings

Using a nationally representative dataset of working mothers in the US, we found that low job control predicted less BF, and we found some evidence that low job control mediates the relationship between race and BF. This is the first study to address either of these questions.

Our hypothesis that low job control would predict reduced BF was supported both in the ZINB models (although only for BF initiation) and in the path analysis (primarily for BF more than six months). No prior study has examined low job control in connection with BF, but others have studied found that a related concept, inflexible work, leads to shorter BF. Specifically, a study of US mothers of full-time working mothers in California found inflexibility predicted shorter BF in adjusted models, but it was not statistically significant in models that adjusted for sociodemographic variables.[60] Similarly, a study of US mothers found that access to flexible schedules did not predict BF outcomes in multivariate models. That we found low job control to be a significant predictor of shorter BF, even after adjusting for other sociodemographic variables, may be because low job control is a broader concept than job inflexibility, encompassing lack of decision-making power and lack of opportunities for skill development.[97] This more comprehensive characteristic may better capture working conditions, especially decision-making power, that enable a working mother to continue BF.

Our hypothesis that physical workload, which included frequent lifting, pushing and repetitive movements, would not predict BF outcomes was also supported in this study. This finding support the idea that psychosocial working conditions, and the closely related concept of work organization,[63] are more relevant to BF outcomes than physical workload.

We had hypothesized that Black mothers would be exposed to lower job control than White mothers, and our data supported that hypothesis. This aligns with prior work showing that Black women are more likely to hold an inflexible job compared to White women.[40] Our findings demonstrate that the racial disparity in low job control impacts new mothers – a population who especially needs greater control over how they do their work, for childcare in general as well as for BF.[117,118] Further, we found evidence for our hypothesis that low job

control mediated the relationship between race and BF outcomes. In the ZINB models, low job control partially mediated the relationship between Black and White race and BF initiation, but not for BF duration. In the path models, there was a significant path from Black compared to White race and to BF of at least six months, and the indirect effect of Black versus White race on both BF outcomes by way of low job control was statistically significant.[j] The evidence for women of other races compared to White followed similar patterns but was less conclusive. Prior studies considered employment status as a potential mediator of the Black-White BF inequity, with overall inconclusive results.[15,19,48] No prior study had explored low job control as a mediator of racial inequities in BF. Our findings indicate that psychosocial working conditions like low job control are barriers to continued BF, and that greater exposure to low job control contributes to shorter BF among Black mothers compared to White mothers.

An interesting finding was that, after adjusting for maternal age, marital status, education, working hours and child's low birth weight, there were fewer differences by race remaining in BF outcomes, even prior to taking low job control into account. For instance, in the ZINB model (Part C, without low job control), Black compared to White race was not significantly predictive of BF duration. Similarly, in the path model, only the path between Black compared to White race and BF for at least six months was significant, even prior to adding low job control. In essence, there were few direct effects that could be mediated. Also, that job control was a significant mediator of BF initiation in the ZINB models raises the question of how working conditions could influence the decision about whether to breastfeed at all, an event that occurs

[j] It may be unexpected that the indirect effects for Black compared to White race on shorter term BF (<6mo) via low job control were significant, when the path between low job control and shorter-term BF was not significant. To note, while the path between low job control and shorter-term BF did not meet the significance threshold, it was what some would call borderline significant (p=0.07), and it indicated an inverse relationship between lower job control and shorter term BF, just as we found for longer-term BF. The path from Black compared with White race to low job control was highly significant. When those two paths were multiplied to obtain the indirect effects, the product had statistical significance below the 0.05 threshold.

prior to return to work. The impact of low job control on BF duration is more plausible, assuming that low job control becomes a barrier only after the mother has returned to work. However, low job control may also impact initiation if mothers are aware prior to giving birth that their job will not accommodate BF. They may decide it is not worthwhile to try because it will be impossible. This is consistent with prior work connecting employment status during pregnancy with BF intentions and behaviors.[119] It is also possible that low job control related to BF initiation by way of a confounder, such as health beliefs, that were not accounted for by the control variables. For instance, if mothers in low job control occupations were also more likely to have negative perceptions of BF, and if this difference in attitudes was not accounted for by education or our other control variables, then it could be the difference in attitudes rather than low job control that drives these relationships.

Strengths and limitations

The present study applied secondary datasets in a rigorous way to overcome a challenge specific to research about occupational drivers of BF: surveys with detailed BF duration information (e.g., the Infant Feeding Practices Study II [IFPS II][120]) often have limited information about mother's occupation, while studies with ample occupation data (e.g., General Social Survey's Quality of Work Life Survey[96]) typically do not provide information about BF). The longitudinal, cross-generational nature of the Panel Study of Income Dynamics[91] and its Child Development Supplement allowed us to gain precise occupation information about the six months postpartum period for mothers and BF outcomes for their children.

A notable methodological limitation was that, of the 1,314 mothers who met the inclusion criteria of having given birth between 2008-2014, 344 were excluded because of incomplete or ambiguous data, most often for the employment-related variables. Prior research

shows that item non-response is more frequent among respondents of color and respondents with low educational attainment.[121] In our sample, respondents who were Black and/or did not have a college degree tended to have lower job control and less BF. If individuals from those groups were excluded from our sample at a higher rate, then we may have underestimated the strength of the relationship between low job control and reduced BF, representing a bias to the null.

Further, by utilizing a job exposure matrix for low job control, we could analyze data on psychosocial working conditions that are rarely studied in surveys of new mothers. A limitation was that the reliability (Cronbach's alpha) for the survey items on which the low job score was based was only moderate. Imprecise measures of job control may have attenuated our results. Also, job exposure matrices specific to female workers may provide more accurate estimates.[97] Future BF research should continue applying job exposures matrices for other psychosocial working conditions, such as social support.[76] Social support would be an informative working condition to consider, as scholars have suggested it can serve to buffer the stressful psychosocial environments caused by low control and high demands,[77,122] and it has been shown to support continued BF among working mothers.[123,124]

Because estimates of low job control were linked at the level of detailed occupation code, we could not account for individual appraisals of this working condition. Many occupational health scholars consider job exposure matrices to be a more objective approach to measuring working conditions for that reason.[125] However, it may have excluded meaningful individual variations in low job control, such as those due to race. Race-based discrimination can exacerbate the health effects of occupational segregation,[126] and future BF studies should assess

experiences with discrimination and other forms of racism not captured within occupational segregation.

An additional strength of this study was our application of two approaches to mediation analysis. One, the Baron and Kenny approach, which we applied using ZINB models, is commonly used and straightforward to interpret, but is less helpful in instances of partial rather than full mediation.[114] Second, we applied path analysis, which allowed for a more accurate representation of the multiple pathways, including, in our case, direct paths between race and BF as well as indirect paths via low job control. Through calculating the decomposition of effects into direct and indirect, we determined that there is a significant path from Black compared to White race, through low job control, to both short- and longer-term BF. The addition of path analysis made clear that low job control is only a partial mediator, and that there are other pathways between race and BF outcomes that can be examined.

The fact that the BF outcome was modeled differently in the two sets of mediation analyses likely contributed to the slightly different stories that emerged. In the Baron and Kenny mediation analysis, we used ZINB modeling, which estimates initiation and duration separately. In the path analysis, we used multinomial logit wherein non-BF initiation was the reference group compared to shorter-term and longer-term BF. Because duration was conditional on initiation, there was a smaller subsample for the duration part of the ZINB model. This may have reduced statistical power for that portion of the Baron and Kenny-style analyses.

Future studies in this area may also apply methods such as factor analysis or latent class analysis to empirically identify groupings of women based on a set of work and other variables. Such analysis could show how socioeconomic status in general varies in accordance with

conditions like low job control,[127] and give a more nuanced sense of which subpopulations of mothers BF less.

Also, future research should take into account whether mothers were working during pregnancy, and if so whether they worked at the same job. It is possible that mothers with jobs that have lower job control or other adverse working conditions may be more likely to stop working during pregnancy. However, if mothers in those jobs have less income overall, they may not have the option to not return to work. Lastly, the PSID survey did not directly assess parental leave; future studies should take into account mother's access to leave, in particular paid leave.[41,54,128]

Implications

To address health inequities like differing rates of BF, it is necessary to examine the structural factors that continue to make healthy behaviors easier for White families and more difficult for Black families. Overemphasis on individual-level factors obscures the larger structural and policy drivers of BF behaviors,[27] including working conditions. Also, by exploring how psychosocial working conditions like low job control help to explain these BF differences, we better capture the range of experiences among subgroups of women. This is particularly salient for research about Black women, who have often been studied through an oversimplified lens that treats them as a homogenous group with negative BF-related characteristics.[129] Further, this study contributes to a growing body of research demonstrating the connection between mothers' occupation and maternal and child health outcomes.[130-132] By showing that low job control accounts for some of the racial differences in BF, we hope to provide evidence to further encourage workplace interventions that give new mothers – and other workers – increased control over their schedule and how they do their work.[117,133,134]

Supplemental Tables

Table S3.1. Low job control as a predictor of breastfeeding initiation and duration: Race-stratified models

	Black mothers (n=223) **Ratio (95% CI)**	**White mothers (n=333)** **Ratio (95% CI)**
Initiation		
Low job control (higher value = lower job control)	0.768 (0.522, 1.130)	0.701 (0.477, 1.033)
Duration		
Low job control (higher value = lower job control)	0.881* (0.803, 0.968)	0.949 (0.811, 1.111)

*P-value <0.05

Notes: CI = Confidence Interval. Both models are zero-inflated negative binomial models (ZINB). Coefficients displayed here have been exponentiated. The odds ratios in bottom half of table represent the odds of initiating BF; we obtained these by exponentiating and then inverting the original coefficients from the ZINB model. Models included survey weights. Both models control for mother's age in years at time of child's birth (range 15.6 to 45.8 years), mother's educational attainment (college graduate versus not), mother's marital status, and whether the infant is was born with low birth weight or not. These models are comparable to those in Model C' in Tables 3.1 and 3.2, but they do not include race as independent variables.

Table S3.2. High physical workload as a potential mediator of race and breastfeeding

	Part A: Race predicting physical workload **b (95% CI)**	**Part B: Physical workload predicting BF** **Ratio (95% CI)**	**Part C: Race predicting BF, without physical workload control** **Ratio (95% CI)**	**Part C': Race predicting BF, with physical workload** **Ratio (95% CI)**
BF Initiation				
Race: Black (vs White)			0.574* (0.342, 0.965)	0.593* (0.355, 0.992)
Race: Other races (vs White)			1.733 (0.740, 4.059)	1.742 (0.742, 4.092)
Physical workload (higher = less physical)		1.616 (0.844, 3.096)		1.557 (0.819, 2.965)
BF Duration				
Race: Black (vs White)			0.933 (0.733, 1.186)	0.931 (0.733, 1.184)
Race: Other races (vs White)			0.909 (0.739, 1.119)	0.909 (0.739, 1.120)
Physical workload (higher = less physical)		1.060 (0.837, 1.340)		1.060 (0.839, 1.338)
High physical demand				
Race: Black (vs White)	-0.084 (-0.190, 0.021)			
Race: Other races (vs White)	0.019 (-0.084, 0.123)			

*P-value <0.05
Notes: CI = Confidence Interval. n=631. Both models are zero-inflated negative binomial models (ZINB). Coefficients displayed here have been exponentiated. The odds ratios in bottom half of table represent the odds of initiating BF; we obtained these by exponentiating and then inverting the original coefficients from the ZINB model. Models included survey weights. Both models control for mother's age in years at time of child's birth (range 15.6 to 45.8 years), mother's educational attainment (college graduate versus not), mother's marital status, and whether the infant is was born with low birth weight or not.

References

1. Victora CG, Bahl R, Barros AJ, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *The Lancet.* 2016;387(10017):475-490.
2. Azad MB, Konya T, Maughan H, et al. Gut microbiota of healthy Canadian infants: profiles by mode of delivery and infant diet at 4 months. *Canadian Medical Association Journal.* 2013;185(5):385-394.
3. Chowdhury R, Sinha B, Sankar MJ, et al. Breastfeeding and maternal health outcomes: a systematic review and meta-analysis. *Acta Paediatrica.* 2015;104:96-113.
4. Ip S, Chung M, Raman G, Trikalinos TA, Lau J. A summary of the Agency for Healthcare Research and Quality's evidence report on breastfeeding in developed countries. *Breastfeeding Medicine.* 2009;4(S1):S-17-S-30.
5. World Health Organization. Infant and young child feeding. https://www.who.int/en/news-room/fact-sheets/detail/infant-and-young-child-feeding. Published 2020. Accessed Nov 3, 2020.
6. Eidelman AI, Schanler RJ. Breastfeeding and the use of human milk. *Pediatrics.* 2012;129(3):e827-e841.
7. Anstey EH, Chen J, Elam-Evans LD, Perrine CG. Racial and geographic differences in breastfeeding—United States, 2011–2015. *Morbidity and Mortality Weekly Report.* 2017;66(27):723.
8. Monasta L, Batty G, Cattaneo A, et al. Early-life determinants of overweight and obesity: a review of systematic reviews. *Obesity Reviews.* 2010;11(10):695-708.
9. Office of the Surgeon General, Centers for Disease Control and Prevention, Office on Women's Health. Publications and Reports of the Surgeon General. In: *The Surgeon*

General's Call to Action to Support Breastfeeding. Rockville (MD): Office of the Surgeon General (US); 2011.

