


Assessing the impact of a statewide effort to improve breastfeeding rates: A RE-AIM evaluation of CHAMPS in Mississippi

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Abstract

Communities and Hospitals Advancing Maternity Practices (CHAMPS) is a public health initiative, operating in Mississippi since 2014, to improve maternal and child health practices and reduce racial disparities in breastfeeding. Using the Reach, Effectiveness, Adoption, Implementation and Maintenance framework, this study assessed CHAMPS, which used a Quality Improvement intervention at hospitals, and engaged intensively with local community partners. The study team assessed outcomes through quantitative data (2014–2020) from national sources, Mississippi hospitals, community partners and CHAMPS programme records, and qualitative data from focus groups. With 95% of eligible Mississippi hospitals enrolled into CHAMPS, the programme reached 98% of eligible birthing women in Mississippi, and 65% of breastfeeding peer counsellors in Mississippi's Special Supplemental Nutrition Programme for Women, Infants and Children. Average hospital breastfeeding initiation rates rose from 56% to 66% ($p < 0.05$), the proportion of hospitals designated Baby-Friendly or attaining the final stages thereof rose from 15% to 90%, and 80% of Mississippi Special Supplemental Programme for Women, Infants, and Children districts engaged with CHAMPS. CHAMPS also maintains a funded presence in Mississippi, and all designated hospitals have maintained Baby-Friendly status. These findings show that a breastfeeding-focused public health initiative using broad-based strategic programming involving multiple stakeholders and a range of evaluation criteria can be successful. More breastfeeding promotion and support programmes should assess their wider impact using evidence-based implementation frameworks.

KEYWORDS

Baby-Friendly Hospital Initiative, breastfeeding, health promotion, implementation science, maternal and child health, maternity practices, quality improvement

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1 | INTRODUCTION

United States breastfeeding initiation and duration rates are influenced by complex factors, such as socioeconomic status and structural racism (Anstey et al., 2017; Merewood, 2006; Merewood et al., 2003, 2005, 2007, 2019; Philipp et al., 2001, 2003; Ware et al., 2018), hospital practices, peer influence, workplace support, infant formula marketing strategies and geography (Anstey et al., 2017; Beauregard et al., 2019; Gallo et al., 2019; Li et al., 2019; Merewood et al., 2019). Communities and Hospitals Advancing Maternity Practices (CHAMPS) is a public health initiative that has operated in several US locations (Burnham et al., 2022; Karol et al., 2016; Merewood et al., 2019) to increase breastfeeding rates, decrease racial disparities in breastfeeding, and improve maternal and child health practices, using an interdisciplinary approach incorporating researchers, community advocates, clinicians, trainers and public and private stakeholders. Since 2014, CHAMPS has focused on Mississippi, which, like its neighbouring southern states, suffers from high rates of infant mortality and morbidity, and some of the lowest breastfeeding rates in the country, especially among Black dyads (Beauregard et al., 2019; Robbins et al., 2018).

While the literature documents national interventions aimed at increasing the US breastfeeding rates (Feldman-Winter et al., 2017; Karol et al., 2016; Merewood et al., 2019), few have assessed interventions using established implementation science frameworks, although the need for such assessments has been acknowledged. Perez-Escamilla and Engmann (2019) stated, '... it is crucial that more robust implementation science research is conducted within the rough and tumble of real-world programming to better understand how to best integrate and scale up nutrition services across health care systems and other platforms based on dynamic complex adaptive systems frameworks'.

Although CHAMPS has documented success regarding increased breastfeeding rates and decreased racial disparities associated with its implementation (Burnham et al., 2022; Merewood et al., 2019), we have not analysed the broader impact of this established programme.

Key messages

- The breastfeeding promotion programme successfully engaged with 95% of birthing hospitals in Mississippi to increase breastfeeding initiation and exclusivity, skin-to-skin and rooming rates and to decrease racial disparities in breastfeeding.
- Broad-scale breastfeeding promotion and engagement initiatives can be successfully implemented and assessed using evidence-based implementation science frameworks.
- Widespread change in health care practices is possible when implemented in partnership with diverse institutions and community groups.

The Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) framework has been used to assess the impact of public health programmes applied across a range of settings (Glasgow & Estabrooks, 2018; Glasgow et al., 1999, 2013; Harden et al., 2018; Jilcott et al., 2007; Sweet et al., 2014), including applications in pragmatic, real-time and public health interventions (Glasgow & Estabrooks, 2018; Sweet et al., 2014) (see Table 1, reproduced from Glasgow & Estabrooks, 2018). We determined that a RE-AIM analysis of CHAMPS would be an appropriate assessment framework, and followed the hybrid approach documented by Sweet et al. (2014), which assesses the impact at the individual (target population) and organizational (institutions and stakeholders) levels. We paid particular attention to economically disadvantaged populations.

