

Mississippi CHAMPS: Decreasing Racial Inequities in Breastfeeding

Laura Burnham, MPH,^a Rebecca Knapp, MPH, RN, IBCLC,^a Kimarie Bugg, DNP, MPH, IBCLC, CLC,^b Nathan Nickel, PhD, MPH,^c Paige Beliveau, MA,^a Lori Feldman-Winter, MD, MPH, FAAP, FABM,^d Anne Merewood, PhD, MPH^a

BACKGROUND AND OBJECTIVES: Race is an important predictor of breastfeeding prevalence in the United States, with rates being lowest among Black populations. The Communities and Hospitals Advancing Maternity Practices (CHAMPS) program works with hospitals and communities to implement the Baby-Friendly Hospital Initiative, increase breastfeeding rates, and decrease racial disparities in breastfeeding. The aims of Mississippi CHAMPS were to (1) increase breastfeeding initiation and exclusivity and (2) decrease racial disparities in breastfeeding by increasing the number of Baby-Friendly hospitals in the state from 2014 to 2020.

METHODS: Mississippi hospitals enrolled into the CHAMPS initiative from 2014 to 2019 and received an intensive quality improvement and technical assistance intervention to implement the Baby-Friendly Hospital Initiative. Community partners and statewide organizations provided parallel support. Hospitals submitted monthly aggregate data stratified by race on breastfeeding (outcome measure), skin-to-skin care, and rooming-in practices (process measures).

RESULTS: Between 2014 and 2020, the number of Baby-Friendly hospitals in Mississippi rose from 0 to 22. Breastfeeding initiation in the hospitals increased from 56% to 66% ($P < .05$), and the disparity between Black and White dyads decreased by 17 percentage points, an average of 0.176 percentage points each month (95% confidence interval: -0.060 to -0.292). Exclusivity increased from 26% to 37% ($P < .05$). Skin-to-skin and rooming-in rates increased significantly for all dyads: 31% to 91% ($P < .01$) for skin-to-skin after vaginal birth, 20% to 86% ($P < .01$) for skin-to-skin after cesarean delivery, and 19% to 86% ($P < .01$) for rooming-in.

CONCLUSIONS: Over the course of the CHAMPS program, there were significant increases in breastfeeding initiation and exclusivity, and decreases in racial inequities in breastfeeding initiation.

abstract

^aDivision of General Pediatrics, Boston Medical Center, Boston, Massachusetts; ^bReaching Our Sisters Everywhere, Inc, Lithonia, Georgia; ^cDepartment of Community Health Sciences, Max Rady College of Medicine, University of Manitoba, Winnipeg, Manitoba, Canada; and ^dDepartment of Pediatrics, Cooper Medical School of Rowan University and Children's Regional Hospital at Cooper University Healthcare, Camden, New Jersey

Ms Burnham assisted with study design, coordinated and supervised data collection, advised hospitals, and reviewed and revised the manuscript; Ms Knapp provided nursing expertise, participated in data collection, advised hospitals, and reviewed and revised the manuscript; Dr Bugg directed the community component of the project and reviewed and revised the manuscript; Dr Nickel worked as the statistician on the study, advised and assisted with the overall design, conceptualized, designed, verified, and performed all data analyses, and reviewed and revised the manuscript; Ms Beliveau coordinated data collection, prepared the data for analysis, acted as research assistant on the project, and reviewed and revised the manuscript; Dr Feldman-Winter acted as physician lead, provided ongoing advice on medical topics and quality improvement, contributed to the initial draft of the manuscript, and reviewed and revised the manuscript; Dr Merewood conceptualized and designed the project, drafted the initial manuscript, and reviewed and revised the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

DOI: <https://doi.org/10.1542/peds.2020-030502>

Accepted for publication Jun 9, 2021

Send correspondence to Anne Merewood, PhD, MPH, Division of General Pediatrics, Boston Medical Center, 801 Albany St, Boston, MA 02119. E-mail: anne.merewood@bmc.org

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2022 by the American Academy of Pediatrics

FUNDING: Cofunded by grants from the W.K. Kellogg Foundation (grant reference P3036679) and the Bower Foundation (grant reference N 2017-186). Neither funding source participated in the design or conduct of the study.