10. Jefferson UT. Breastfeeding exposure, attitudes, and intentions of African American and Caucasian college students. *Journal of Human Lactation.* 2017;33(1):149-156.
11. McCarter-Spaulding D, Gore R. Breastfeeding self-efficacy in women of African descent. *Journal of Obstetric, Gynecologic & Neonatal Nursing.* 2009;38(2):230-243.
12. Bai Y, Wunderlich SM, Fly AD. Predicting intentions to continue exclusive breastfeeding for 6 months: A comparison among racial/ethnic groups. *Maternal and Child Health Journal.* 2011;15(8):1257-1264.
13. McLaughlin KA, Alvarez K, Fillbrunn M, et al. Racial/ethnic variation in trauma-related psychopathology in the United States: a population-based study. *Psychological Medicine.* 2019;49(13):2215-2226.
14. Cricco-Lizza R. Infant-feeding beliefs and experiences of Black women enrolled in WIC in the New York metropolitan area. *Qualitative Health Research.* 2004;14(9):1197-1210.
15. McKinney CO, Hahn-Holbrook J, Chase-Lansdale PL, et al. Racial and ethnic differences in breastfeeding. *Pediatrics.* 2016;138(2):e20152388.
16. Gurley-Calvez T, Bullinger L, Kapinos KA. Effect of the Affordable Care Act on breastfeeding outcomes. *American Journal of Public Health.* 2018;108(2):277-283.
17. Asiodu I, Flaskerud JH. Got Milk? A look at breastfeeding from an African American perspective. *Issues in Mental Health Nursing.* 2011;32(8):544-546.
18. Louis-Jacques AF, Marhefka SL, Brumley J, et al. Historical antecedents of breastfeeding for African American Women: from the pre-colonial period to the mid-twentieth century. *Journal of Racial and Ethnic Health Disparities.* 2020;7(5):1003-1012.

19. Ryan AS, Zhou W, Arensberg MB. The effect of employment status on breastfeeding in the United States. *Women's Health Issues.* 2006;16(5):243-251.

20. Johnson A, Kirk R, Rosenblum KL, Muzik M. Enhancing breastfeeding rates among African American women: A systematic review of current psychosocial interventions. *Breastfeeding Medicine.* 2015;10(1):45-62.

21. Jefferson UT. Breastfeeding exposure, attitudes, and intentions of African American and Caucasian college students. *Journal of Human Lactation.* 2017;33(1):149-156.

22. Sussner KM, Lindsay AC, Peterson KE. The influence of acculturation on breast-feeding initiation and duration in low-income women in the US. *Journal of Biosocial Science.* 2008;40(5):673-696.

23. Yudell M, Roberts D, DeSalle R, Tishkoff S. Taking race out of human genetics. *Science.* 2016;351(6273):564-565.

24. Gee GC, Ford CL. Structural racism and health inequities: old issues, new directions. *Du Bois Review.* 2011;8(1):115-132.

25. Williams DR, Mohammed SA, Leavell J, Collins C. Race, socioeconomic status, and health: complexities, ongoing challenges, and research opportunities. *Annals of the New York Academy of Sciences.* 2010;1186:69-101.

26. Hardeman RR, Medina EM, Kozhimannil KB. Structural racism and supporting black lives — the role of health professionals. *New England Journal of Medicine.* 2016;375(22):2113-2115.

27. Dinour LM, Bai YK. Breastfeeding: The illusion of choice. *Women's Health Issues.* 2016;26(5):479-482.

28. Laughlin LL. *Maternity leave and employment patterns of first-time mothers: 1961-2008.* US Department of Commerce, Economics and Statistics Administration; 2011.

29. Ahluwalia IB, Morrow B, Hsia J. Why do women stop breastfeeding? Findings from the Pregnancy Risk Assessment and Monitoring System. *Pediatrics.* 2005;116(6):1408-1412.

30. National Institute for Occupational Safety and Health Surveillance Program. *Supplement report: analysis of New Hampshire Pregnancy Risk Assessment Monitoring System (PRAMS) to better understand breastfeeding initiation and duration by industry category.* 2020.

31. Bruk-Lee V, Albert D, Stone KL. Lactation and the working woman: understanding the role of organizational factors, lactation support, and legal policy in promoting breastfeeding success. In: *Research perspectives on work and the transition to motherhood.* Springer; 2016:217-239.

32. Bergmann BR. occupational segregation, wages and profits when employers discriminate by race or sex. *Eastern Economic Journal.* 1974;1(2):103-110.

33. Alonso-Villar O, del Río C. The occupational segregation of African American women: its evolution from 1940 to 2010. *Feminist Economics.* 2017;23(1):108-134.

34. Mintz B, Krymkowski DH. The intersection of race/ethnicity and gender in occupational segregation. *International Journal of Sociology.* 2010;40(4):31-58.

35. Pager D, Shepherd H. The sociology of discrimination: racial discrimination in employment, housing, credit, and consumer markets. *Annual Review of Sociology.* 2008;34:181-209.

36. Tomaskovic-Devey D, Thomas M, Johnson K. Race and the accumulation of human capital across the career: A theoretical model and fixed-effects application. *American Journal of Sociology.* 2005;111(1):58-89.

37. Wrigley-Field E, Seltzer N. Unequally insecure: rising Black/White disparities in job displacement, 1981-2017. *Washington Center for Equitable Growth Working Paper Series Washington, DC.* 2020.

38. Crenshaw K. Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. *University of Chicago Legal Forum.* 1989:139.

39. United States Bureau of Labor Statistics CPS. *Labor force characteristics by race and ethnicity, 2018.* 2019.

40. Golden L. Limited access: Disparities in flexible work schedules and work-at-home. *Journal of Family and Economic Issues.* 2008;29(1):86-109.

41. Hawkins D. Disparities in the usage of maternity leave according to occupation, race/ethnicity, and education. *American Journal of Industrial Medicine.* 2020;63:1134-1144.

42. Griswold MK, Crawford SL, Perry DJ, et al. Experiences of racism and breastfeeding initiation and duration among first-time mothers of the Black Women's Health Study. *Journal of Racial and Ethnic Health Disparities.* 2018;5(6):1180-1191.

43. Ortiz SY, Roscigno VJ. Discrimination, women, and work: processes and variations by race and class. *The Sociological Quarterly.* 2009;50(2):336-359.

44. Fekedulegn D, Alterman T, Charles LE, et al. Prevalence of workplace discrimination and mistreatment in a national sample of older U.S. workers: The REGARDS cohort study. *SSM Popul Health.* 2019;8:100444-100444.

45. Dalianis EA. *Multi-level Analysis of the Role of the Workplace and Employment in Racial Disparities in Breastfeeding Practices*. Philadelphia, PA: Public Health, Drexel University; 2016.

46. Ahonen EQ, Fujishiro K, Cunningham T, Flynn M. Work as an inclusive part of population health inequities research and prevention. *American Journal of Public Health.* 2018;108(3):306-311.

47. McKinney CO, Hahn-Holbrook J, Chase-Lansdale PL, et al. Racial and ethnic differences in breastfeeding. *Pediatrics.* 2016:e20152388.

48. Safon CB, Heeren TC, Kerr SM, et al. Disparities in breastfeeding among US Black mothers: identification of mechanisms. *Breastfeeding Medicine.* 2021.

49. Snyder K, Hansen K, Brown S, Portratz A, White K, Dinkel D. Workplace breastfeeding support varies by employment type: the service workplace disadvantage. *Breastfeeding Medicine.* 2018;13(1):23-27.

50. Karasek RA, Theorell T, Schwartz JE, Schnall PL, Pieper CF, Michela JL. Job characteristics in relation to the prevalence of myocardial infarction in the US Health Examination Survey (HES) and the Health and Nutrition Examination Survey (HANES). *American Journal of Public Health.* 1988;78(8):910-918.

51. Whitley MD, Ro A, Palma A. Work, race and breastfeeding outcomes for mothers in the United States. *(Under review with PLOS ONE).*

52. Kimbro RT. On-the-job moms: work and breastfeeding initiation and duration for a sample of low-income women. *Maternal and Child Health Journal.* 2006;10(1):19-26.

53. Visness CM, Kennedy KI. Maternal employment and breast-feeding: findings from the 1988 National Maternal and Infant Health Survey. *American Journal of Public Health.* 1997;87(6):945-950.

54. Dagher RK, McGovern PM, Schold JD, Randall XJ. Determinants of breastfeeding initiation and cessation among employed mothers: a prospective cohort study. *BMC Pregnancy and Childbirth.* 2016;16(1):194.

55. Spitzmueller C, Zhang J, Thomas CL, et al. Identifying job characteristics related to employed women's breastfeeding behaviors. *Journal of Occupational Health Psychology.* 2018;23(4):457.

56. Hilliard ED. A review of worksite lactation accommodations: Occupational health professionals can assure success. *Workplace Health & Safety.* 2017;65(1):33-44.

57. Bai YK, Gaits SI, Wunderlich SM. Workplace lactation support by New Jersey employers following US reasonable break time for nursing mothers law. *Journal of Human Lactation.* 2015;31(1):76-80.

58. Alvarez R, Serwint JR, Levine DM, Bertram A, Sattari M. Lawyer mothers: infant-feeding intentions and behavior. *Southern Medical Journal.* 2015;108(5):262-267.

59. Ortiz J, McGilligan K, Kelly P. Duration of breast milk expression among working mothers enrolled in an employer-sponsored lactation program. *Pediatric Nursing.* 2004;30(2):111-119.

60. Guendelman S, Kosa JL, Pearl M, Graham S, Goodman J, Kharrazi M. Juggling work and breastfeeding: effects of maternity leave and occupational characteristics. *Pediatrics.* 2009;123(1):e38-e46.

61. Jacknowitz A. The role of workplace characteristics in breastfeeding practices. *Women & Health.* 2008;47(2):87-111.

62. Jacobs K, Hellman M, Markowitz J, Wuest E. Psychosocial Work Environment. In: Gellman MD, Turner JR, eds. *Encyclopedia of Behavioral Medicine.* New York, NY: Springer New York; 2013:1587-1587.

63. Rugulies R. What is a psychosocial work environment? *Scandinavian Journal of Work, Environment & Health.* 2019(1):1-6.

64. Bonde JPE. Psychosocial factors at work and risk of depression: a systematic review of the epidemiological evidence. *Occupational and Environmental Medicine.* 2008;65(7):438-445.

65. Svane-Petersen AC, Holm A, Burr H, et al. Psychosocial working conditions and depressive disorder: disentangling effects of job control from socioeconomic status using a life-course approach. *Social Psychiatry and Psychiatric Epidemiology.* 2020;55(2): 217-228.

66. Lavigne É, Bourbonnais R. Psychosocial work environment, interpersonal violence at work and psychotropic drug use among correctional officers. *International Journal of Law and Psychiatry.* 2010;33(2):122-129.

67. Juvani A, Oksanen T, Virtanen M, et al. Clustering of job strain, effort− reward imbalance, and organizational injustice and the risk of work disability: a cohort study. *Scandinavian Journal of Work, Environment & Health.* 2018;44(5):485-495.

68. Kivimäki M, Nyberg ST, Batty GD, et al. Job strain as a risk factor for coronary heart disease: a collaborative meta-analysis of individual participant data. *The Lancet.* 2012;380(9852):1491-1497.

69. Kouvonen A, Kivimäki M, Väänänen A, et al. Job strain and adverse health behaviors: The Finnish Public Sector Study. *Journal of Occupational and Environmental Medicine.* 2007;49(1):68-74.

70. Dinour LM, Szaro JM. Employer-based programs to support breastfeeding among working mothers: a systematic review. *Breastfeeding Medicine.* 2017;12(3):131-141.

71. Spencer B, Wambach K, Domain EW. African American women's breastfeeding experiences: cultural, personal, and political voices. *Qualitative Health Research.* 2015;25(7):974-987.

72. Gross TT, Davis M, Anderson AK, Hall J, Hilyard K. Long-term breastfeeding in African American mothers. *Journal of Human Lactation.* 2017;33(1):128-139.

73. Karasek Jr RA. Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly.* 1979:285-308.

74. Karasek R, Brisson C, Kawakami N, Houtman I, Bongers P, Amick B. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. *Journal of Occupational Health Psychology.* 1998;3(4):322.

75. Xu W, Zhao Y, Guo L, Guo Y, Gao W. Job stress and coronary heart disease: a case-control study using a Chinese population. *Journal of Occupational Health.* 2009;51(2):107-113.

76. Saijo Y, Chiba S, Yoshioka E, et al. Synergistic interaction between job control and social support at work on depression, burnout, and insomnia among Japanese civil servants. *International Archives of Occupational and Environmental Health.* 2015;88(2):143-152.

77. Johnson JV, Hall EM. Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *American Journal of Public Health.* 1988;78(10):1336-1342.

78. Knardahl S, Johannessen HA, Sterud T, et al. The contribution from psychological, social, and organizational work factors to risk of disability retirement: a systematic review with meta-analyses. *BMC Public Health.* 2017;17(1):1-31.

79. Kim E, Park H, Hong Y-C, et al. Effect of maternal job strain during pregnancy on infant neurodevelopment by gender at 6 and 12 months: Mothers and Children's Environmental Health (MOCEH) study. *Annals of Occupational and Environmental Medicine.* 2015;27(1):1-10.

80. Kuper H, Yang L, Theorell T, Weiderpass E. Job strain and risk of breast cancer. *Epidemiology.* 2007:764-768.

81. Meyer JD, Warren N, Reisine S. Job control, substantive complexity, and risk for low birth weight and preterm delivery: an analysis from a state birth registry. *American Journal of Industrial Medicine.* 2007;50(9):664-675.

82. Smith P, Frank J, Mustard C, Bondy S. Examining the relationships between job control and health status: a path analysis approach. *Journal of Epidemiology & Community Health.* 2008;62(1):54-61.

83. Tsutsumi A, Kayaba K, Yoshimura M, et al. Association between job characteristics and health behaviors in Japanese rural workers. *International Journal of Behavioral Medicine.* 2003;10(2):125-142.