1.1 | Goal

The goal was to assess the real-time implementation of Mississippi CHAMPS, using the RE-AIM framework 6 years after the intervention began, at a point where the analysis could accelerate and inform

TABLE 1 Key translation and pragmatic questions to consider in addressing the RE-AIM dimensions (Glasgow & Estabrooks, 2018).

RE-AIM dimension	Key pragmatic questions to consider and answer ^a
Reach	WHO is (was) intended to benefit and who actually participates or is exposed to the intervention? Measured by number and similarity of participants to your target group.
Effectiveness	WHAT are (were) the most important benefits you are trying to achieve and what is (was) the likelihood of negative outcomes? Measured by a change in key outcome(s) and consistency across subgroups.
Adoption	WHERE is (was) the programme or policy applied and WHO applied it? Measured by what settings and staff take up the intervention and which do not.
Implementation	HOW consistently is (was) the programme or policy delivered, HOW will it be (was it) adapted, HOW much will (did) it cost, and WHY will (did) the results come about?
Maintenance	WHEN will (was) the initiative become operational; how long will (was) it be sustained (setting level); and how long are the results sustained (individual level)? Measured by the longevity of effects (individual level) and programme sustainability (setting level).

^aTerms within parentheses are phrased for postintervention evaluation. The basic questions are phrased for use in programme or policy planning.

actionable strategic planning to maintain momentum and sustain the initiative.

2 | METHODS

2.1 | Overview

CHAMPS used the implementation of the Ten Steps to Successful Breastfeeding (Ten Steps), the pillars of the World Health Organization's (WHO) Baby-Friendly Hospital Initiative (BFHI) as the main hospital-based intervention (United Nations Children's Fund, 2022). The BFHI improves breastfeeding rates, especially in vulnerable groups (Feldman-Winter et al., 2017; Kramer et al., 2001; Merewood et al., 2003, 2005, 2019; Nobari et al., 2017; Philipp et al., 2001; Ware et al., 2018). US hospitals that fully comply with the Ten Steps, and pass onsite assessment by Baby-Friendly USA (BFUSA), gain WHO Baby-Friendly designation. As a deliberate CHAMPS policy, and unlike comparable interventions (Feldman-Winter et al., 2017), hospitals were not assessed for appropriate commitment or required to complete complex applications; all Mississippi hospitals that applied for enrolment into CHAMPS were accepted (hereafter termed 'CHAMPS hospitals'). To help hospitals gain compliance with the Ten Steps, CHAMPS uses a Quality Improvement (QI) approach, providing technical assistance, coaching, training, policy review, data collection, conferences, onsite visits and other strategies. The intervention has been described in depth elsewhere (Burnham et al., 2022; Merewood et al., 2019).

The CHAMPS model fosters a robust community component, with community stakeholders proactively and intensively engaged. For example, Mississippi CHAMPS subcontracted with the national Reaching Our Sisters Everywhere (ROSE) organization, which provided, among many other collaborative services, Community Transformer training (Burnham et al., 2022; Merewood et al., 2019). Peer counsellors from the Special Supplemental Programme for Women, Infants and Children (WIC) were invited to all CHAMPS hospital site visits, attended most and were integrally involved with training and strategic planning. WIC is a federal assistance programme for the health and nutrition of low-income women, infants and children up to age 5. Mississippi WIC provides nutrition education and support across a wide variety of topics including breastfeeding, to about 61.6% of the eligible population (United States Department of Agriculture [USDA], 2018). Annual CHAMPS conferences were free to all stakeholders, and intensive training was offered to hospitals and community stakeholders alike.

Quantitative data for this analysis were collected from hospital QI data (Merewood et al., 2019), from CHAMPS conference, training and coaching call records and also from the Mississippi Department of Health and the USDA. We used data from 2010 to 2020, deliberately encompassing a broad range of dates to allow for data collection over time, and the most recent data where available. Quantitative data sources are described in Table 2; they were obtained through Mississippi nursing staff focus groups (Burnham et al., 2021).

2.2 | RE-AIM methodological approach

The key planning questions and measuring strategies to address each RE-AIM dimension were adopted from Glasgow's article, 'Pragmatic Applications of RE-AIM for Health Care Initiatives in Community and Clinical Settings' (Glasgow & Estabrooks, 2018).