CONFLICT OF INTEREST DISCLOSURES: The authors have indicated they have no conflicts of interest relevant to this article to disclose.

To cite: Burnham L, Knapp R, Bugg K, et al. Mississippi CHAMPS: Decreasing Racial Inequities in Breastfeeding. *Pediatrics*. 2022;149(2):e2020030502

Full article can be found online at www.pediatrics.org/cgi/doi/10.1542/peds.2020-030502

The Ten Steps to Successful Breastfeeding are:

1. Have a written breastfeeding policy that is routinely communicated to all health care staff.
2. Train all health care staff in the skills necessary to implement this policy.
3. Inform all pregnant women about the benefits and management of breastfeeding.
4. Help mothers initiate breastfeeding within 1 hour of birth.
5. Show mothers how to breastfeed and how to maintain lactation, even if they are separated from their infants.
6. Give infants no food or drink other than breast milk, unless medically indicated.
7. Practice rooming in : allow mothers and infants to remain together 24 hours a day.
8. Encourage breastfeeding on demand.
9. Give no pacifiers or artificial nipples to breastfeeding infants.
10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or birth center.

FIGURE 1

Ten Steps to Successful Breastfeeding.

In the United States, race and geography are two of the biggest predictors of breastfeeding outcomes.¹⁻⁴ Together with other southern states, Mississippi suffers high rates of infant mortality and morbidity and low breastfeeding rates.^{2,5-7} In 2014, Mississippi had the lowest breastfeeding rates in the United States, with a 57.5% initiation rate; almost 10 percentage points below any other state. Breastfeeding rates are lowest nationally among African Americans.¹ Mississippi also has some of the nation's highest rates of heart disease,⁸ obesity,⁹ and diabetes¹⁰; all of which can be moderated by increased breastfeeding.¹¹ Barriers to care in Mississippi include institutional racism¹² and the associated outcomes of extreme poverty and ongoing trauma.

The Ten Steps to Successful Breastfeeding (Fig 1) constitute the pillars of the World Health Organization and the United Nations Children's Fund Baby-Friendly Hospital Initiative (BFHI), launched in 1991, to improve breastfeeding rates worldwide. BFHI implementation is associated with increased breastfeeding rates,¹³⁻¹⁵ particularly in racial minorities and vulnerable groups¹⁴⁻¹⁸; thus, we chose this method as the best evidence-based approach to reducing racial disparities in breastfeeding.

Increased breastfeeding rates in the hospital occur in correlation with increased exposure to the practices defined by the Ten Steps in a dose-responsive manner.^{13,15,17,19-22}

Previous multistate initiatives to implement the BFHI include American Indian and Alaska Native Communities and Hospitals Advancing Maternity Practices (CHAMPS) and CHAMPS South^{15,23,24} and Best Fed Beginnings¹³ and Empower (both funded by the Centers for Disease Control and Prevention). All resulted in Baby-Friendly designation of multiple hospitals.

CHAMPS is a respected quality improvement (QI) initiative with demonstrated success at increasing the number of Baby-Friendly hospitals in the United States and decreasing racial disparities in breastfeeding.^{13,15,23,24} Being aware of the efficacy of the BFHI, and having experienced and documented positive outcomes of the BFHI,^{1,13-15,25-27} we sought to implement this evidence-based strategy to increase breastfeeding rates in Mississippi.

We chose Mississippi because Mississippi had the lowest breastfeeding rates in the United States, demonstrating need. Pragmatically, CHAMPS was also able to secure funding from the W.K. Kellogg Foundation for this program

because the Foundation provides place-based funding to support work in Mississippi.

Our philosophical and practical approach was that the issue of low breastfeeding rates in Mississippi's African American mothers results from a social construct. We chose the 2 comparison groups of White and Black mothers because these are the 2 largest racial groups in Mississippi.