84. Mozurkewich EL, Luke B, Avni M, Wolf FM. Working conditions and adverse pregnancy outcome: a meta-analysis. *Obstetrics and Gynecology.* 2000;95(4):623-635.

85. Snijder CA, Brand T, Jaddoe V, et al. Physically demanding work, fetal growth and the risk of adverse birth outcomes. The Generation R Study. *Occupational and Environmental Medicine.* 2012;69(8):543-550.

86. van Beukering MDM, van Melick MJGJ, Mol BW, Frings-Dresen MHW, Hulshof CTJ. Physically demanding work and preterm delivery: a systematic review and meta-analysis. *International Archives of Occupational and Environmental Health.* 2014;87(8):809-834.

87. Cai C, Vandermeer B, Khurana R, et al. The impact of occupational activities during pregnancy on pregnancy outcomes: a systematic review and metaanalysis. *American Journal of Obstetrics and Gynecology.* 2020;222(3):224-238.

88. Bell JF, Zimmerman FJ, Diehr PK. Maternal work and birth outcome disparities. *Maternal and Child Health Journal.* 2008;12(4):415-426.

89. Croteau A, Marcoux S, Brisson C. Work activity in pregnancy, preventive measures, and the risk of delivering a small-for-gestational-age infant. *American Journal of Public Health.* 2006;96(5):846-855.

90. Burris HH, Lorch SA, Kirpalani H, Pursley DM, Elovitz MA, Clougherty JE. Racial disparities in preterm birth in USA: a biosensor of physical and social environmental exposures. *Archives of Disease in Childhood.* 2019;104(10):931-935.

91. Institute for Social Research, University of Michigan. *PSID Main Interview User Manual: Release 2019.* February 2019.

92. University of Michigan, Institute for Social Research, Survey Research Center. Panel Study of Income Dynamics. https://psidonline.isr.umich.edu/. Published 2020. Accessed June 15, 2020.

93. McGonagle KA, Schoeni RF, Sastry N, Freedman VA. The Panel Study of Income Dynamics: Overview, Recent Innovations, and Potential for Life Course Research. *Longitudinal and Life Course Studies.* 2012;3(2):188.

94. Johnson D, McGonagle K, Freedman V, Sastry N. Fifty Years of the Panel Study of Income Dynamics: Past, Present, and Future. *The Annals of the American Academy of Political and Social Science.* 2018;680(1):9-28.

95. MacDonald T, Noel-Weiss J, West D, et al. Transmasculine individuals' experiences with lactation, chestfeeding, and gender identity: a qualitative study. *BMC Pregnancy and Childbirth.* 2016;16(1):106.

96. National Institute for Occupational Safety and Health. Quality of Work Life Questionnaire. https://www.cdc.gov/niosh/topics/stress/qwlquest.html. Published 2013. Accessed March 30, 2020.

97. Choi B. Developing a job exposure matrix (JEM) of work organization hazards in the United States: a review on methodological issues and research protocol. *Safety and Health at Work.* 2020; 11:397-404.

98. Madsen IE, Gupta N, Budtz-Jørgensen E, et al. Physical work demands and psychosocial working conditions as predictors of musculoskeletal pain: a cohort study comparing self-

reported and job exposure matrix measurements. *Occupational and Environmental Medicine.* 2018;75(10):752-758.

99. United States Census Bureau. Industry and Occupation Code Lists & Crosswalks. https://www.census.gov/topics/employment/industry-occupation/guidance/code-lists.html. Published 2020. Updated August 31, 2000. Accessed Oct 21, 2020.

100. United States Bureau of Labor Statistics. Standard Occupational Classification. https://www.bls.gov/soc/. Accessed February 15, 2021.

101. Choi B. Email correspondence about descriptive statistics for job exposure matrix variables. In: Whitley M, 2021.

102. Trinkoff AM, Lipscomb JA, Geiger-Brown J, Storr CL, Brady BA. Perceived physical demands and reported musculoskeletal problems in registered nurses. *American Journal of Preventive Medicine.* 2003;24(3):270-275.

103. Felson DT, Hannan MT, Naimark A, et al. Occupational physical demands, knee bending, and knee osteoarthritis: results from the Framingham Study. *The Journal of rheumatology.* 1991;18(10):1587-1592.

104. Nygaard PP, Skovlund SV, Sundstrup E, Andersen LL. Is low-back pain a limiting factor for senior workers with high physical work demands? A cross-sectional study. *BMC Musculoskeletal Disorders.* 2020;21(1):622.

105. Sullivan R. The age pattern of first-birth rates among US women: the bimodal 1990s. *Demography.* 2005;42(2):259-273.

106. Xiang AH, Chow T, Mora-Marquez J, et al. Breastfeeding persistence at 6 months: trends and disparities from 2008 to 2015. *The Journal of Pediatrics.* 2019;208:169-175.e162.

107. Yang Y, Morgan SP. How big are educational and racial fertility differentials in the US? *Social biology.* 2003;50(3-4):167-187.

108. Musick K, England P, Edgington S, Kangas N. Education differences in intended and unintended fertility. *Social Forces.* 2009;88(2):543-572.

109. Li R, Darling N, Maurice E, Barker L, Grummer-Strawn LM. Breastfeeding rates in the United States by characteristics of the child, mother, or family: the 2002 National Immunization Survey. *Pediatrics.* 2005;115(1):e31-e37.

110. Fomby P, Cherlin AJ. Family instability and child well-being. *American Sociological Review.* 2007;72(2):181-204.

111. Flacking R, Nyqvist KH, Ewald U, Wallin L. Long-term duration of breastfeeding in Swedish low birth weight infants. *Journal of Human Lactation.* 2003;19(2):157-165.

112. Acevedo-Garcia D, Soobader M-J, Berkman LF. The differential effect of foreign-born status on low birth weight by race/ethnicity and education. *Pediatrics.* 2005;115(1):e20-e30.

113. Lubold AM. Breastfeeding and employment: A propensity score matching approach. *Sociological Spectrum.* 2016;36(6):391-405.

114. Baron RM, Kenny DA. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology.* 1986;51(6):1173.

115. MacKinnon DP, Warsi G, Dwyer JH. A Simulation study of mediated effect measures. *Multivariate Behavioral Research.* 1995;30(1):41-62.

116. VanderWeele TJ, Vansteelandt S. Odds ratios for mediation analysis for a dichotomous outcome. *American Journal of Epidemiology.* 2010;172(12):1339-1348.

117. Kelly EL, Moen P, Tranby E. Changing workplaces to reduce work-family conflict:schedule control in a white-collar organization. *American Sociological Review.* 2011;76(2):265-290.

118. Collins C. *Making Motherhood Work: How Women Manage Careers and Caregiving.* Princeton, New Jersey: Princeton University Press; 2019.

119. Attanasio L, Kozhimannil KB, McGovern P, Gjerdingen D, Johnson PJ. The impact of prenatal employment on breastfeeding intentions and breastfeeding status at 1 week postpartum. *Journal of Human Lactation.* 2013;29(4):620-628.

120. Fein SB, Li R, Chen J, Scanlon KS, Grummer-Strawn LM. Methods for the year 6 follow-up study of children in the Infant Feeding Practices Study II. *Pediatrics.* 2014;134 Suppl 1(Suppl 1):S4-s12.

121. Meitinger KM, Johnson TP. Power, culture and item nonresponse in social surveys. In: *Understanding Survey Methodology.* Springer; 2020:169-191.

122. Van der Doef M, Maes S. The job demand-control (-support) model and psychological well-being: A review of 20 years of empirical research. *Work & stress.* 1999;13(2):87-114.

123. Holtzman M, Glass J. Explaining changes in mothers' job satisfaction following childbirth. *Work and Occupations.* 1999;26(3):365-404.

124. Witters-Green R. Increasing breastfeeding rates in working mothers. *Families, Systems, & Health.* 2003;21(4):415-434.

125. Frese M, Zapf D. Methodological issues in the study of work stress: Objective vs subjective measurement of work stress and the question of longitudinal studies. In: *Causes, coping and consequences of stress at work.* Oxford, England: John Wiley & Sons; 1994:375-411.

126. Meyer JD. Race-based job discrimination, disparities in job control, and their joint effects on health. *American Journal of Industrial Medicine.* 2014;57(5):587-595.

127. Muntaner C, O'Campo PJ. A critical appraisal of the demand/control model of the psychosocial work environment: epistemological, social, behavioral and class considerations. *Social Science & Medicine.* 1993;36(11):1509-1517.

128. Whipps MDM, Honoroff J. Time off work after childbirth and breastfeeding supportive workplaces: associations with near-exclusive breastfeeding trajectory membership. *Women's Health Issues.* 2019;29(6):506-512.

129. Carter SK, Stone A, Graham L, Cox JM. Creating Intersectional Subjects: A Critical Discourse Analysis of Health Science Breastfeeding Research. *Sociology of Race and Ethnicity.* 2021:1-16.

130. Li J, Loerbroks A, Siegrist J. Effort–reward Imbalance at work, parental support, and suicidal ideation in adolescents: a cross-sectional study from Chinese dual-earner families. *Safety and Health at Work.* 2017;8(1):77-83.

131. Li J, Pollmann-Schult M. Fathers' commute to work and children's social and emotional well-being in Germany. *Journal of Family and Economic Issues.* 2016;37(3):488-501.

132. Li J, Kaiser T, Pollmann-Schult M, Strazdins L. Long work hours of mothers and fathers are linked to increased risk for overweight and obesity among preschool children:

longitudinal evidence from Germany. *Journal of Epidemiology and Community Health.* 2019;73(8):723-729.

133. Moen P, Kelly EL, Tranby E, Huang Q. Changing work, changing health:can real work-time flexibility promote health behaviors and well-being? *Journal of Health and Social Behavior.* 2011;52(4):404-429.

134. Pfeffer J. *Dying for a Paycheck: How Modern Management Harms Employee Health and Company Performance--and What We Can Do About It.* HarperCollins; 2018.

CHAPTER 4

Workplace breastfeeding support and job satisfaction among working mothers[k]

Abstract

Background

Job satisfaction is associated with health and productivity. Workplace support for breastfeeding (BF) may affect working mothers' job satisfaction.

Methods

We analyzed responses from 488 women from the Infant Feeding Practices Study II (2005-2007). Using logistic regression, we assessed whether workplace BF problems at three months postpartum were related to low job satisfaction concurrently and, for a subsample (n=265), at nine and 12 months postpartum.

Results

Compared to women reporting no problems, women reporting three or more problems had higher odds (Odds Ratio [OR]=4.76; 95% Confidence Interval [CI]: 2.03-11.18) of low job satisfaction at three months, and at 12 months (OR=6.88, CI: 1.33-35.58) after controlling for baseline job satisfaction. Models isolating problems with break time and space to pump/nurse showed more modest results.

[k] Whitley MD, Ro A, Choi B. Workplace breastfeeding support and job satisfaction among working mothers in the United States. *American Journal of Industrial Medicine,* 2019: 1-11.

Conclusions

Work-related BF problems at three months postpartum were associated with low job satisfaction concurrently and at follow-up. Improving workplace BF accommodations could improve mothers' job satisfaction.

Introduction

Job satisfaction and work-family conflict: Job satisfaction is used to indicate overall socio-emotional wellbeing of workers[1] and results "from the appraisal of one's job as achievement or facilitating the achievement of one's job values" (p 8).[2] Job satisfaction is strongly correlated with workers' mental health outcomes, including depression and anxiety, and modestly correlated with physical health.[1] Prolonged poor job satisfaction in early to mid-adulthood predicts worse mental health outcomes later in life.[3] Further, job satisfaction is positively associated with employee retention[4] and job performance, and negatively associated with absenteeism and turnover,[5] making it an outcome of interest to employers. One factor that can decrease job satisfaction is conflict between one's work and family demands.[6-8] Work-family conflicts have been linked to job satisfaction theory on the basis that, for many workers, being able to meet both family and work obligations is a job value, and being unable to do so lowers job satisfaction.[9]

Breastfeeding behaviors and the role of the workplace: For working mothers with young children, particularly the 57% of mothers who are working after six months postpartum,[10] BF can contribute to the experience of work-family conflict and, we argue, job satisfaction. BF is of interest to public health because it is associated with improved maternal and infant health

outcomes, including decreased rates of various infections among infants and reduced risk of obesity for children and mothers.[11,12] The American Academy of Pediatrics recommends exclusive BF for six months and continued BF for at least 12 months.[13] While 72% of mothers initiate BF at birth,[14] BF rates decrease rapidly following birth, with only 38% of mothers BF at all at six months, and only 16% at 12 months, with worse outcomes among African American, United States (US)-born, and lower-income mothers.[14]

BF while working often requires a laborious process of expressing breastmilk multiple times during the workday, then storing it and bringing it home. This process can lead to work-family conflict among BF, working mothers, particularly those who lack appropriate accommodations and support at work.[15] BF accommodations at work, like an appropriate space and break time to express (pump) milk, are essential in order for many workers to continue BF.[16] In 2010, the Affordable Care Act (ACA) established mandated break time and a private, non-bathroom space for BF mothers to express milk during the first year of a child's life for most employers,[17,18] augmenting numerous state laws already in existence.[19] However, even after passage of the ACA, 40% of working mothers in the US still lacked access to adequate break time and space for BF.[20] Women working in service occupations are less likely to have access to such accommodations than women in professional and management occupations.[21]

Empirical research about how BF experiences relate to job satisfaction would be relevant to health policymakers interested in the effects of BF accommodations like those mandated by the ACA, and also for organizational leaders concerned with the productivity, wellbeing and retention of employees. Because job satisfaction relates to employee retention and turnover,[4,5] including among workers who are new parents,[22] BF experiences at work could affect women's decisions to stay in or drop out of the workforce while their children are young. Previous studies

have shown that BF-related experiences at work can impact attitudes and psychological wellbeing outcomes, such general perceptions of support from their organization, stress, burnout, and depression.[23,24] However, with respect to job satisfaction, only two cross-sectional studies published in peer reviewed journals have explored whether workplace BF support relates to job satisfaction among women in the US.[25,26] Both studies observed a positive relationship between perceptions of BF support at work and women's job satisfaction. Neither study assessed specific experiences with workplace BF accommodations, like break time or space to pump milk. Moreover, longitudinal analyses that measure workplace BF support prior to job satisfaction assessment would control for temporality and for individual baseline job satisfaction, resulting in a better estimate of how BF experiences affect job satisfaction over time and addressing the call for more longitudinal research of job satisfaction and approaches to improving it.[1]

This study: We wanted to understand how women's experiences with BF support (or lack thereof) at work during the first few months postpartum could affect concurrent and later job satisfaction. Further, because the ACA and other policies specifically address adequate break time and space to express milk, we wanted to know if problems with those accommodations in particular were related to job satisfaction in the immediate and the long term.