2.2.1 | Reach

2.2.1.1 | Hospitals

We assessed *Reach* among birthing women in Mississippi (the target population) by calculating the proportion of women giving birth in a CHAMPS hospital in 2019, out of all women giving birth in Mississippi and also by calculating proportions by race. Data came from the 2019 Mississippi birth certificate (the most recent data available). Two hospitals were excluded because they were not eligible to be enrolled in CHAMPS; one participated in a parallel, national, CDC-funded programme, which did not allow enrolment into additional initiatives, and the other was close to designation when CHAMPS started (Burnham et al., 2022). Excluded hospitals' births were removed from the numerator and the denominator.

2.2.1.2 | Community

We assessed *Reach* among Mississippi WIC breastfeeding peer counsellors, who work to support breastfeeding women. We calculated the proportion of WIC peer counsellors practicing in 2019 who had been exposed to CHAMPS, out of the total number of Mississippi WIC breastfeeding peer counsellors practicing in 2019. Exposure was defined as a peer counsellor attending a CHAMPS hospital site visit, conference or training.

2.2.2 | Effectiveness

2.2.2.3 | Hospitals

Our primary *Effectiveness* measures were changes in rates of breastfeeding initiation and exclusivity, and changes in racial inequities in breastfeeding, at CHAMPS hospitals. Our secondary outcome measures were changes in rates of compliance with Steps 4 (skin-to-skin contact) and 7 (rooming-in care) of the Ten Steps, with both terms defined as per requirements by BFUSA (Merewood et al., 2019). Data collection methods have been described in depth elsewhere (Burnham et al., 2022) and came from QI data submitted monthly by CHAMPS hospitals. We calculated monthly rates for breastfeeding initiation, breastfeeding exclusivity, skin-to-skin-care and rooming-in for all infants and stratified by infants' race/ethnicity. We tested for statistically significant changes over time using generalized estimating equations (GEEs) using a negative binomial distribution with an exchangeable correlations structure and bootstrapped standard errors. Time-series graphs were created from the GEE models to display results.

TABLE 2 Quantitative measures, results and sources for the RE-AIM analysis of CHAMPS.

RE-AIM component	Outcome measures	Results	Data source(s), timeframe
Reach	<i>Primary outcome measure:</i> Proportion of Mississippi birthing women giving birth at CHAMPS hospitals, by race.	98% of eligible birthing women reached <ul style="list-style-type: none"> • 99% of eligible Black patients • 97% of eligible White patients 	MSDH vital statistics report, 2019
	<i>Community-level outcome measure:</i> Proportion of MS WIC peer counsellors exposed to CHAMPS.	65% of MS WIC breastfeeding peer counsellors exposed to CHAMPS.	MS WIC regional coordinators, 2019
Effectiveness	<i>Primary outcome measure:</i> Changes in rates of breastfeeding initiation and exclusivity, and changes in racial inequities in breastfeeding at CHAMPS hospitals.	Average breastfeeding initiation rate at CHAMPS hospitals increased from 56% to 66% ($p < 0.05$).	CHAMPS hospital data (Burnham et al., 2022), January 2015–December 2019
		Exclusive breastfeeding rate at CHAMPS hospitals increased from 26% to 37% ($p < 0.05$).	
		Gap in racial disparities in breastfeeding initiation between Black and White dyads at CHAMPS hospitals decreased by 17 percentage points.	
	<i>Secondary outcome measure:</i> changes in rates of compliance with Steps 4 (skin-to-skin) and 7 (rooming-in) at CHAMPS hospitals.	Skin-to-skin rates after vaginal birth at CHAMPS hospitals increased from 31% to 91% ($p < 0.01$).	CHAMPS hospital data (Burnham et al., 2022), January 2015–December 2019
Skin-to-skin rates after caesarean birth at CHAMPS hospitals increased from 20% to 86% ($p < 0.01$).			
<i>Community-level primary outcome measure:</i> Changes in MS WIC rates of breastfeeding within CHAMPS' years of operation.	Rooming-in rates at CHAMPS hospitals increased from 19% to 86% ($p < 0.01$).	USDA WIC breastfeeding data: Local agency reports, 2010–2019	
Adoption	<i>Hospital-level primary outcome measure:</i> Proportion of eligible MS birthing hospitals who enrolled in CHAMPS.	95% of eligible MS hospitals enrolled in CHAMPS (39/41).	MS CHAMPS programme records, enrolment to August 2020.
	<i>Community-level primary outcome measure:</i> Proportion of organizations addressing breastfeeding in MS who engaged with CHAMPS.	25 organizations engaged as implementers, catalysts and active partners.	Internet searches, Facebook, discussions with CHAMPS partners; enrolment to August 2020
Implementation	<i>Hospital-level primary outcome measure:</i> Proportion of CHAMPS hospitals that entered D3, D4 and/or was designated.	CHAMPS hospitals in the third or fourth stage of the pathway or designated increased from 15% at enrolment to 90% by August 2020.	MS CHAMPS programme records/Baby-Friendly USA, enrolment to August 2020
		51% (20) CHAMPS hospitals were fully designated by August 2020 compared to zero at enrolment.	
	<i>Hospital-level secondary outcome measure:</i> Level of compliance with BFHI requirements.	Hospitals paying fair market value for infant formula increased from 3% at enrolment to 77% by August 2020.	MS CHAMPS programme records, enrolment to August 2020
		Hospitals distributing formula industry sample packs decreased from 79% at enrolment to 13% by August 2020.	
	>1600 staff and trainers trained at 95 trainings by August 2020.		