The first cohort of Mississippi hospitals began enrolling into CHAMPS in 2014, with a second cohort enrolling from 2017 to 2019 as new funding became available.

Our aims were to (1) increase breastfeeding initiation and exclusivity and (2) decrease racial disparities in breastfeeding by increasing the number of Baby-Friendly hospitals in the state from 2014 to 2020. In 2014, no Mississippi hospitals were Baby-Friendly designated, and there was no precedent for this work in a state with such low breastfeeding rates. We felt it would be artificial to predict a specific percentage as a goal for increasing breastfeeding rates or decreasing racial disparities. Instead, we trusted the evidence-based intervention of the BFHI and put our resources into ensuring that hospitals knew what to implement and how to implement it.

METHODS

Context and Interventions

In 2014, before CHAMPS launched in the state, Mississippi was one of the few US states with no Baby-Friendly hospitals. Initially, hospitals were slow to enroll, but through networking efforts, the CHAMPS team, including Reaching our Sisters Everywhere (ROSE), a national organization to promote breastfeeding in communities of color, proactively approached

The 4-D Pathway to Baby-Friendly Designation

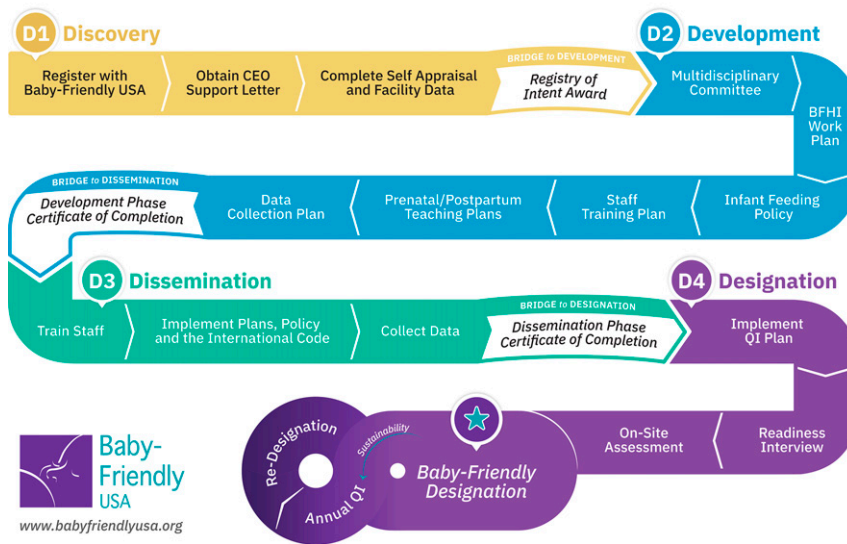


FIGURE 2

Diagram of the 4-D Pathway to Baby-Friendly Designation (reprinted with permission from Baby-Friendly USA).

Mississippi breastfeeding experts, community-based breastfeeding organizations, and hospital lactation consultants and held a conference in the Mississippi delta with a “build it and they will come” approach. The conference (in 2015) was filled to capacity, and several hospitals enrolled into CHAMPS.

After enrollment, hospitals were familiarized with the Ten Steps (Fig 1), the BFHI, and the requirements for progressing through the Baby-Friendly United States of America (BFUSA) 4-D Pathway (Fig 2). The details of our CHAMPS intervention have been described in depth in our article on a different cohort,¹⁵ and we followed this methodology. CHAMPS used intense on-site and remote coaching, clinician training, and charting and data collection in preparing for BFUSA’s assessment, which included a CHAMPS mock assessment (Fig 3).¹⁵

The CHAMPS approach hinges on community integration and support.

Given the background of low breastfeeding rates and racial inequities in Mississippi, direct and meaningful collaboration with the community was critical to prepare women for changing practices and to support breastfeeding mothers postpartum. ROSE implemented “community transformer” trainings in populations around enrolled hospitals, enabled parent panels at conferences, and was an ongoing and essential partner at all team and strategic planning meetings.