To address these questions, we utilized data from the Infant Feeding Practices Study II, 2005-2007 (IFPS II).[27] We first examined a cross-sectional association between work-related BF problems, including break time and space to pump, and job satisfaction at three months post-partum, controlling for potential confounders. The three-month questionnaire was the first instance in the IFPS II when both workplace BF experiences and job satisfaction were assessed. Moreover, three months represents an important point of time given that 44% of mothers are back at work by then,[10] and those BF are halfway through meeting the AAP's six month

exclusive BF duration target. Then, we examined longitudinal associations between work-related BF problems at three months and low job satisfaction at nine and 12 months postpartum in a smaller set of women.

Materials and Methods

Dataset

The Infant Feeding Practices Study II (IFPS II) is a longitudinal mail survey that was conducted by the Centers for Disease Control and Prevention and the Food and Drug Administration between 2005 and 2007. Respondents were recruited via a nation-wide consumer panel of 500,000 households, and roughly 2000 new mothers participated in the surveys throughout the first year postpartum.[27] The survey assessed socio-demographic characteristics prenatally, and it assessed job satisfaction, work-related problems with BF, and other BF intentions, beliefs and experiences at three, six, nine and 12 months postpartum. A battery of other nutrition and clinical health data were assessed at other intervals.[27]

Variables

Job satisfaction: Job satisfaction was assessed using a single item asking, "How much satisfaction do you get from your paid work?" with responses on 5-point scale ranging from 1 representing "none" to 5 representing "very much." This item is similar to other validated job satisfaction items.[28] We used low job satisfaction, operationalized as a score of 1 or 2 on the 5 point scale and collected at nine and 12 months postpartum as our dependent variables.

Work-related breastfeeding problems: Six yes/no dichotomous items assessed whether the respondent experienced specific work-related problems with BF. Three additional IFPS II

items about other problems with BF were excluded because the items emphasized worry or embarrassment. These constructs are related to psychological distress and may introduce bias if used in models predicting job satisfaction. Moreover, by limiting the analysis to external, workplace constructs, our study findings can better inform workplace policy changes. The topics of each item are shown in Table 4.1. The six items were administered at three and six months postpartum for n=278 respondents who were BF and working at those time points. While we only used the three-month assessment in our analyses, we examined test-retest reliability between three and six months to confirm measurement validity. We used the simple agreement percentage, which is the percentage of all responses that were the same at both times, and the kappa coefficient. Agreement percentages (and kappa coefficients) for the six items were: item 1 96.8% (0.45), item 2 – 97.1% (0.0), item 3 – 84.5% (0.63), item 4 – 87.4% (0.53), item 5 – 95.0% (0.44), and item 6 – 92.1%, (0.38).

We coded our independent variable, BF problems at three months postpartum, in two ways. First, we categorized the total number of problems into: 1) no problems; 2) one-two problems; and 3) three-six problems. Second, we focused our analysis on responses to the items about space and time: "It was hard for me to arrange break time for BF or pumping milk," and "It was hard for me to find a place to breastfeed or pump milk." We categorized respondents as: 1) having experienced problems with both break time and space to pump/nurse; 2) problems with just one of them; 3) some other problem(s); or 4) no problems at all.

Covariates: We included additional covariates in our multivariate regression models: income (<$25,000, $25,000-$75,000, >$75,000), mother's age in years, race and ethnicity (White, Black, Hispanic, Asian/Pacific Islander, Other, with some categories collapsed for the longitudinal models), number of hours worked per week (<20, ≥20), work setting (dichotomized as either a non-residential building such as an office, store, restaurant, school or hospital or

another setting such as a private residence, vehicle or outdoors), and US geographical location (Northeast, South, Midwest, or West). BF duration was assessed based on whether or not a respondent reported continuing to breastfeed at 12 months postpartum. BF duration was reported for descriptive purposes but was not included in the multivariate models because it is a potential mediator variable between workplace BF experience and job satisfaction and would require a separate mediation analysis; moreover, 12-month follow up data were not available for many in the cross-sectional sample. Occupation was collapsed into 1) executive, professional or managerial versus 2) service, sales, administrative support, technician, or other non-managerial/non-executive occupation. Occupation was reported for descriptive purposes, including in a Table SI showing age, race/ethnicity and work-related BF problems by occupation for a subsample, but was excluded from the multivariate models because of low response rate.

Analysis

Inclusion criteria: We included in our analyses respondents who were BF and working for pay at three months postpartum. The prenatal sample in the IFPS II included 4902 women, of whom 2388 responded to the three-month postpartum survey. Of those, 956 reported working at some point in the past four weeks. Among those, 571 were BF. We excluded 83 respondents because of missing data (in 61 cases, they lacked responses about work-related BF problems), leaving a cross-sectional sample of n=488 working mothers.

For inclusion into the longitudinal analysis, respondents had to complete the nine- and 12-months postpartum questionnaires, report working for pay, and respond to the job satisfaction item at both time points.

Of the n=488 women included in the cross-sectional analysis, we excluded from longitudinal analysis 155 respondents due to non-response on either the nine and/or 12 month questionnaire. We excluded another 68 who had no job satisfaction data (63 of those women

reported not working at either or both time points, 2 did not respond about their work status, and another three were working but did not answer the job satisfaction item at one of the time points). This left a longitudinal analytic sample of n=265 working mothers.

Table 4.1 shows descriptive statistics for the independent and dependent variables, BF duration, socio-demographic variables, work characteristics and geographic region. All of the 95% confidence intervals for descriptive statistics of the cross-sectional and longitudinal samples overlap, suggesting that the characteristics of the two groups do not significantly differ. We conducted chi-squared tests (categorical variables) and a t-test (age) to compare characteristics of the n=265 respondents included in the longitudinal sample and the n=223 who were excluded. Respondents included in the longitudinal sample were significantly more likely to work in a non-residential building versus other setting and to have income in the highest tertile, they were slightly older, and they were less likely have low job satisfaction at three months postpartum or to identify as Black or Hispanic compared to respondents excluded from the longitudinal analysis.

Table 4.1. Descriptive statistics for cross-sectional and longitudinal samples of working mothers who breastfed until at least 3 months

	3-month postpartum cross-sectional sample (n=488) % (95% CI)	12-month postpartum longitudinal sample (n=265) % (95% CI)
Low job satisfaction at 3 months	12.9 (10.06, 16.21)	9.8* (6.51, 14.04)
Number of work-related BF problems reported at 3 months		
0 problems	61.5 (57.00, 65.81)	58.5 (52.30, 64.49)
1-2 problems	30.5 (26.47, 34.83)	33.2 (27.56, 39.23)
3-6 problems	8.0 (5.74, 10.76)	8.3 (5.28, 12.30)
Frequency of specific work-related BF problems reported at 3 months		
1) Coworker made negative comments about BF	4.3 (2.68, 6.50)	3.4 (1.56, 6.35)
2) Supervisor made negative comments BF	1.2 (0.45, 2.66)	0.8 (0.09, 2.70)

3) It was hard to arrange break time for BF/pumping milk	30.5 (26.47, 34.83)	33.2 (27.56, 39.23)
4) It was hard to find a place to breastfeed/pump milk	19.5 (16.05, 23.26)	20.8 (16.03, 26.14)
5) It was hard to arrange a place to store pumped breast milk	5.3 (3.68, 7.95)	4.5 (2.36, 7.78)
6) It was hard to carry the equipment to pump milk at work	9.8 (7.34, 12.83)	10.9 (7.45, 15.34)
BF duration[1]		
Continuing to breastfeed at 12 months	43.3 (37.64, 48.94)	44.9 (38.82, 51.11)
Age in years (Mean, SD)	29.7 (29.25, 30.17)	30.8** (30.17, 31.34)
Household income, annual		
<$25,000	12.1 (9.33, 15.32)	9.4 (6.20, 13.61)
$25,000-$74,999	64.6 (60.12, 68.80)	62.6 (56.51, 68.48)
≥$75,000	23.4 (19.68, 27.37)	27.9* (22.61, 33.74)
Race/ethnicity		
White	86.1 (82.67, 89.01)	88.3 (83.81, 91.91)
Hispanic	4.7 (3.01, 6.99)	3.0 (1.31, 5.86)
Black	4.3 (2.68, 6.50)	2.3* (0.84, 4.86)
Asian/Pacific Islander	3.1 (1.73, 5.02)	4.2 (2.09, 7.31)
Other	1.8 (0.85, 3.47)	2.3 (0.84, 4.86)
Region		
Northeast	17.0 (13.78, 20.64)	16.6 (12.33, 21.64)
Midwest	33.6 (29.42, 37.99)	33.6 (27.92, 39.61)
South	28.5 (24.52, 32.71)	28.3 (22.96, 34.14)
West	20.9 (17.38, 24.78)	21.5 (16.71, 26.95)
Hours worked per week		
<20 hours	39.3 (34.98, 43.83)	36.2 (30.43, 42.33)
≥20 hours	60.7 (56.17, 65.02)	63.8 (57.67, 69.57)
Work setting		
Non-residential building (e.g., office, store, or restaurant)	68.0 (63.69, 72.15)	71.7* (65.86, 77.04)
Residence, vehicle, outdoors or other location	32.0 (27.85, 36.31)	28.3 (22.96, 34.14)
Occupation[2]		
Executive, professional, or managerial occupation	57.5 (51.79, 62.99)	59.9 (52.59, 66.89)
Service, sales, administrative support, technician, or other non-managerial/non-executive occupation	42.5 (37.01, 48.21)	40.1 (33.11, 47.41)

Notes: CI=Confidence Interval, SD=Standard deviation. For all variables other than age, which is continuous, CIs are exact binomial confidence intervals, also referred to as Clopper-Pearson intervals. For age, the CI is based on a normal distribution.

[1]Continued BF until 12 months is only available for respondents who completed the 12-month questionnaire, so this information was not available for everyone in the cross-sectional sample. Sample sizes for this item were n=310 for the cross-sectional sample and n=265 (entire sample) for the longitudinal sample.
[2]Occupation was assessed on a separate questionnaire that was completed by fewer respondents. Sample sizes for this item were n=315 for the cross-sectional sample and n=192 for the longitudinal sample.
*p<0.05, **p<0.001 for X^2 test (categorical variable) or two-sided t-test (continuous variable) comparing the n=236 respondents included in longitudinal sample and the n=223 who were excluded.

We calculated the frequency of work-related BF problems, along with age and race/ethnicity, by occupation for respondents from the six most frequently reported occupation categories in the cross-sectional sample: professional specialty, executive and managerial, administrative support, sales, technician, and service workers.

We used logistic regression to assess the relationship between work-related BF problems and respondents' job satisfaction. In Model 1, we predicted the odds of low job satisfaction at three months based on the number of problems reported with BF at three months. In Model 2, we predicted the odds of low job satisfaction at three months based on problems reported with break time or space to pump/breastfeed, also at three months. Then, using the longitudinal sample of n=265 women, we assessed whether work-related problems with BF at three months, operationalized both by number of problems and also focusing on break time and space problems, were associated with low job satisfaction at nine months (supplemental table only) and 12 months postpartum. We have presented three nested versions of Models 1 and 2 to predict low job satisfaction: version a) using work-related BF problems at three months as the only independent variable, version b) controlling for three-month baseline job satisfaction, an approach that prior studies have used to the effect over time of work-family conflict on job satisfaction,[8] and version c) which includes other covariates along with three month job satisfaction.

As a sensitivity check to address confounding by existing poor job satisfaction, we created logistic regression models that excluded respondents who already had low job satisfaction at three months in order to predict the odds of incident low job satisfaction at 12

months based on work-related BF problems. Additional sensitivity analyses included creating cross-sectional and longitudinal models that treated job satisfaction as a continuous rather than dichotomous variable to assess whether the results reported here could be an artifact of how that variable was dichotomized, and models stratified by household income, hours worked per week, and work setting to assess whether the relationship between BF support and job satisfaction could be different for any of those subgroups.

All the logistic regression models controlled for respondents' income, age, race/ethnicity, part time versus full time status, work setting and geographic region. Analyses were conducted in Stata SE (version 15).

This study was reviewed by the University of California Irvine Institutional Review Board and determined to be exempt.

Results

Descriptive Statistics

The descriptive statistics (Table 4.1) show that 12.9% of women in the cross-sectional sample had low job satisfaction according to our criteria, and 38.5% reported at least one work-related BF problem. The most frequently reported problems were challenges with arranging break time (30.5%) and with finding a place to pump or breastfeed (19.5%). Fewer than half (43.3%) continued BF until 12 months. The majority of women in the sample worked more than 20 hours per week (60.7%), in a non-residential building setting (68.0%), and in an executive, professional or managerial occupation (57.5%). Respondents were predominately white (86.1%), with income between $25,000 and $75,000 (64.6%) and average age was about 39.7 years. The largest proportion of respondents lived in the Midwest (33.6%).