TABLE 2 (Continued)

RE-AIM component	Outcome measures	Results	Data source(s), timeframe
	<i>Community-level primary outcome measure:</i> Proportion of MS counties where WIC peer counsellors have engaged with CHAMPS.	80% of WIC districts employed WIC peer counsellors who had engaged with CHAMPS.	MS WIC regional coordinators, 2019
Maintenance	<i>Hospital-level primary outcome measure:</i> Proportion of CHAMPS hospitals who retained Baby-Friendly designation.	100% of designated CHAMPS hospitals retained their Baby-Friendly status.	MS CHAMPS programme records/Baby-Friendly USA, enrolment to August 2020
	<i>Hospital-level secondary outcome measure:</i> Proportion of CHAMPS hospitals who maintained participation in CHAMPS.	100% of hospitals maintained enrolment in CHAMPS.	MS CHAMPS records, enrolment to August 2020

Abbreviations: BFUSA, Baby-Friendly USA; CHAMPS, Communities and Hospitals Advancing Maternity Practices; MS, Mississippi; MSDH, Mississippi State Department of Health; MS WIC, Mississippi Special Supplemental Nutrition Programme for Women, Infants and Children; RI, rooming-in; STS, skin-to-skin; USDA, United States Department of Agriculture.

2.2.2.4 | Community

Our primary outcome measure for *Effectiveness* was the change in rates of any breastfeeding in the Mississippi WIC population, from 2010 to 2019; 2010 was chosen as a start point to allow for comparison of pre-CHAMPS rates. WIC offers three food packages for participating mothers of children under 1 year of age, which can be used as a proxy for breastfeeding rates. We derived an outcome measure of 'any breastfeeding' by combining the data of WIC participants who received the fully breastfeeding food package (exclusive breastfeeding) and the participants receiving the partially breastfeeding food package (some breastfeeding). Data are collected by local WIC offices across the country and submitted through the Food Programmes Reporting System; they were provided to the research team by the USDA Programme Analyst; WIC Funding, Reporting and Analysis Branch.

We used the synthetic control method to evaluate whether CHAMPS was associated with an increase in the percentage of WIC families doing any breastfeeding each month from January 2010 to December 2020. We constructed a control group comprising unexposed jurisdictions (states and tribal councils), which we weighted to resemble Mississippi based on the number of infants served by WIC in each jurisdiction, infant feeding indicators and trends in infant feeding during the pre-CHAMPS period. Because large sample inferential statistics are not well suited to synthetic control methods, we used placebo tests to identify significant treatment effects. We used an a priori standardized effect measure of 10% to determine statistical significance. Model fit was assessed by calculating the ratio of the pre to post root-mean-squared prediction error.

2.2.3 | Adoption

2.2.3.5 | Hospitals

We assessed *Adoption* at the point of interaction by calculating the proportion of Mississippi hospitals that enrolled in CHAMPS, out of the total number of CHAMPS-eligible birthing hospitals in Mississippi.

2.2.3.6 | Community

We estimated *Adoption* by assessing the number of breastfeeding organizations in Mississippi that engaged with CHAMPS. We defined engagement as participation of an organization's members in a CHAMPS training, site visit, conference or webinar; or if the organization advertised CHAMPS activities on their social media platforms; or performed similar, trackable activities, such as substantial interaction with CHAMPS social media platforms. Engaged organizations were described as fulfilling one of three roles, following Lewis (2010); implementers (providing and coordinating services); catalysts (promoting discussion and social transformation) or partners (working collaboratively with other actors in the system, in this case, CHAMPS). If organizations played multiple roles, they were categorized according to their primary role (Table 3).