CHAMPS team members included a physician lead for the overall project, local consultants, and key nursing leaders from around the state. Throughout the initiative, CHAMPS collaborated with the Mississippi State Department of Health; the Mississippi Supplemental Nutrition Program for Women, Infants, and Children (WIC), and Blue Cross & Blue Shield of Mississippi. CHAMPS hosted and participated in statewide and regional conferences in collaboration with these partners.

Our theory of change was derived from the evidence-based change package developed by the CHAMPS team,¹⁵ and we used the driver diagram created by the Best Fed Beginnings QI Initiative¹³ that members of the CHAMPS leadership had developed when working on the initiative as consultants. To this theory, we added the experience-based precept that working with a statewide collaborative and with minority-led changemakers would facilitate momentum for change.¹⁶ This theory included the hypothesis that hospitals would shift from being competitive to cooperative in this shared aim.

Measures and Definitions

The main outcome measures were breastfeeding initiation and exclusive breastfeeding rates during the hospital stay. Breastfeeding initiation was defined as an infant receiving any breast milk. Exclusive breastfeeding was defined as an infant receiving only breast milk with no supplementation. Infants were excluded from the denominator of both breastfeeding practices if they met the Joint Commission Perinatal Core Measure 5 Exclusion Criteria from 2014, the year data collection training began. Exclusions include NICU admit, galactosemia diagnosis, parenteral infusion, length of stay of >120 days, enrolled in clinical trial, transferred out of the hospital, prematurity, or infant death.²⁸

The key process measures, skin-to-skin care (step 4 of the Ten Steps, see Fig 1) and rooming-in (step 7 of the Ten Steps, see Fig 1), were defined and exclusions made on the basis of BFUSA’s Guidelines and Evaluation Criteria for Facilities Seeking Baby-Friendly Designation, 2010 Revision. To gain designation, a hospital must comply with all 10 steps; however, hospitals’ capacity to collect data is limited. Thus, we decided to only