Compared to working and BF mothers from the other four occupation categories, technicians and administrative support persons were the most likely to experience work-related BF problems at three months postpartum, with 43.7% and 41.1% reporting at least one problem, respectively (Supplemental Table 1). Women in executive and managerial positions were the least likely to experience problems, with 34.6% reporting one or more problems. Challenges with arranging break time to pump or nurse followed by challenges finding a place to pump or nurse were the most frequently reported problems for every occupation group.

Cross-Sectional Analysis

Model 1 in Table 4.2 predicted the odds of low job satisfaction at three months based on number of work-related problems also at three months. In this model, reporting three to six problems was significantly associated with 4.76 times the odds of low job satisfaction compared to reporting no problems. The odds of low satisfaction for those reporting one or two problems compared to reporting no problems was not statistically significant.

Table 4.2. Cross-sectional models predicting odds of low job satisfaction at 3 months postpartum based on work-related problems with breastfeeding among working mothers

	Model 1: Number of problems **OR (95% CI)**	**Model 2: Break time and space problems** **OR (95% CI)**
Number of BF problems at 3 months (Reference: No problems)		
1-2 problems	1.02 (0.52, 2.03)	
3-6 problems	4.76** (2.03, 11.18)	
Break time/space problems at 3 months (Reference: No problems)		
Break time *or* space problem		1.06 (0.49, 2.31)
Break time *and* space problems		2.72* (1.31, 5.63)
Some other problems		0.75 (0.15, 3.89)
Age in years	0.93* (0.88, 0.99)	0.93* (0.87, 0.99)
Household income (Reference: <$25,000)		

$25,000-$74,999	0.99 (0.43, 2.26)	1.06 (0.46, 2.44)
≥$75,000	1.06 (0.37, 3.04)	1.15 (0.41, 3.28)
Race/ethnicity (Reference: White)		
Black	4.52* (1.58, 12.99)	5.37* (1.89, 15.29)
Hispanic	0.18 (0.02, 1.50)	0.24 (0.03, 1.90)
Asian/Pacific Islander	1.19 (0.24, 5.84)	1.05 (0.21, 5.34)
Other	1.61 (0.30, 8.53)	1.59 (0.30, 8.40)
Region (Reference: Northeast)		
Midwest	1.14 (0.46, 2.84)	1.12 (0.45, 2.76)
South	1.23 (0.48, 3.13)	1.32 (0.52, 3.34)
West	1.92 (0.73, 5.08)	1.87 (0.71, 4.91)
Hours worked per week (Reference: <20 hours)		
≥20 hours	1.97* (1.03, 3.79)	1.96* (1.03, 3.74)
Work setting (Reference: Non-residential building)		
Residence, vehicle, outdoors or other location	1.53 (0.77, 3.03)	1.50 (0.76, 2.97)

Note: CI=Confidence Interval; OR = Odds Ratio. Respondents n=488.
*p-value<0.05; **p-value< 0.001

Model 2 isolates problems with break time and with space to pump/breastfeed. Women who reported problems with both arranging break time and arranging a space to pump or breastfeed had 2.72 times the odds of low job satisfaction when compared to women who did not report any workplace BF problems, and this difference was statistically significant. The odds ratio associated with experiencing only one of the two problems was not statistically significant, and neither was the odds ratio for reporting only other problems.

In both cross-sectional models, age was significantly associated with decreased odds of low job satisfaction. Black women had significantly higher odds of low job satisfaction when compared to white respondents, and women working more than 20 hours per week had higher odds of low job satisfaction than those working less than 20 hours per week.

Longitudinal Analysis

The longitudinal logistic regression models in Table 4.3 predicted odds of low job satisfaction at 12 months postpartum based on the number of work-related BF problems reported for a sample of n=265 women. In all three iterations of the model, women experiencing three to six workplace-related BF problems at three months postpartum had significantly higher odds of low job satisfaction at 12 months compared to women experiencing no problems, with odds ratios ranging from 4.38 to 6.89. The odds ratios associated with reporting one to two problems were not statistically significant in any of the versions of the model. The odds ratio estimate for baseline job satisfaction was statistically significant both times that it was included, which was expected. In the fully adjusted model (Model 1c), black women and women working more than 20 hours per week were significantly more likely to have low job satisfaction at 12 months than white women and women working less than 20 hours per week, respectively.

Table 4.3. Longitudinal models predicting odds of low job satisfaction at 12-months postpartum based on number of work-related breastfeeding problems at three months among working mothers

	Model 1a **OR (95% CI)**	**Model 1b** **OR (95% CI)**	**Model 1c** **OR (95% CI)**
Number of BF problems at 3 months (Reference: No problems)			
1-2 problems	1.59 (0.56, 4.54)	1.41 (0.46, 4.36)	1.75 (0.48, 6.36)
3-6 problems	6.89** (2.12, 22.37)	4.38* (1.13, 16.88)	6.88* (1.33, 35.58)
Job satisfaction at 3 months (Reference: Moderate or high)			
Low job satisfaction		14.10** (5.02, 39.61)	15.14** (4.50, 50.88)
Age in years			1.06 (0.94, 1.18)
Household income (Reference: <$25,000)			
$25,000-$74,999			1.76 (0.23, 13.17)
≥$75,000			0.35 (0.03, 3.69)
Race/ethnicity (Reference: White)			
Black			2.74* (0.24, 31.49)
Hispanic, Asian/Pacific Islander or Other			1.18 (0.21, 6.70)

Region (Reference: Northeast)			
Midwest			0.96 (0.20, 4.57)
South			0.71 (0.14, 3.67)
West			0.80 (0.00, 0.13)
Hours worked per week (Reference: <20 hours)			
≥20 hours			3.78* (0.91, 15.65)
Work setting (Reference: Non-residential building)			
Residence, vehicle, outdoors or other location			2.60 (0.72, 9.38)

Note: CI=Confidence Interval; OR = Odds Ratio. Respondents n=265.
*p-value<0.05; **p-value< 0.001

Table 4.4 shows three nested versions of logistic regression Model 2, which focused on whether problems with break time and space to pump/nurse at three months predicted low job satisfaction at 12 months. In two of the three iterations shown, Model 2a, which does not include a baseline control or other covariates, and Model 2c, the fully adjusted model, women who experienced problems with both break time and space had significantly higher odds of low job satisfaction than those who had experienced no problems; the odds ratios ranged from 1.44 to 4.03 and had a higher value in the models that controlled for baseline job satisfaction. Experiencing problems with only break time or space were not significantly associated with low job satisfaction at 12 months, and neither was experiencing some other BF problem. As expected, the odds ratio estimate for baseline job satisfaction was statistically significant in both models in which it was included. No other variables in the model were significant.

Table 4.4. Longitudinal models predicting odds of low job satisfaction at 12-months postpartum based on break time and space problems at three months among working mothers

	Model 2a **OR (95% CI)**	**Model 2b** **OR (95% CI)**	**Model 2c** **OR (95% CI)**
Break time/space problems at 3 months (Reference: No problems)			

Break time *or* space problem	1.84 (0.21, 16.18)	1.20 (0.31, 4.62)	1.28 (0.26, 6.23)
Break time *and* space problems	1.44* (0.42, 4.99)	2.78 (0.86, 9.03)	4.03* (1.03, 15.67)
Some other problems	4.08 (1.44, 11.62)	3.18 (0.34, 29.35)	2.77 (0.23, 32.84)
Job satisfaction at 3 months (Reference: Moderate or high satisfaction)			
Low job satisfaction		15.48** (5.43, 44.10)	15.97** (4.75, 43.65)
Age in years			1.04 (0.93, 1.16)
Household income (Reference: <$25,000)			
$25,000-$74,999			1.53 (0.22, 10.66)
≥$75,000			0.39 (0.04, 3.71)
Race/ethnicity (Reference: White)			
Black			4.04 (0.37, 44.06)
Hispanic, Asian/Pacific Islander or Other			1.27 (0.22, 7.30)
Region (Reference: Northeast)			
Midwest			0.71 (0.15, 3.42)
South			0.59 (0.11, 3.01)
West			0.68 (0.11, 5.35)
Hours worked per week (Reference: <20 hours)			
≥20 hours			3.90 (0.95, 16.05)
Work setting (Reference: Non-residential building)			
Residence, vehicle, outdoors or other location			2.59 (0.72, 9.33)

Note: CI=Confidence Interval; OR = Odds Ratio. Respondents n=265.
*p-value<0.05; **p-value< 0.001

Sensitivity Analyses

For the longitudinal models predicting low job satisfaction at 12 months, we conducted a sensitivity test to assess whether controlling for prenatal rather than three-month job satisfaction would change the results. The results were consistent with what we observed in the model using the three-month job satisfaction control variable (less than 0.6 difference in the magnitude of the odds ratios and a comparable level of statistical significance; results available upon request).

Models predicting the odds of low job satisfaction at nine months postpartum, shown in Tables S4.2 and S4.3, had results similar to the 12-month models. Specifically, in Model 1 (Table S4.2), experiencing three-six work-related BF problems at three months was associated with significantly higher odds of low job satisfaction at nine months in all three iterations of the model compared to experiencing no problems, with odds ratios ranging from 4.44 to 6.89. The odds ratios for experiencing one to two problems were not statistically significant.

Table S4.3 shows that experiencing problems with both break time and space to pump/nurse at three months, compared to not experiencing any problems, was a statistically significant predictor of low job satisfaction at nine months in only one iteration, Model 2a, which did not control for baseline job satisfaction or other covariates. In the other two iterations, the odds ratios for experiencing both break time and space problems were greater than one, but the relationships did not reach statistical significance. Similarly, the odds ratio for experiencing only one of the two problems (break time or space) compared to experiencing no problems was not statistically significant.

Table S4.4 shows the results of fully adjusted longitudinal models that predicted the odds of incident low job satisfaction at 12 months postpartum by excluding those in the sample who already had low job satisfaction at three months. In Model 1, experiencing three-six work-related BF problems at three months was associated with 11.65 times the odds of developing low job satisfaction at 12 months compared to experiencing no problems, and this relationship was statistically significant. The odds ratio associated with experiencing one to two problems compared to 0 problems was not statistically significant. In Model 2, experiencing problems with both break time and space to pump/nurse was associated with 7.02 times the odds of developing low job satisfaction at 12 months compared to experiencing no problems, and this was

statistically significant. The odds ratios for the other categories of BF problems in Model 2 were not statistically significant.

The cross-sectional and longitudinal models that used a continuous job satisfaction variable produced results that were generally consistent with what we found when we used the dichotomous variable. Women reporting more BF problems had lower job satisfaction than those without problems, and they experienced a larger decrease in job satisfaction over time, on average and holding all other variables equal. However, the relationships were not statistically significant in all instances. Results are available upon request.

The models stratified by household income, hours worked per week and work setting also produced results that were generally consistent with the main models reported here. The relationship between workplace BF problems and job satisfaction appeared stronger for women in families earning less than $50,000 per year than for those earning more, and for women working at least 20 hours a week compared to those working less. Results are available upon request.

Discussion

This study aimed to test whether there is a relationship between experiences with BF at work and job satisfaction among working mothers, using both a cross-sectional and a longitudinal approach. We found a consistent relationship between work-related problems with BF and concurrent low job satisfaction among working women, in particular for women who reported three or more problems. Moreover, difficulty arranging break time or a space to pump or breastfeed – the two problems meant to be addressed by policies like the Affordable Care Act (ACA)'s Break Time for Nursing Mothers law[17] – were the most frequent problems reported in this sample, which was collected prior to the ACA's passage. In most of our models, the

combined presence of break time and space problems was associated with higher odds of low job satisfaction compared to not experiencing problems.

This is, to our knowledge, the first published study to longitudinally examine the relationship between work-related problems with BF and job satisfaction among working mothers. The overall number of work-related BF problems at three months postpartum, and time and space problems in particular, were associated with low job satisfaction at nine and 12 months, including in models that controlled for baseline job satisfaction and models that predicted incident low job satisfaction by excluding those with low job satisfaction at baseline. This suggests that after taking into account an individual's tendency to have low job satisfaction at baseline, experiencing problems with BF is associated with worse satisfaction outcomes later down the line.

It is notable that we observed an association between BF problems at work at three months postpartum and job satisfaction not only across multiple iterations of these models, but also for two distinct follow-up periods, nine and 12 months. Other research about work-family conflict used a one year follow-up period to capture changes in job satisfaction,[8] potentially because job satisfaction is a relatively stable and slow-changing construct, and for this reason we have emphasized the 12 month results here.

Limitations: There are some limitations to this study. First, women with middle and higher incomes, professional or managerial positions, and white women were over-represented in the sample.[27] Also, the data were collected over 10 years ago, which means that the proportion of women who now experience problems with space and time is different and probably smaller because of passage of the ACA's workplace lactation accommodation law in 2010.[17,29] While we attempted to control adequately for potential confounders, it is possible that other work-family

policies like flexible scheduling or paid maternity leave could confound the relationship between BF support at work and job satisfaction. Workers' disposition could also function as a confounder, given that personality traits like negative affect are associated with experiences of work-family conflict.[30] We have tried to reduce the influence of this potential confounder by removing from our measure of BF problems the three items about embarrassment, worrying about keeping one's job, and worrying about continuing to breastfeed, which may be more related to neuroticism and negative affect than the other BF problems items.