2.2.4 | Implementation

2.2.4.7 | Hospitals

We assessed *Implementation* by calculating the proportion of CHAMPS hospitals that entered the third or fourth stage of the BFUSA 4D pathway, and by the proportion of hospitals that gained Baby-Friendly designation, by 1 August 2020, out of the total number of CHAMPS hospitals. We assessed secondary outcome measures by calculating the level of compliance with selected BFUSA requirements or aspects of the International Code of Marketing of Breast Milk Substitutes. Measures included the proportion of hospitals paying fair market value for infant feeding products and the proportion of hospitals not distributing formula industry-sponsored samples to patients, out of the total number of CHAMPS hospitals, calculated at enrolment and by 1 August 2020. Compliance with Baby-Friendly staff training requirements was also assessed (Table 2).

2.2.4.8 | Community

To assess *Implementation*, we calculated the proportion of Mississippi counties where WIC peer counsellors practicing in

TABLE 3 Community organizations engaging with the Mississippi CHAMPS Programme, from enrolment through August 2020.

Organization name	Category ^a (Lewis, 2010)	Engagement method
Academy of Breastfeeding Medicine (Local branch)	Catalyst	Organization engaged in strategic planning with CHAMPS.
American Academy of Family Medicine (Local branch)	Catalyst	CHAMPS spoke at their conference.
American Academy of Paediatrics (Local branch)	Catalyst	Representatives attended CHAMPS conferences and training.
Association of Women's Health, Obstetric and Neonatal Nurses (Local branch)	Catalyst	CHAMPS spoke at their conference.
Delta Breastfeeding Coalition	Catalyst	Organization engaged with CHAMPS social media.
East Mississippi Breastfeeding Coalition	Catalyst	Organization engaged with CHAMPS social media and reposted CHAMPS materials.
La Leche League of Alabama, Mississippi and Louisiana	Catalyst	Organization attended CHAMPS conferences and engaged with CHAMPS social media.
Mississippi Breastfeeding Coalition	Catalyst	Organization engaged with CHAMPS social media.
Mississippi Roadmap to Health Equity	Catalyst	Representatives attended CHAMPS training and hosted community training.
North Mississippi Breastfeeding Coalition	Catalyst	Organization engaged with CHAMPS social media.
South Mississippi Breastfeeding Coalition	Catalyst	Organization engaged with CHAMPS social media and was featured as Champion of the Week.
Tougaloo Delta Health Partners	Catalyst	Organization engaged with CHAMPS social media.
Baby Cafés	Implementer	CHAMPS enabled the 1st Baby Café in Mississippi and remains involved in the initiative.
Clarksdale Baby University-Spring Initiative	Implementer	Representatives participated in CHAMPS webinars.
Families First Resource Center	Implementer	Organization collaborated with CHAMPS partners.
Gulf Coast Breastfeeding Center	Implementer	Organization engaged with CHAMPS social media.
Mississippi Lactation Services	Implementer	Paediatrician representative engaged in CHAMPS training.
Mississippi Special Supplemental Nutrition Programme of Women, Infants and Children	Implementer	Organization provided high-level strategic input; CHAMPS-sponsored training and site visits, spoke at CHAMPS conferences and attended CHAMPS hospital site visits.
Mothers' Milk Bank of Mississippi	Implementer	Organization engaged with CHAMPS training, conferences and social media.
Northeast Mississippi Birthing Project	Implementer	Representatives attended CHAMPS training and spoke on CHAMPS conference panels.
Right! From the Start	Implementer	Representatives collaborated with CHAMPS regarding CHAMPS conferences and meetings.
Blue Cross & Blue Shield of Mississippi	Partner	Organization hosted training, performed hospital site visits with CHAMPS, engaged in strategic planning and sponsored and spoke at CHAMPS conferences.
Every Mother	Partner	Organization provided training and consults, and participated in CHAMPS site visits.
Mississippi State Department of Health Mississippi Perinatal Quality Collaborative	Partner	Organization provided funding and spoke at CHAMPS conferences. CHAMPS served as the breastfeeding arm of the MSPQC committee and participated in the committee conference.
Reaching Our Sisters Everywhere Community transformers	Partner	Organization provided high-level strategic input; performed CHAMPS-sponsored training and site visits, spoke at CHAMPS conferences and provided hospital coaching.

Abbreviation: CHAMPS, Communities and Hospitals Advancing Maternity Practices.

^aCatalysts promote discussion and social transformation; implementers provide and coordinate services; partners work collaboratively with other actors in the system, in this case, CHAMPS.

2019 had engaged with CHAMPS. The engagement was defined as WIC peer counsellors attending CHAMPS hospital site visits, CHAMPS conferences or training, or being involved in CHAMPS/WIC ventures such as the Mississippi Baby Cafés.