Project	Fall of 2014: <ul style="list-style-type: none"> 2-day meeting for team members and the funder to introduce team members, discuss goals and strategies. Public launch at Dillard University, a historically black college near New Orleans, at HealthConnect One conference. October 2014 - August 2016: Engagement with and active recruitment of hospitals in New Orleans, Mississippi, Texas and Southern Tennessee through online advertisements, CHAMPS website, local announcements, state departments of health, WIC, regional conferences, community organizations, breastfeeding coalitions, and hospital networks.
Applications	Application forms were available on the CHAMPS website; emailed to interested parties, and handed out at conferences on paper (Exhibit A). On receipt of application, CHAMPS set up a phone call or onsite visit to review the application, answer the hospital's questions, and set goals (Baby-Friendly designation vs implementation of 3 of the Ten Steps). Onsite visits almost always included a community representative (usually a WIC employee). All hospitals committed to a goal of becoming Baby-Friendly or at least adopting 3 of the 10 Steps to Successful Breastfeeding, and all hospitals that applied were accepted and enrolled, on a first come, first served basis until resources were exhausted.
Enrollment	Upon enrollment, hospitals were asked to complete and submit several tasks: <ul style="list-style-type: none"> Team Roster: A list of team members who would be incorporated into a task force to work on achieving their goals. September 2015, CHAMPS presented a webinar "Building a Baby-Friendly Taskforce". Subsequently, the webinar link was provided as a resource for completing the team roster and made publicly available online. CHAMPS Clinician Education Plan: A document to outline the hospital's plan for meeting Step 2 (clinician education). Hospitals that did not have Step 2 as a goal were not required to do this; however, over time, almost all adopted a Baby-Friendly goal and completed this required by Baby-Friendly USA. January 2015, CHAMPS presented a webinar "Clinician Training Needs for Baby-Friendly and How CHAMPS Can Help." Subsequently, the webinar link was provided as a resource for completing the clinician education plan and made publicly available online. Data Training: CHAMPS scheduled hospitals for data collection training on how to collect and submit data on breastfeeding initiation and exclusivity, skin-to-skin and rooming-in. Most training occurred virtually, but some was provided in person.
Initial Follow-up	<ul style="list-style-type: none"> After CHAMPS received a hospital's roster, all the contacts were added to our contact lists. Once hospitals returned their Clinician Training Plan, interested facilities were connected with Lactation Education Resources, a company that provides online lactation training. CHAMPS grant funding paid for 10 slots per hospital in LER's 15-hour Baby-Friendly online training for nursing staff. Hospitals could purchase additional slots at a reduced price of \$45 each. Hospitals were also given a link to a free 3-hour online training for providers through Community Health Training Institute. Both trainings provided CEUs.
Maintenance: Ongoing Technical Assistance	<ul style="list-style-type: none"> Monthly workshops: For hospitals on the Baby-Friendly Pathway, CHAMPS offered monthly workshops tailored to specific phases of the 4-D Pathway. For hospitals not on the Pathway, workshops were tailored to specific Steps. Hospitals in the same phase were encouraged to attend workshops together to promote sharing. QI training: During workshops and conferences, hospitals were taught QI skills such as plan-do-study-act (PDSA) cycles. Website: A website was created to house information about CHAMPS, www.cheequity.org/champs-south Patient Education Materials Reviews: CHAMPS developed a tool for and provided patient education material reviews for hospitals to ensure they met Baby-Friendly standards. Infant Feeding Policy Reviews: CHAMPS developed a tool for and provided infant feeding policy reviews for hospitals to ensure they met Baby-Friendly standards. This service was offered to all hospitals working on policy updates. Monthly Data Review and Reports: Data submissions were reviewed for errors each month, and continued technical assistance around monthly data was offered to all hospitals. CHAMPS provided quarterly data reports to hospitals. Staff Training: CHAMPS provided resources for staff trainings to the hospitals (see enrollment follow-up section). CHAMPS also provided 4-hour clinical skills trainings for nursing staff directly to hospitals. Site Visits: On average each hospital received 2 site visit over the course of the grant. CHAMPS invited community representatives (usually WIC staff) to attend site visits whenever possible. Wednesday Webinars: CHAMPS, in collaboration with the Mississippi Department of Health, hosted monthly webinars for hospital staff and community partners on a variety of topics related to the 10 Steps to Successful Breastfeeding and the Baby-Friendly Hospital Initiative. The webinars were recorded and archived on the CHAMPS website
Designation	<p>Prior to a hospital's onsite assessment with Baby-Friendly USA CHAMPS provided intensive assistance and preparation:</p> <ul style="list-style-type: none"> Readiness Assessment Interview Workshop: Before a hospital's readiness assessment interview with BFUSA, CHAMPS offered hospitals a workshop to help them prepare for the interview. Mock Assessment/Report: CHAMPS performed 14, 1-day mock assessments at hospitals preparing for Designation. After each mock assessment a detailed report was sent to hospitals highlighting any areas that did not meet BFHI standards.

FIGURE 3
 Diagram of the CHAMPS intervention in relation to the enrolled hospitals (reprinted with permission from CHAMPS South). CEU, Continuing Education Unit.

require ongoing data collection for steps 4 and 7, both of which are linked by the evidence to increased breastfeeding rates.^{20,29–31} Hospitals were considered compliant with step 4 if infants were placed skin-to-skin with their mothers, uninterrupted, for the first hour of life or until the end of the first breastfeed, and with step 7 if infants remained in the mother's room for 23 of 24 hours during the hospital stay. The World Health Organization revised the Ten Steps in 2018, but CHAMPS hospitals continued to follow the original Ten Steps (Fig 1) in accordance with guidance in this period from BFUSA.

Other process measures included implementation milestones and key CHAMPS activities, such as a hospital paying fair market value for formula and ceasing to distribute free formula industry gift bags to patients. These data were collected at enrollment as baseline information, and then dates of achievement were recorded. We also recorded the number of CHAMPS trainings for nursing staff and community members, the number of community transformers trained, and the number of Baby Cafés that opened in the state.