Respondent attrition between three and 12 months postpartum could have left out a selected group of women, including those who stopped working during that period. If some of those women left their jobs because they had trouble continuing to breastfeed, this could have created a bias toward the null in our results. Moreover, based on our comparison between longitudinal study participants and non-participants, frequency of BF problems was similar for the individuals included in the longitudinal sample and those excluded, but the groups differed in terms of the frequency of low job satisfaction, as well as some sociodemographic and work characteristics. The small sample size likely reduced our statistical power, and this is evident in the wide confidence intervals for some coefficient estimates in the longitudinal models shown in Tables 4.3 and 4.4.

There are some limitations to the job satisfaction measure used in the IFPS II. Most prior research on this topic has used multi-item measures for job satisfaction.[8,25,31,32] However, some studies have used a single-item measure,[3,26,33,34] and it has been suggested that single, global measures of job satisfaction may work better to capture changes over time.[28] One meta-analysis found that single item job satisfaction measures correlated acceptably with multi-item measures (mean correlation, corrected for reliability, of 0.67).[35] Single item measures may underestimate

low satisfaction,[36] which would create a bias towards the null in a study such as this. We believe our single item is a valid, if conservative, measure of job satisfaction. Further, because we only had a single, 1-5 point measure, we dichotomized the scores and conducted logistical regression rather than treating it as an ordinal or ratio variable. This may have further reduced our power to detect statistically significant relationships in the models.

Strengths: This is the first study, to our knowledge, that used a national US dataset representing a variety of occupation types to assess the relationship between workplace BF experiences and job satisfaction. Moreover, we were able to explore how BF experiences related longitudinally to low job satisfaction, controlling for baseline job satisfaction, which is a stronger study design and avoids the potential temporal ambiguity that limits the cross-sectional approaches used in prior studies.[25,26] That we observed significant longitudinal relationships even after controlling for baseline job satisfaction suggests that these models are not simply capturing the difference between workplaces that are better or worse on the whole. Also, because we used as the independent variable reports of recent negative experiences with BF among working mothers rather than general perceptions of workplace support for BF, we could isolate the effects of specific types of experiences, like problems with break time and space to pump or nurse, on job satisfaction.

Public health implications: These findings fill a gap in the literature about how problems with BF relate to job satisfaction among a sample of women from across the US. While many studies have shown that workplace BF accommodations are positively associated with BF duration,[16,20,37] far fewer studies have considered workplace BF accommodations from the perspective of work-family conflict and examined how it affects mothers' psychosocial outcomes. By demonstrating that work-related problems with BF are positively associated with low job satisfaction, we are providing further evidence in favor of providing lactation

accommodations for workers. This aligns with previous research showing that BF experiences are related to other job attitudes and psychological outcomes among working mothers.[23,24] The outcome of job satisfaction aligns with the thrust to assess positive psychological outcomes in the workplace, in addition to more commonly-studied negative outcomes like stress and burnout.[38]

Additionally, we were able to single out the effects of the two problems meant to be addressed by the ACA's workplace lactation accommodation law: break time as well as a space to pump. The law mandated access to break time whenever a nursing mother needs it, and a private space that is not a bathroom.[17] This amendment to the Fair Labor Standards Act has been in place since 2010, but research shows that these provisions still have not been implemented for many working mothers.[20] Recent attempts to overturn the ACA could put the national workplace lactation accommodation standard at risk, although thus far the law has avoided threats of being overturned.[39] While we are unable to draw definitive causal conclusions, our findings support the notion that if the BF break time and space provisions of the ACA were fully implemented, low job satisfaction could be reduced among working, BF women.

Areas for future research: We provided some evidence that BF problems at work vary by occupation type, aligning with prior research.[15,21] However, because of the limitations of the dataset, we could only examine this relationship for a small number of occupations and a small sample of working women. Future studies should explore in more depth how experiences with BF vary by occupation type and other work characteristics.

Moreover, our study focused on providing strong, policy-relevant evidence for a relationship between a set of work-related BF problems at the three-month stage and job satisfaction, but we did not focus on mediators or pathways in this relationship, such as BF behavior. For example, we did not take into account BF duration and whether problems at work

could have led to cessation of BF, which could decrease job satisfaction. In the future, we plan to explore why women who experience BF problems may develop worse job satisfaction. Also, due to intercorrelation among reported BF problems and the limitations of our sample, we were unable to determine which individual problem was most strongly associated with changes in job satisfaction. This is another important area to explore.

Lastly, further research should focus on BF experiences among groups that are not well-represented in this sample, including women of color and low-wage workers, who tend to face more barriers to BF and experience more adverse working conditions.[20] Studies should also take into account other family-friendly policies like paid leave and flexible time[7] for a comprehensive understanding of how policies that support BF may also impact working mothers' job satisfaction.

Supplemental Tables

Table S4.1. Socio-demographic characteristics and frequency of work-related breastfeeding problems by occupation category

	Professional specialty (n=129) (%)	**Executive and managerial (n=52) (%)**	**Administrative support (n=51) (%)**	**Sales (n=19) (%)**	**Technician (n=32) (%)**	**Service (n=27) (%)**
Age in years (Mean, SD)	31.2, 4.2	30.9, 4.7	30.3, 4.4	29.7, 6.2	31.4, 5.5	28.7, 5.0
Race/ethnicity						
White	91.5	84.6	80.4	84.2	87.5	81.5
Hispanic	1.6	9.6	9.8	5.3	0	11.1
Black	3.9	1.9	5.9	10.5	3.1	0
Asian/PI	2.3	1.9	2.0	0	6.3	3.7
Other	0.8	1.9	2.0	0	3.1	3.7
Number of work-related BF problems reported at 3 months						
0 problems	58.9	65.4	58.8	63.2	56.3	63.0
1-2 problems	33.3	26.9	27.4	26.3	40.6	29.6
3-6 problems	7.8	7.7	13.7	10.5	3.1	7.4

Frequency of specific work-related BF problems reported at 3 months						
1) Coworker made negative comments about BF	1.6	1.9	9.8	0	6.3	11.1
2) Supervisor made negative comments BF	0.8	0	2.0	0	3.1	3.7
3) It was hard to arrange break time for BF/ pumping milk	33.3	23.0	35.3	36.8	34.4	22.2
4) It was hard to find a place to breastfeed/ pump milk	22.5	15.4	21.6	21.1	15.6	18.5
5) It was hard to arrange a place to store pumped breast milk	5.4	7.7	2.0	15.8	3.1	7.4
6) It was hard to carry the equipment to pump milk at work	10.1	15.4	9.8	0	6.3	11.1

Notes: SD=Standard deviation. Respondents included in this table are a subsample of the n=488 individuals included in our cross-sectional sample. Fewer than half of respondents answered the occupation item because it was administered prior to the beginning of the study only to members of the initial consumer opinion panel. Moreover, certain occupational groups were excluded from this table due to very small numbers: "precision production, craft and repair" and "operator, fabricator and laborer" each had just 1 respondent, and "farming, forestry and fishing" had 3. Also, 74 women reported not working at the time they filled out this initial demographic sheet and could not be included in this table, but they reported working in the postnatal period and were included in our cross-sectional sample.

Table S4.2. Longitudinal models predicting odds of low job satisfaction at 9 months postpartum based on number of work-related BF problems at three months among working mothers

	Model 1a **OR (95% CI)**	**Model 1b** **OR (95% CI)**	**Model 1c** **OR (95% CI)**
Number of BF problems at 3 months (Reference: No problems)			
1-2 problems	1.34 (0.45, 4.01)	1.17 (0.37, 3.74)	1.30 (0.35, 4.76)
3-6 problems	6.89* (2.12, 22.37)	4.44* (1.18, 16.75)	5.69* (1.21, 26.68)
Job satisfaction at 3 months (Reference: Moderate or high)			
Low job satisfaction		11.90** (4.17, 33.95)	12.33** (3.73, 40.75)
Age in years			0.98 (0.88, 1.10)
Household Income (Reference: <$25,000)			
$25,000-$74,999			0.87 (0.15, 4.90)
>$75,000			0.28 (0.03, 2.41)
Race/ethnicity (Reference: White)			
Black			1.90 (0.16, 22.28)

Hispanic, Asian/Pacific Islander or Other			1.48 (0.29, 7.64)
Region (Reference: Northeast)			
Midwest			1.48 (0.30, 7.26)
South			1.02 (0.19, 5.48)
West			0.55 (0.07, 4.08)
Hours worked per week (Reference: <20 hours)			
≥20 hours			1.61 (0.48, 5.45)
Work setting (Reference: Non-residential building)			
Residence, vehicle, outdoors or other location			2.42 (0.68, 8.61)

Note: CI=Confidence Interval; OR = Odds Ratio. Respondents n=265.
*p-value<0.05; **p-value< 0.001

Table S4.3. Longitudinal models predicting odds of low job satisfaction at 9 months postpartum based on break time and space problems at 3 months among working mothers

	Model 2a **OR (95% CI)**	**Model 2b** **OR (95% CI)**	**Model 2c** **OR (95% CI)**
Break time/space problems at 3 months (Reference: No problems)			
Break time *or* space problem	1.44 (0.42, 4.99)	1.23 (0.33, 4.60)	1.26 (0.28, 5.75)
Break time *and* space problems	4.08* (1.44, 11.62)	2.87 (0.91, 9.04)	3.70 (1.00, 13.65)
Some other problems[1]	--	--	--
Job satisfaction at 3 months (Reference: Moderate or high)			
Low job satisfaction		11.67** (4.13, 32.95)	10.98** (3.34, 36.09)
Age in years			0.98 (0.88, 1.09)
Household Income (Reference: <$25,000)			
$25,000-$74,999			0.94 (0.17, 5.29)
>$75,000			0.30 (0.04, 2.46)
Race/ethnicity (Reference: White)			
Black			4.53 (0.35, 57.74)
Hispanic, Asian/Pacific Islander or Other			1.67 (0.32, 8.61)
Region (Reference: Northeast)			
Midwest			1.35 (0.27, 6.63)
South			0.98 (0.18, 5.18)
West			0.57 (0.08, 4.21)
Hours worked per week (Reference: <20 hours)			
≥20 hours			1.66 (0.49, 5.62)
Work setting (Reference: Non-residential building)			
Residence, vehicle, outdoors or other location			2.34 (0.67, 8.21)

Note: CI=Confidence Interval; OR = Odds Ratio. Respondents n=254.
*p-value<0.05; **p-value< 0.001
[1]11 individuals, all who reported some problems other than break time or space at 3 months, were excluded from these logistic regression models because none of them reported low job satisfaction. For this reason the sample is 254 rather than 265.

Table S4.4. Longitudinal models predicting odds of incident low job satisfaction at 12 months postpartum based work-related BF problems at 3 months among working mothers

	Model 1 – Number of problems **OR (95% CI)**	**Model 2 – Break time and space problems** **OR (95% CI)**
Number of BF problems at 3 months (Reference: No problems)		
1-2 problems	2.22 (0.43, 11.50)	
3-6 problems	11.65* (1.13, 119.74)	
Break time/space problems at 3 months (Reference: No problems)		
Break time *or* space problem		0.79 (0.07, 8.67)
Break time *and* space problems		7.02* (1.18, 41.69)
Some other problems[1]		3.86 (0.30, 49.25)
Age in years	0.92 (0.79, 1.08)	0.89 (0.76, 1.05)
Household Income (Reference: <$50k)		
≥$50k	0.23 (0.05, 1.11)	0.27 (0.06, 1.27)
Race/ethnicity (Reference: White)		
Black, Hispanic, Asian/Pacific Islander, or Other	1.88 (0.16, 22.06)	1.58 (0.13, 19.77)
Region (Reference: Northeast or Midwest)		
South or West	0.20 (0.03, 1.25)	0.21 (0.03, 1.41)
Hours worked per week (Reference: <20 hours)		
≥20 hours	5.49 (0.91, 32.99)	7.00* (1.03, 47.72)
Work setting (Reference: Non-residential building)		
Residence, vehicle, outdoors or other location	6.63* (1.30, 33.69)	5.67* (1.18, 27.12)

Note: CI=Confidence Interval; OR = Odds Ratio. Respondents: n=239.
In order to include only new instances of low job satisfaction at 12 months postpartum, these models exclude individuals who reported low job satisfaction at 3 months.
*p-value<0.05; **p-value< 0.001

References

1. Faragher EB, Cass M, Cooper CL. The relationship between job satisfaction and health: a meta-analysis. *Occupational and Environmental Medicine.* 2005;62(2):105-112.
2. Locke EA. What is job satisfaction? *Organizational Behavior and Human Performance.* 1969;4(4):309-336.
3. Dirlam J, Zheng H. Job satisfaction developmental trajectories and health: A life course perspective. *Social Science & Medicine.* 2017;178:95-103.
4. Tett RP, Meyer JP. Job satisfaction, organizational commitment, turnover intention, and turnover: path analyses based on meta-analytic findings. *Personnel Psychology.* 1993;46(2):259-293.
5. Judge TA, Parker S, Colbert AE, Heller D, Ilies R. Job satisfaction: a cross-cultural review. In: Anderson N, Ones DS, Sinangil HK, Viswesvaran C, eds. *Handbook of Industrial, Work and Organization Psychology. Volume 2: Organizational Psychology.* Vol 2. London, Thousand Oaks, New Delhi: Sage Publications; 2001:25-52.
6. Wang YC, Peng JX. Work-family conflict and depression in Chinese professional women: the mediating roles of job satisfaction and life satisfaction. *International Journal of Mental Health and Addiction.* 2017;15(2):394-406.
7. Kossek EE, Ozeki C. Work-family conflict, policies, and the job-life satisfaction relationship: A review and directions for organizational behavior human resources research. *Journal of Applied Psychology.* 1998;83(2):139-149.
8. Grandey AA, Cordeiro BL, Crouter AC. A longitudinal and multi-source test of the work-family conflict and job satisfaction relationship. *Journal of Occupational and Organizational Psychology.* 2005;78:305.