2.2.5 | Maintenance

To assess *Maintenance*, we tracked the duration of the CHAMPS programme in Mississippi as enabled by continued funding and continued or strengthened relationships with partners. We assessed the proportion of CHAMPS hospitals that maintained Baby-Friendly designation, and the proportion of hospitals remaining in the CHAMPS programme. Two of the original 39 hospitals enrolled in CHAMPS ceased offering maternity services in 2020 and were therefore excluded from the maintenance analysis.

2.3 | Qualitative methods and analysis

To obtain qualitative data to inform the study, we conducted in-person focus groups with nursing staff at a purposive sample of five Mississippi CHAMPS, Baby-Friendly designated hospitals, between late 2019 and early 2020. The methods have been described in depth elsewhere (Burnham et al., 2021); briefly, the Baby-Friendly lead at each selected hospital recruited a convenience sample of approximately five staff nurses, from labour and birthing units, to share their experiences regarding the Baby-Friendly designation process. Focus group sessions were recorded, professionally transcribed and analysed using thematic analysis with an inductive approach to coding and analysis (Clarke et al., 2015). Investigator triangulation was used to maximize the trustworthiness of the analysis. Final themes and subthemes were generated and agreed upon by the consensus of the research team, then linked to their relevant RE-AIM domains and key quotes were identified to exemplify each theme or subtheme.

3 | RESULTS

3.1 | Reach

3.1.1 | Hospitals

CHAMPS reached approximately 98% of the eligible target population (31,071 births at CHAMPS hospitals out of 31,648 total eligible births in Mississippi in 2019); 99% (14,185) of eligible Black patients and 97% (16,033) of eligible White patients in the state.

3.1.2 | Communities

CHAMPS reached 65% of Mississippi WIC breastfeeding peer counsellors as 30/46 WIC peer counsellors in 2019 were exposed to CHAMPS.

3.1.3 | Focus group themes

In the nurse focus groups, the subtheme *Community Awareness Informed Women of BFHI*, emerged as relevant. 'Now our patients... they kind of know, or they're telling their friends about [Baby-Friendly practices] now too, and people—it is getting more widely known and accepted'.

3.2 | Effectiveness

3.2.1 | Hospitals

Of the 39 CHAMPS hospitals, 37 contributed data to the analysis. Between 2015 and 2019, average breastfeeding initiation rates rose from 56% to 66% ($p < 0.05$) (2015–2019). The disparity between Black and White dyads narrowed by 17 percentage points, with breastfeeding initiation rates for Black dyads increasing from 42% to 63%, and 69% to 73% for White dyads. Exclusive breastfeeding rates increased from 26% to 37% ($p < 0.05$). Skin-to-skin contact and rooming-in rates increased, from 31% to 91% ($p < 0.01$) for skin-to-skin rates after vaginal birth, from 20% to 86% ($p < 0.01$) for skin-to-skin rates after caesarean birth and from 19% to 86% ($p < 0.01$) for rooming-in rates (Burnham et al., 2022).

3.2.2 | Community

The proportion of Mississippi WIC families doing any breastfeeding increased significantly over the period of CHAMPS implementation, from 5.1% to 15% ($p = 0.049$) when compared to the control population (Figure 1).

3.2.3 | Focus group themes

The focus group theme, *Attitudes Changed from Negative to Positive Over the Course of Adoption*, spoke to *Effectiveness*: '... the patients are in [a better] place. I mean, they just get so much more information and education from every different nurse they come in contact with, because of the Baby-Friendly and they have more people helping them to do successful I've seen a huge difference in the patients'.

3.3 | Adoption

3.3.1 | Hospitals

Ninety-five percent of eligible Mississippi hospitals enrolled in CHAMPS (39/41).

3.3.2 | Community

CHAMPS engaged with 25 different organizations as implementers, catalysts and active partners (Lewis, 2010), including ROSE, The Mississippi Perinatal Quality Collaborative, Blue Cross and Blue Shield of Mississippi and regional branches of national organizations such as the American Academy of Family Medicine (Table 3).

3.3.3 | Focus group themes

The subtheme, *BFHI Process Was Hard but Worth It spoke to Adoption* in the focus groups. 'I think now it [BFHI] is just routine for all of us and I don't think we even really think about it necessarily anymore. Like, it's hard to remember what we used to do because we do that now'.

3.4 | Implementation

3.4.1 | Hospitals

When CHAMPS began in Mississippi in 2014, no hospitals in the state were Baby-Friendly designated. At their enrolment, 15% of CHAMPS hospitals were in the third or fourth phase of BFUSA's 4-D

Pathway. By 1 August 2020, 90% of CHAMPS hospitals were in the third ($n = 4$) or fourth ($n = 11$) stages of the pathway, or had been fully designated ($n = 20$, 51%).