In terms of balancing measures, hospitals exercised their own quality control around program implementation and tracked balancing measures at an institutional level. CHAMPS held focus groups with nursing staff at several hospitals in 2020, where positives and negatives of implementation were discussed.³²

Monthly Data Collection

CHAMPS hospitals were asked to submit monthly data on the main outcome measures, breastfeeding initiation and exclusivity, and key process measures skin-to-skin care for vaginal and cesarean deliveries and rooming-in. Hospitals submitted deidentified, aggregate data monthly via an online Qualtrics survey. Hospitals were asked to submit monthly data by race/ethnicity, which was defined as Hispanic, non-Hispanic Black ("Black"), non-Hispanic White ("White"), or other. The categories were intentionally broad to simplify the data collection process for hospitals and ensure racial categories with adequate sample size. Hospitals were told the preferred source for race/ethnicity was the birth certificate, and the medical record was a secondary option. We did not track which type of record hospitals chose to use. Hospitals followed Joint Commission sampling minimums.²⁸ If hospitals had on average ≥ 516 births each month, their minimum sample size was 104; for 131 to 515 births, the minimum was 20% of their monthly births; for 26 to 130 births, the minimum was 26; and for < 26 births, hospitals were told to collect data on 100% of births. If a practice was not charted, it was considered that the practice did not happen. Hospital data coordinators were trained on how to extract these data from their medical records, with a second teach back training after their first submission. Before the project, no hospital collected

breastfeeding data by race and/or ethnicity or any data at all on skin-to-skin care or rooming-in.

Data Analyses

CHAMPS analyzed monthly breastfeeding, skin-to-skin, and rooming-in data collected from the hospitals from January 2015 through December 2019. Data were reported by month of data submission, not by calendar month, to account for our rolling enrollment. Month 1 for all hospitals was the first month they submitted data to CHAMPS. We calculated monthly rates of breastfeeding initiation and exclusivity, skin-to-skin care after vaginal birth, skin-to-skin care after cesarean delivery, and rooming-in at hospital discharge for all infants and stratified by infant's 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 the results over time.

Models included the month of data submission as the primary explanatory variable and data on each of the process measures and breastfeeding as the outcome variables of interest. Because hospitals enrolled on a rolling basis, they contributed data for different numbers of months. Although the overall project duration was 60 months, only a few hospitals joined at the very start, and just 12 hospitals contributed 49 months' worth of data or more. As a result, we limited our follow-up time to 49 months because, after that, the results became unstable because of small sample size. We included a race/ethnicity variable and an interaction between race/ethnicity and time to test for racial/ethnic inequities in hospital practices and breastfeeding and to

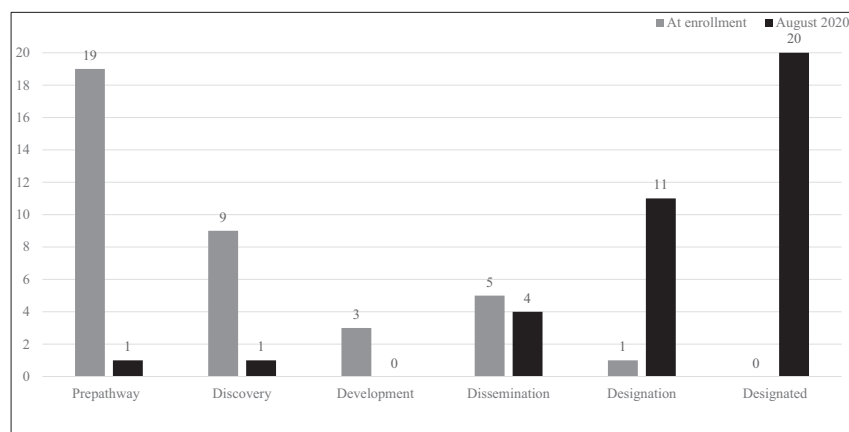


FIGURE 4

The number of Mississippi CHAMPS hospitals in each 4-D Pathway phase at time of enrollment and in August 2020 ($n = 37$).

identify whether time trends differed by racial ethnic groups. Tests used an a priori significance level of $P < .05$. Analyses and data management were conducted by using Stata/SE 15.1 (Stata Corp, College Station, TX).