9. Perrewe PL, Hochwarter WA, Kiewitz C. Value attainment: An explanation for the negative effects of work–family conflict on job and life satisfaction. *Journal of Occupational Health Psychology.* 1999;4(4):318.

10. Laughlin LL. *Maternity leave and employment patterns of first-time mothers: 1961-2008.* US Department of Commerce, Economics and Statistics Administration; 2011.

11. Ip S, Chung M, Raman G, Trikalinos TA, Lau J. A summary of the Agency for Healthcare Research and Quality's evidence report on breastfeeding in developed countries. *Breastfeeding Medicine.* 2009;4(S1):S-17-S-30.

12. Sankar MJ, Sinha B, Chowdhury R, et al. Optimal breastfeeding practices and infant and child mortality: a systematic review and meta-analysis. *Acta Paediatrica.* 2015;104(S467):3-13.

13. Eidelman AI, Schanler RJ, Johnston M, et al. Breastfeeding and the use of human milk. *Pediatrics.* 2012;129(3):e827-e841.

14. Singh G, Kogan M, Dee D. Nativity/immigration status, race/ethnicity, and socioeconomic determinants of breastfeeding initiation and duration in the United States, 2003. *Pediatrics* 2007;119:S38-S46.

15. Johnson KM, Salpini C. Working and nursing: navigating job and breastfeeding demands at work. *Community Work and Family.* 2017;20(4):479-496.

16. Hilliard ED. A review of worksite lactation accommodations: Occupational health professionals can assure success. *Workplace Health & Safety.* 2017;65(1):33-44.

17. United States Department of Labor, Wage and Hour Division. Frequently Asked Questions – Break Time for Nursing Mothers. Accessed June 11, 2018.

18. Meek JY. Clarification of the "Break Time for Nursing Mothers" provisions of the Patient Protection and Affordable Care Act. *Journal of Human Lactation.* 2016;32(2):388-388.

19. National Conference of State Legislatures. Breastfeeding State Laws. http://www.ncsl.org/research/health/breastfeeding-state-laws.aspx. Updated June 5, 2017. Accessed June 6, 2018.

20. Kozhimannil KB, Jou J, Gjerdingen DK, McGovern PM. Access to workplace accommodations to support breastfeeding after passage of the Affordable Care Act. *Women's Health Issues.* 2016;26(1):6-13.

21. Snyder K, Hansen K, Brown S, Portratz A, White K, Dinkel D. Workplace breastfeeding support varies by employment type: the service workplace disadvantage. *Breastfeeding Medicine.* 2018;13(1):23-27.

22. Brough P, O'Driscoll MP, Biggs A. Parental leave and work-family balance among employed parents following childbirth: An exploratory investigation in Australia and New Zealand. *Kōtuitui: New Zealand Journal of Social Sciences Online.* 2009;4(1):71-87.

23. Bruk-Lee V, Albert D, Stone KL. Lactation and the working woman: Understanding the role of organizational factors, lactation support, and legal policy in promoting breastfeeding success. In: *Research perspectives on work and the transition to motherhood.* Springer; 2016:217-239.

24. Spitzmueller C, Wang Z, Zhang J, et al. Got milk? Workplace factors related to breastfeeding among working mothers. *Journal of Organizational Behavior.* 2016;37(5):692-718.

25. Jantzer AM, Anderson J, Kuehl RA. Breastfeeding support in the workplace: the relationships among breastfeeding support, work–life balance, and job satisfaction. *Journal of Human Lactation.* 2018;34(2), pp.379-385.

26. Waite WM, Christakis D. Relationship of maternal perceptions of workplace breastfeeding support and job satisfaction. *Breastfeeding Medicine.* 2015;10(4):222-227.

27. Fein SB, Labiner-Wolfe J, Shealy KR, Li R, Chen J, Grummer-Strawn LM. Infant feeding practices study II: study methods. *Pediatrics.* 2008;122(Supplement 2):S28-S35.

28. Scarpello V, Campbell JP. Job satisfaction: are all the parts there? *Personnel psychology.* 1983;36(3):577-600.

29. Raju TNK. Reasonable Break Time for Nursing Mothers: A Provision Enacted Through the Affordable Care Act. *Pediatrics.* 2014;134(3):423-424.

30. Bruck CS, Allen TD. The relationship between big five personality traits, negative affectivity, type A behavior, and work–family conflict. *Journal of Vocational Behavior.* 2003;63(3):457-472.

31. Deng SC, Gao J. The Mediating roles of work-family conflict and facilitation in the relations between leisure experience and job/life satisfaction among employees in Shanghai banking industry. *Journal of Happiness Studies.* 2017;18(6):1641-1657.

32. Mazerolle SM, Bruening JE, Casa DJ, Burton LJ. Work-family conflict, part II: job and life satisfaction in National Collegiate Athletic Association Division I-A certified athletic trainers. *Journal of Athletic Training.* 2008;43(5):513-522.

33. Roeters A, Craig L. Part-time work, women's work-life conflict, and job satisfaction: A cross-national comparison of Australia, the Netherlands, Germany, Sweden, and the United Kingdom. *International Journal of Comparative Sociology.* 2014;55(3):185-203.

34. Elias SM, Smith WL, Barney CE. Age as a moderator of attitude towards technology in the workplace: work motivation and overall job satisfaction. *Behaviour & Information Technology.* 2012;31(5):453-467.

35. Wanous JP, Reichers AE, Hudy MJ. Overall job satisfaction: how good are single-item measures? *Journal of Applied Psychology.* 1997;82(2):247.

36. Titus O. Overall job satisfaction: how good are single versus multiple-item measures? *Journal of Managerial Psychology.* 1999;14(5):388-403.

37. Lawrence RA, Howard CR. Progress and Challenges from the Seventh Summit on Breastfeeding. *Breastfeeding Medicine.* 2015;10(8):383-384.

38. Wright TA, Quick JC. The emerging positive agenda in organizations: greater than a trickle, but not yet a deluge. *Journal of Organizational Behavior.* 2009;30(2):147-159.

39. Berenson T, Farber M. Obamacare Helped Working Moms Breastfeed — And It's One Thing Republicans Might Keep. In. *Time,* 2017.

CHAPTER 5

Conclusion

With this dissertation, I endeavored to contribute to the science about maternal occupation and its interconnections with racial inequities in BF and with women's psychosocial wellbeing. I quantitatively analyzed two existing datasets of mothers in the US to address three sets of hypotheses: first, whether taking occupation type and worker's race into account affects the oft-cited BF advantage for mothers who do not work; second, whether low job control, a commonly-studied psychosocial working condition, predicts BF outcomes, and if so, whether it explains any of the variation in BF initiation and duration between White and Black mothers; third, whether workplace BF experiences influence job satisfaction among work mothers. Overall, the results of these three studies support the idea that occupation and working conditions influence BF behaviors and contribute to racial inequities in BF and psychosocial wellbeing outcomes among working mothers.

Underlying theory

In Chapter 1, I outlined the current state of the public health and social science literature about BF, including the evidence of persistent inequities in BF by race, wherein Black mothers tend to breastfeed less than White mothers, as well as inequities by occupation, wherein non-working women tend to breastfeed longer than those who work, and among those who work, those working in professional/managerial jobs and jobs with greater flexibility tend to breastfeed longer. I identified gaps in the literature related to certain occupational constructs, like low job control, as potential predictors of BF outcomes, and job satisfaction as a potential sequalae of BF experiences. I outlined existing theories that aid in the study of these concepts, including fundamental causes of health outcomes,[1] psychosocial working conditions,[2] work-family

conflict,[3] and the market-family matrix.[4] I then proposed a new conceptual framework to ground this inquiry. This dissertation is based on assumptions that, by way of structural racism, race serves as a proxy for exposure to inequitable access to job opportunities, and which leads to differential employment status, occupation and working conditions among working mothers. Those exposures shape a mother's workplace experiences with BF, which can influence how long she breastfeeds as well as her psychosocial wellbeing, in particular job satisfaction.

Summary of empirical findings

These three studies fill multiple gaps in the empirical literature. First, the findings provide nuance to our understanding about how work relates to BF by highlighting the importance of occupation type and psychosocial working conditions. It was established previously that employment,[5] occupation[6-10] and certain working conditions, such as access to family leave and flexibility on the job are predictive of BF outcomes.[11-17] However, it was unclear whether non-working mothers held a consistent advantage in BF outcomes compared to working mothers, or whether this advantage would fade if non-working mothers are compared to those in professional/managerial jobs, which tend to be more accommodating. It was also unclear how those patterns would hold in models that accommodated moderating effects by race. The findings from Chapter 2 addressed these questions.

In Chapter 2, using data from n=970 mothers in the Panel Study of Income Dynamics (PSID), I demonstrated that overall, not-working was associated with longer BF duration, as prior studies indicated, but only in comparison to working in a service/labor job. The difference in BF between non-working mothers and mothers in professional/managerial jobs was not significant. Furthermore, when I allowed those relationships to vary by race, I found that among White mothers, non-working mothers breastfed the longest (5.9 months on average), while

among Black mothers, those in professional/managerial work breastfed the longest (4.7 months on average). These findings align with earlier work showing that non-working was associated with longer BF among White women but not as consistently among Black women.[7]

Relatedly, prior research indicated that flexibility at work facilitated continued BF.[12,18,19] However, BF has not been examined in connection with low job control,[2] a widely studied psychosocial working condition known to predict adverse cardiovascular outcomes (when paired with high job demands)[20,21] and poor health behaviors.[22,23] In Chapter 3, using a subsample of n=631 mothers in the PSID, I showed that each additional point of low job control was associated with lower odds of BF for six months or more (OR=0.61, $p<0.05$). Further, because Black working mothers were more likely than White working mothers to be exposed to low job control, low job control accounted for approximately 31% of the Black- White inequity for shorter term BF (less than six months) as well as for longer-term BF (at least six months). The addition of low job control as a workplace determinant of BF outcomes, and highlighting its role within the Black-White BF inequities, helps address the question noted by the US Surgeon General in 2011 about how work contributes to relatively low rates of BF among Black mothers.[24]

Lastly, I contribute to the empirical literature about how experiences with BF among working mother affect job satisfaction,[25,26] a psychosocial outcome thought to impact physical and mental health[27] as well as work productivity.[28,29] Prior work suggested that women's job satisfaction was positively linked to their perceptions about BF support at work, yet studies had not connected job satisfaction to the actual challenges with BF that mothers faced.[30,31] In Chapter 4, I leveraged longitudinal data for n=265 mothers in the Infant Feeding Practices Study II to account for changes in low job satisfaction during the first year postpartum, and considered

reports of BF-related problems at work at three months postpartum. I found that women who experienced more problems, such as an inability to find space or time to pump or lack of support, from colleagues had 6.9 times the odds of developing low job control at 12 months, even after controlling for potential confounders. This study demonstrated that beyond influencing whether and for how a mother breastfeeds,[5] experiences with BF at work have implications for her general wellbeing and her outcomes on the job.

Theoretical contributions

In addition to new empirical findings, this set of studies has implications for theory. I built on existing theory about race, racism and socioeconomic status as fundamental causes of health[32] by integrating psychosocial work environment[2,33] and the work-family interface.[3,4] These are under-studied health behavior determinants, situated in the mid-to-outer circles of the social ecological model,[34] that provide a more complete understanding of population level variation in BF. The conceptual framework proposed in Chapter 1 draws a path from race and exposure to racism, through women's employment opportunities and working conditions, BF behaviors and psychosocial outcomes. This framework addresses the call by Ahonen and colleagues[35] to better integrate working conditions into health inequities scholarship, and it provides a set of relevant constructs and pathways to help guide such an inquiry.

Further, inspired by intersectionality theory[36] and its public health applications,[37,38] my work attempts to go beyond the broad brushstrokes of the decades-long disparity in BF outcomes among Black and White mothers by highlighting BF variations within these large (and socially-constructed) categories of mothers. Chapter 3 demonstrated, for instance, that while there was a three-month difference in average BF duration between Black and White mothers who did not work, the difference among professional/managerial working mothers was less than one month.

Chapter 4 demonstrated that mothers with low job control, both Black and White, faced greater barriers to continued BF.[a]

Another theoretical detail that emerged was the fact that the advantage of not working for more/longer BF became more complicated when we took occupation as well as race into account. The Chapter 2 study demonstrated that overall, not working was associated with longer BF only in comparison to service/labor jobs, and not in comparison to professional/managerial jobs. Further, the patterns differed for White and Black mothers, where Black mothers who did not work had far shorter BF, while among White mothers, those not working had the longest BF duration. I believe these relationships are due in part to causal processes that are unique for each group (e.g., White non-working mothers may have social relationships that encourage BF, and Black working mothers may receive greater family support such as childcare that facilitates continued BF[4]), but also due to differential selection into these groups (e.g., White mothers who decide not to work during the early postpartum period may differ from their Black counterparts in ways that are related to BF).