By 1 August 2020, 77% of hospitals were paying fair market value for infant formula, in compliance with the International Code of Marketing of Breast Milk Substitutes, compared to just 3% at baseline. Additional compliance results are reported in Table 2.

3.4.2 | Community

Eighty percent of WIC districts (66/82) employed WIC peer counsellors who had engaged with CHAMPS in 2019.

3.4.3 | Focus group themes

Implementation was neatly summed up by one nurse focus group participant: 'I was like, well, this will never happen... that's what we all thought. That'll never happen. Lo and behold, here we are'.

3.5 | Maintenance

MS CHAMPS maintained continuous funding from 2014, not only from the original W. K. Kellogg Foundation grantor but also from additional sources, including the Bower Foundation, which funds only Mississippi-based programmes and sought out CHAMPS as a grantee after identifying the success of their programme. In 2021, Mississippi CHAMPS won a Reducing Disparities in Breastfeeding Innovation Challenge award from the Office on Women's Health, US Department of Health and Human Services, for reducing racial disparities in breastfeeding in Mississippi.

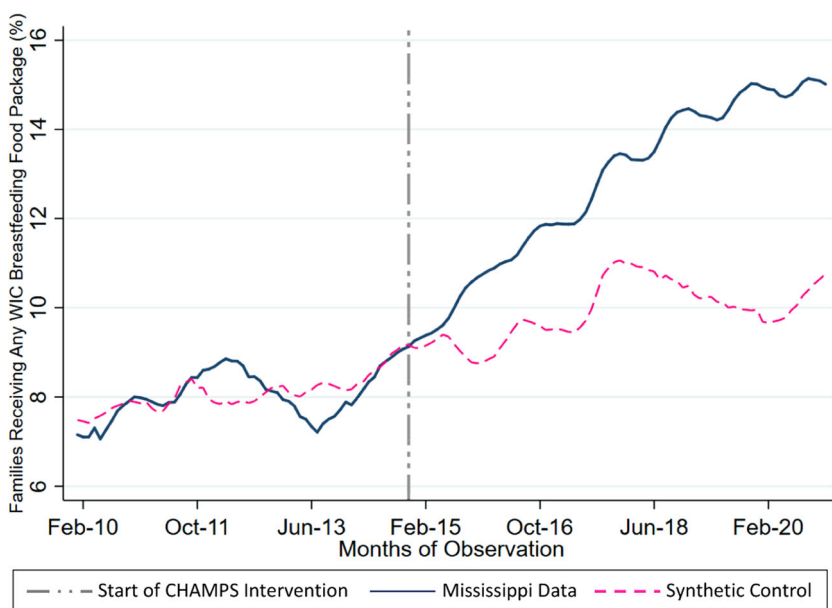


FIGURE 1 Trends in the percentage of WIC families receiving any breastfeeding food package before and after the launch of CHAMPS: Mississippi and a synthetic control. CHAMPS, Communities and Hospitals Advancing Maternity Practices; WIC, Women, Infants and Children.

3.5.1 | Hospitals

As of November 2021, all CHAMPS hospitals had retained their Baby-Friendly designation, and 100% of hospitals maintained enrolment in CHAMPS, although some were more actively engaged than others.

3.5.2 | Focus group themes

The subtheme, *BFHI Process Was Hard but Worth It* from the nurse focus groups spoke to sustainability. 'I feel like breastfeeding and doing things naturally are the best thing...I was like, that—there's no way that all that's going to change, but it has changed. And so, I can see out in the future, there could be so much more change as far as the way childbirth and moms and babies are treated in the hospital'.

4 | DISCUSSION

This study used the RE-AIM framework to evaluate the implementation and outcomes associated with a comprehensive breastfeeding promotion and support initiative in Mississippi. We found that, when assessed using RE-AIM criteria, Mississippi CHAMPS accomplished broad, measurable, positive, quantitative and qualitative outcomes. This is important because previous work assessing the implementation of breastfeeding promotion programmes has primarily addressed quantitative outcomes (Burnham et al., 2022; Feldman-Winter et al., 2017; Merewood et al., 2019), whereas this study sought to measure more comprehensive indicators at the population, stakeholder and institutional levels. The study also demonstrates that an implementation science framework can be applied successfully to assess outcomes in maternal and child health, specifically around breastfeeding promotion.

Assessment measures were selected, to the best of our ability, by our programme focus, which was primarily, hospitals and community stakeholders. Thus, we sought to assess RE-AIM outcomes among hospital populations, and among WIC employees. At the hospital level, we assessed breastfeeding rate data, and at the community level, we assessed the programme's ability to reach the WIC population, primarily via WIC peer counsellors.