Mississippi CHAMPS was a health care improvement activity, as defined by the Standards for Quality Improvement Reporting Excellence.³³ QI initiatives do not require institutional review board approval because they are not human subjects' research.³⁴

RESULTS

CHAMPS enrolled a total of 39 of 43 birthing hospitals in Mississippi between 2014 and 2019. Of the hospitals that did not enroll, 2 were ineligible (1 was close to

designation, and the other was participating in a Centers for Disease Control and Prevention-funded program that did not allow enrollment into additional initiatives). When CHAMPS launched in 2014, Mississippi had no Baby-Friendly hospitals. By August 2020, 20 Mississippi CHAMPS hospitals (22 hospitals in the state as a whole) had gained Baby-Friendly designation, and 11 others were in the final designation phase of BFUSA's 4-D Pathway (Fig 4).

Of the 39 enrolled hospitals, 37 contributed monthly data to the analysis. Of those 37, 28 (76%) contributed ≥ 26 months of data (interquartile range: 26–49 months), 4 hospitals did not initially submit data by race/ethnicity,

TABLE 1 Characteristics of Mississippi CHAMPS Hospitals ($n = 37$)

General Hospital Characteristics	All Hospitals ($n = 37$)
Total No. births	31 329
No. births per hospital, mean (range)	847 (195–2316)
Patient race and/or ethnicity, median (range), %	
Black (non-Hispanic)	47 (12–88)
White (non-Hispanic)	51 (11–86)
Other	1 (0–13)
Provides NICU care level II or above, n (%)	24 (65)
Average No. NICU beds for hospitals with a NICU, mean (range)	19 (4–100)
Provides donor milk for hospitals with a NICU, n (%)	9 (24)
Prenatal care status	
Hospital-operated clinic, n (%)	13 (35)