Also, the finding from Chapter 2 that, in some instances, working was associated with longer BF than not working among new mothers, ran counter to much of the literature and to idea of Work-Family Conflict. However, it aligned with Dow's Market Family Matrix framework.[4] Most of the middle class Black mothers Dow interviewed did not perceive paid work role as conflicting with their mothering role. Indeed, many considered that work and

[a] One likely reason for the dearth of research that integrates racial inequities and occupation-related inequities in BF is the lack of existing datasets with sufficient information about both areas. The Panel Study of Income Dynamics' provided a valuable tool because it includes employment status and occupation code for mothers of children in the Child Development Supplement. Further, by integrating a new job exposure matrix (see Choi B, Developing a job exposure matrix of work organization hazards in the United States: a review on methodological issues and research protocol, *Safety and Health at Work* 2020, 11:4, 397-404), I was able to link observations in the PSID with mothers' psychosocial working conditions.

parenting responsibilities could integrate successfully. My findings in Chapter 2 support that idea.[b]

Lastly, the present work draws a theoretical connection between workplace accommodation for BF, including appropriate space and time to pump, and support from supervisors and colleagues, with the psychosocial wellbeing of working mothers, operationalized as job satisfaction. A large body of literature examines the health impacts on mothers' health due directly to lactation, like the way lactation buffers the mother's physiological response, potentially because of increased oxytocin and prolactin.[39-41] A comparatively smaller body of work examines how *the experience* of BF and related experiences impact maternal wellbeing. For instance, mothers who do not meet their personal BF goals may feel guilty or ashamed, particularly if they believe others are negatively judging them.[42,43] The empirical findings in Chapter 4, along with the theoretical framework proposed in Chapter 1, move forward the notion that negative experiences with BF negatively impact wellbeing, and that this is particularly salient in the work setting.

Implications for policy

These studies have implications for policy and practice as well. Evidence that low job control contributes to BF inequities suggests that existing BF interventions should explore ways to increase job control.[44] Existing programs lead by human resource experts, psychosocial occupational health practitioners and others demonstrate that organizations can increase worker job control,[45-47] and this could benefit not only BF behaviors but other health-related and productivity-related outcomes.

[b] To note, neither Work-Family Conflict nor the Market-Family Matrix theory deal explicitly with BF. I am extending those theories toward what I consider their logical implications for BF.

Also, a central tenet in the first two chapters is the role of structural racism, particularly its effect on employment, occupation and working conditions, as a contributor to BF inequities among Black and White mothers. Chapters 2 and 3 underscored this theme. Interventions meant to address structural racism and occupational segregation, for instance, multisectoral, community-specific programs to improve equity, or policy reforms that remove barriers to certain occupations for individuals with criminal justice involvement,[48] could ultimately improve health behaviors like BF along with other outcomes.

Conclusion

The interplay between BF, work and race represents a particularly American phenomenon. It occurs in the context of a continuously-increasing proportion of mothers in the workforce,[49] a notoriously meager social welfare system (e.g., there is no right to paid maternity leave at the national level in the US),[50] and workplaces that in some cases are beacons of work-family integration[46] but more often leave the hassle of resolving work-family conflict in the hands of individuals and families.[51] Under these circumstances, maintaining BF for the recommended six months or more[52] is at best a major challenge, and at worst, impossible for working mothers in the US. Further, those best and worst scenarios are not distributed equally across the population. Structural racism in the US, so pervasive that one scholar describes it as a caste system,[53] has lent an unfair advantage to White mothers and a disadvantage to Black mothers in a host of ways, including in the jobs they hold and working conditions they experience.[48,54-58] Those differences in work-related exposures likely contribute to the longstanding racial inequities in BF, yet research in this area has been limited.

In this dissertation, I have utilized nationwide datasets and applied quantitative research methods to establish empirical connections among relevant but understudied constructs in these

areas – linking race to occupation type, low job control, workplace BF experiences and job satisfaction. By strengthening and refining the evidence base about work and working conditions as a fundamental driver of BF outcomes, and a component of racial inequities in BF, I hope to help move the field of public health toward more effective solutions.

References

1. Link BG, Phelan J. Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior.* 1995:80-94.
2. Karasek Jr RA. Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly.* 1979:285-308.
3. Greenhaus JH, Beutell NJ. Sources of conflict between work and family roles. *Academy of Management Review.* 1985;10(1):76-88.
4. Dow DM. *Mothering While Black: Boundaries and Burdens of Middle-Class Parenthood.* Oakland, CA: University of California Press; 2019.
5. Roe B, Whittington LA, Fein SB, Teisl MF. Is there competition between breast-feeding and maternal employment? *Demography.* 1999;36(2):157-171.
6. Kimbro RT. On-the-job moms: work and breastfeeding initiation and duration for a sample of low-income women. *Maternal and Child Health Journal.* 2006;10(1):19-26.
7. Visness CM, Kennedy KI. Maternal employment and breast-feeding: findings from the 1988 National Maternal and Infant Health Survey. *American Journal of Public Health.* 1997;87(6):945-950.
8. Snyder K, Hansen K, Brown S, Portratz A, White K, Dinkel D. Workplace breastfeeding support varies by employment type: the service workplace disadvantage. *Breastfeeding Medicine.* 2018;13(1):23-27.
9. Dagher RK, McGovern PM, Schold JD, Randall XJ. Determinants of breastfeeding initiation and cessation among employed mothers: a prospective cohort study. *BMC Pregnancy and Childbirth.* 2016;16(1):194.

10. National Institute for Occupational Safety and Health Surveillance Program. *Supplement report: analysis of New Hampshire Pregnancy Risk Assessment Monitoring System (PRAMS) to better understand breastfeeding initiation and duration by industry category.* 2020.

11. Johnson KM, Salpini C. Working and nursing: navigating job and breastfeeding demands at work. *Community, Work & Family.* 2017;20(4):479-496.

12. Guendelman S, Kosa JL, Pearl M, Graham S, Goodman J, Kharrazi M. Juggling work and breastfeeding: effects of maternity leave and occupational characteristics. *Pediatrics.* 2009;123(1):e38-e46.

13. Jacknowitz A. The role of workplace characteristics in breastfeeding practices. *Women & Health.* 2008;47(2):87-111.

14. Spitzmueller C, Zhang J, Thomas CL, et al. Identifying job characteristics related to employed women's breastfeeding behaviors. *Journal of Occupational Health Psychology.* 2018;23(4):457.

15. Calnen G. Paid maternity leave and its impact on breastfeeding in the United States: an historic, economic, political, and social perspective. *Breastfeeding Medicine.* 2007;2(1):34-44.

16. Whipps MDM, Honoroff J. Time off work after childbirth and breastfeeding supportive workplaces: associations with near-exclusive breastfeeding trajectory membership. *Women's Health Issues.* 2019;29(6):506-512.

17. Lauer EA, Armenti K, Henning M, Sirois L. Identifying barriers and supports to breastfeeding in the workplace experienced by mothers in the New Hampshire Special Supplemental Nutrition Program for Women, Infants, and Children utilizing the Total

Worker Health framework. *International Journal of Environmental Research and Public Health.* 2019;16(4):529.

18. Spencer B, Wambach K, Domain EW. African American women's breastfeeding experiences: Cultural, personal, and political voices. *Qualitative Health Research.* 2015;25(7):974-987.

19. Gross TT, Davis M, Anderson AK, Hall J, Hilyard K. Long-term breastfeeding in African American mothers. *Journal of Human Lactation.* 2017;33(1):128-139.

20. Kivimäki M, Nyberg ST, Batty GD, et al. Job strain as a risk factor for coronary heart disease: a collaborative meta-analysis of individual participant data. *The Lancet.* 2012;380(9852):1491-1497.

21. Xu W, Zhao Y, Guo L, Guo Y, Gao W. Job stress and coronary heart disease: a case-control study using a Chinese population. *Journal of Occupational Health.* 2009;51(2):107-113.

22. Smith P, Frank J, Mustard C, Bondy S. Examining the relationships between job control and health status: a path analysis approach. *Journal of Epidemiology & Community Health.* 2008;62(1):54-61.

23. Tsutsumi A, Kayaba K, Yoshimura M, et al. Association between job characteristics and health behaviors in Japanese rural workers. *International Journal of Behavioral Medicine.* 2003;10(2):125-142.

24. Office of the Surgeon General, Centers for Disease Control and Prevention, Office on Women's Health. Publications and Reports of the Surgeon General. In: *The Surgeon General's Call to Action to Support Breastfeeding.* Rockville (MD): Office of the Surgeon General (US); 2011.

25. Faragher EB, Cass M, Cooper CL. The relationship between job satisfaction and health: a meta-analysis. *Occupational and Environmental Medicine.* 2005;62(2):105-112.

26. Locke EA. What is job satisfaction? *Organizational Behavior and Human Performance.* 1969;4(4):309-336.

27. Dirlam J, Zheng H. Job satisfaction developmental trajectories and health: A life course perspective. *Social Science & Medicine.* 2017;178:95-103.

28. Tett RP, Meyer JP. Job satisfaction, organizational commitment, turnover intention, and turnover: path analyses based on meta-analytic findings. *Personnel Psychology.* 1993;46(2):259-293.

29. Judge TA, Parker S, Colbert AE, Heller D, Ilies R. Job satisfaction: a cross-cultural review. In: Anderson N, Ones DS, Sinangil HK, Viswesvaran C, eds. *Handbook of Industrial, Work and Organization Psychology. Volume 2: Organizational Psychology.* Vol 2. London, Thousand Oaks, New Delhi: Sage Publications; 2001:25-52.

30. Jantzer AM, Anderson J, Kuehl RA. Breastfeeding support in the workplace: the relationships among breastfeeding support, work–life balance, and job satisfaction. *Journal of Human Lactation.* 2017:0890334417707956.

31. Waite WM, Christakis D. Relationship of maternal perceptions of workplace breastfeeding support and job satisfaction. *Breastfeeding Medicine.* 2015;10(4):222-227.

32. Phelan JC, Link BG. Is racism a fundamental cause of inequalities in health? *Annual Review of Sociology.* 2015;41(1):311-330.

33. Rugulies R. What is a psychosocial work environment? *Scandinavian Journal of Work, Environment & Health.* 2019(1):1-6.

34. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health Education Quarterly.* 1988;15(4):351-377.

35. Ahonen EQ, Fujishiro K, Cunningham T, Flynn M. Work as an inclusive part of population health inequities research and prevention. *American Journal of Public Health.* 2018;108(3):306-311.

36. Crenshaw K. Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. University of Chicago Legal Formu. 1989:139.

37. Bowleg L. The problem with the phrase women and minorities: intersectionality—an important theoretical framework for public health. *American Journal of Public Health.* 2012;102(7):1267-1273.

38. Bowleg L. Evolving Intersectionality Within Public Health: From Analysis to Action. *American Journal of Public Health.* 2021;111(1):88-90.

39. Light KC, Smith TE, Johns JM, Brownley KA, Hofheimer JA, Amico JA. Oxytocin responsivity in mothers of infants: a preliminary study of relationships with blood pressure during laboratory stress and normal ambulatory activity. *Health Psychology.* 2000;19(6):560.

40. Mezzacappa ES, Kelsey RM, Katkin ES. Breast feeding, bottle feeding, and maternal autonomic responses to stress. *Journal of Psychosomatic Research.* 2005;58(4):351-365.

41. Altemus M, Redwine LS, Leong Y-M, Frye CA, Porges SW, Sue Carter C. Responses to Laboratory Psychosocial Stress in Postpartum Women. *Psychosomatic Medicine.* 2001;63(5):814-821.

42. Fahlquist JN. Experience of non-breastfeeding mothers: Norms and ethically responsible risk communication. *Nursing Ethics.* 2014;23(2):231-241.

43. Bresnahan M, Zhuang J, Goldbort J, Bogdan-Lovis E, Park S-Y, Hitt R. Made to feel like less of a woman: The experience of stigma for mothers who do not breastfeed. *Breastfeeding Medicine.* 2020;15(1):35-40.

44. Dinour LM, Szaro JM. Employer-based programs to support breastfeeding among working mothers: a systematic review. *Breastfeeding Medicine.* 2017;12(3):131-141.

45. Moen P, Kelly EL, Tranby E, Huang Q. Changing Work, Changing Health:Can Real Work-Time Flexibility Promote Health Behaviors and Well-Being? *Journal of Health and Social Behavior.* 2011;52(4):404-429.

46. Pfeffer J. *Dying for a Paycheck: How Modern Management Harms Employee Health and Company Performance--and What We Can Do About It.* HarperCollins; 2018.

47. Bond FW, Bunce D. Job control mediates change in a work reorganization intervention for stress reduction. *Journal of Occupational Health Psychology.* 2001;6(4):290.

48. Bailey ZD, Krieger N, Agénor M, Graves J, Linos N, Bassett MT. Structural racism and health inequities in the USA: evidence and interventions. *The Lancet.* 2017;389(10077):1453-1463.

49. Laughlin LL. *Maternity leave and employment patterns of first-time mothers: 1961-2008.* US Department of Commerce, Economics and Statistics Administration; 2011.

50. Heymann J, Earle A, Hayes J. *The work, family, and equity index: How does the United States measure up?* Montreal, QC; Boston, MA: Project on Global Working Families;2007.

51. Collins C. *Making Motherhood Work: How Women Manage Careers and Caregiving.* Princeton, New Jersey: Princeton University Press; 2019.

52. Eidelman AI, Schanler RJ. Breastfeeding and the use of human milk. *Pediatrics.* 2012;129(3):e827-e841.

53. Wilkerson I. *Caste: The Origins of Our Discontents.* New York: Random House; 2020.

54. Pager D, Shepherd H. The sociology of discrimination: Racial discrimination in employment, housing, credit, and consumer markets. *Annual Review of Sociology.* 2008;34:181-209.

55. Tomaskovic-Devey D, Thomas M, Johnson K. Race and the accumulation of human capital across the career: A theoretical model and fixed-effects application. *American Journal of Sociology.* 2005;111(1):58-89.

56. Wrigley-Field E, Seltzer N. Unequally Insecure: Rising Black/White Disparities in Job Displacement, 1981-2017. *Washington Center for Equitable Growth Working Paper Series Washington, DC.* 2020.

57. Golden L. Limited access: Disparities in flexible work schedules and work-at-home. *Journal of Family and Economic Issues.* 2008;29(1):86-109.

58. Hawkins D. Disparities in the usage of maternity leave according to occupation, race/ethnicity, and education. *American Journal of Industrial Medicine.* 2020;63: 1134-1144.