Breastfeeding initiation rates in the hospitals rose by 10 percentage points over the 4 years measured, and in line with our goals, the disparity between Black and White dyads narrowed by 17 percentage points. Although this may seem like a modest increase, it compares favourably with the 4% increase demonstrated in a national programme with similar goals (Feldman-Winter et al., 2017). The impact on Black dyads in the hospital was particularly noticeable; it is notoriously difficult to narrow racial inequities in health care outcomes, and we are not aware of any other programmes that have been able to demonstrate such a significant decrease in racial disparities in hospital breastfeeding rates.

We also noted a significant increase in breastfeeding rates for the WIC programme, although overall the rates remained low. We believe this is because many other factors play into breastfeeding rates in the WIC population during the first year of life, whereas the impact on breastfeeding rates in the hospital is more dramatic.

Our study did not assess exactly *how* CHAMPS achieved success, but we believe it was due to utilizing proactively broad and inclusive strategies. First, CHAMPS accepted all hospitals that applied. This removed barriers to participation, enabling, for example, engagement from hospitals with very little established breastfeeding support. Consequently, many hospitals with few resources from impoverished communities joined the programme, resulting in successful reach to traditionally neglected populations. Because membership was unconditional, small groups of hospital staff (primarily, in our experience, nurses) were able to benefit from access to resources, and then able to engage other sectors (such as, doctors) once the initiative had gained momentum at their site. Foundation-based funding from the W. K. Kellogg Foundation and the Bower Foundation was flexible and empathetic to changing programme needs; this allowed CHAMPS to train large numbers of staff and community members at no cost to the institutions or communities involved, thereby increasing access.

At the community level specifically, CHAMPS went beyond the concepts of 'cultural competence' and 'levelling the playing field' to proactively tackle barriers, such as institutional racism and lack of community access. The programme brought non-White stakeholders to the table and established, for example, a presence at hospital management meetings for WIC breastfeeding peer counsellors—an idea suggested by an African-American community leader in Mississippi. This also enabled meetings between hospital staff and the WIC peer counsellors who served their patients. Moreover, ROSE collaborated with CHAMPS and ensured that the African-American perspective was honoured and enacted at every step. Some examples included proactive engagement of African-American trainers and conference speakers, and thus at least 50% of CHAMPS' annual conference speakers and attendees are people of colour. We believe the support and trust of this community were a major factor behind CHAMPS' success. In addition, CHAMPS engaged meaningfully with Mississippi health care stakeholders, such as the Mississippi Perinatal QI Collaborative and Blue Cross and Blue Shield of Mississippi. Joining forces with these organizations greatly facilitated outreach and credibility with state departments and hospitals.

The study has some limitations. Some data were collected from programme records and CHAMPS hospitals, which introduces the possibility of bias. Related to this, we cannot prove a causal relationship between the CHAMPS programme and the changes measured as hospitals served as their own controls, and the broader statewide outcomes cannot be causally linked to CHAMPS. That said, one of our strategic goals was to act as a catalyst. CHAMPS funded, for example, the first Baby Café™ in Mississippi, and since then, 11 Baby Cafes have opened independently. While we cannot state that this was a direct result of CHAMPS, our goal in funding the first Baby

Café was to demonstrate the model in Mississippi, in order for it to spread statewide, which it did.

5 | CONCLUSION

When assessed using RE-AIM criteria, Mississippi CHAMPS demonstrated broad, measurable, positive, quantitative and qualitative outcomes. The findings suggest that broad-scale breastfeeding promotion and engagement initiatives can be successfully implemented and that established implementation science frameworks can be used to assess them. We recommend that breastfeeding promotion programmes utilize such methods going forward, to assess more comprehensively the impact of the initiative, beyond a reliance on measuring breastfeeding rates.

AUTHOR CONTRIBUTIONS

Anne Merewood conceptualized and designed the study, interpreted the data, drafted the initial manuscript and reviewed and revised the manuscript. Laura Burnham interpreted the quantitative and qualitative data, drafted the initial manuscript and reviewed the revised the manuscript. Jacqueline Berger interpreted the quantitative data, drafted the initial manuscript and reviewed the revised the manuscript. Aishat Gambari assisted with the acquisition and interpretation of the qualitative data, contributed to the initial manuscript and reviewed and revised the manuscript. Cara Safon assisted with the initial planning of the analysis, contributed to the initial manuscript and reviewed and revised the final manuscript. Paige Beliveau did the initial quantitative data collection, contributed to the initial manuscript and reviewed and revised the final manuscript. Tawanda Logan-Hurt coordinated data collection at the Mississippi WIC programme and reviewed the final manuscript. Nathan Nickel spearheaded all quantitative data analyses, and reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agreed to be accountable for all aspects of the work.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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