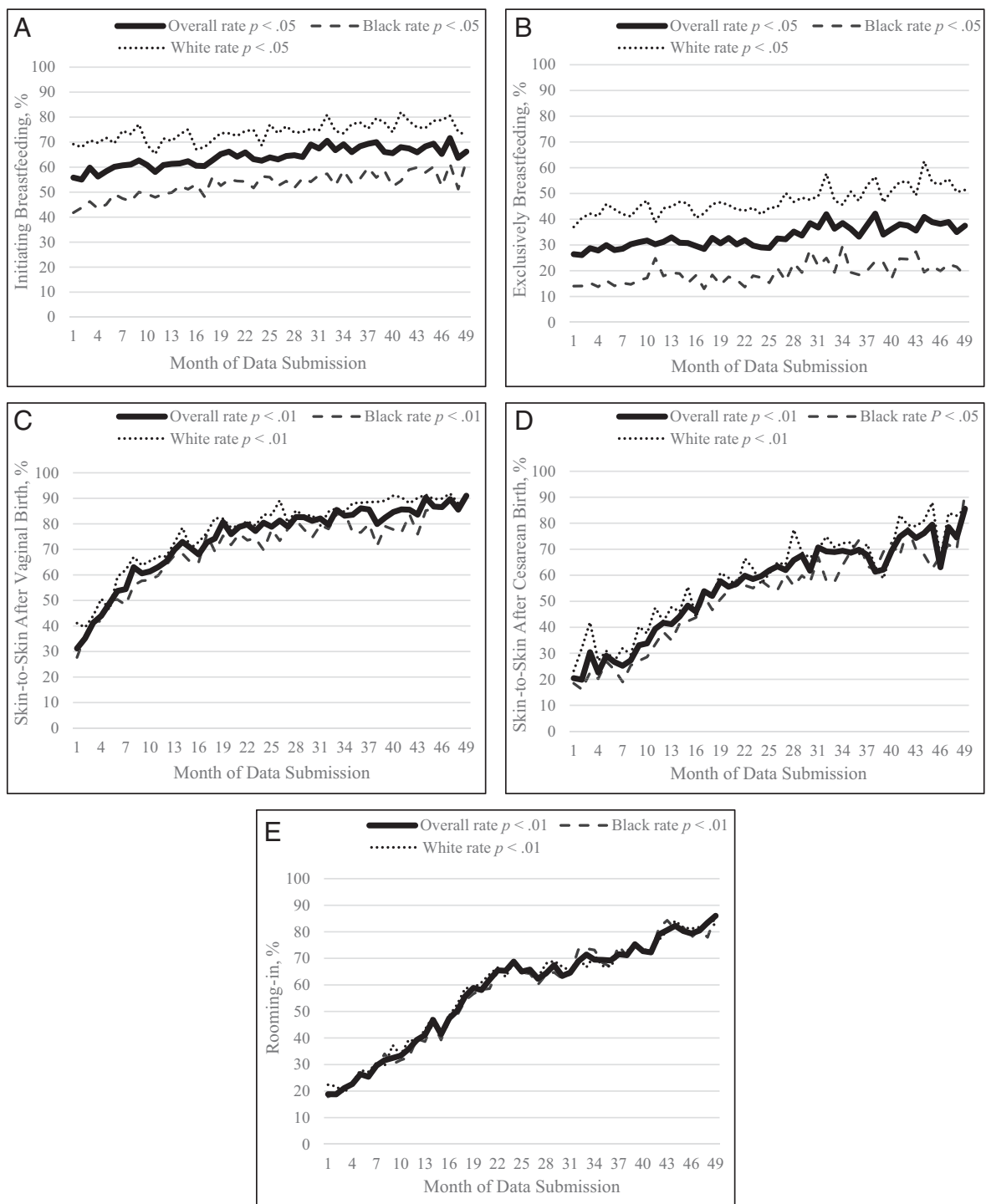


FIGURE 5

Breastfeeding rates and Baby-Friendly practices by race over time among CHAMPS hospitals. A, Breastfeeding initiation. B, Exclusive breastfeeding. C, Skin-to-skin after a vaginal birth. D, Skin-to-skin after a cesarean birth. E, Rooming in.

8 experienced <5 months of missing data, and 4 hospitals experienced >5 months of missing data. Hospitals had a mean of 847 births

(range 195–2316) and varied racial makeups (range 12%–88% Black) (Table 1). Significant racial inequities existed in breastfeeding

initiation and exclusivity at baseline but not in skin-to-skin care postbirth or rooming-in (Fig 5).

TABLE 2 Modeling Slope Over Time for Breastfeeding and Practice Outcomes Stratified by Race

	All Births		Black Dyads		White Dyads	
	RR (95% CI)	<i>P</i>	RR (95% CI)	<i>P</i>	RR (95% CI)	<i>P</i>
Breastfeeding initiation	1.004 (1.002 to 1.005)	<.001	1.006 (1.004 to 1.009)	<.001	1.002 (1.001 to 1.003)	<.001
Exclusive breastfeeding	1.005 (1.002 to 1.008)	<.001	1.009 (1.004 to 1.015)	.001	1.003 (1.000 to 1.007)	.04
Skin-to-skin after vaginal birth	1.019 (1.014 to 1.024)	<.001	1.019 (1.014 to 1.025)	<.001	1.017 (1.012 to 1.022)	<.001
Skin-to-skin after cesarean delivery	1.032 (1.024 to 1.040)	<.001	1.036 (1.028 to 1.044)	<.001	1.028 (1.020 to 1.037)	<.001
Rooming-in	1.036 (1.029 to 1.044)	<.001	1.038 (1.030 to 1.045)	<.001	1.035 (1.027 to 1.043)	<.001

Over the course of the study, breastfeeding initiation rose by 10 percentage points, from 56% to 66% ($P < .05$) (Fig 5A), an average of 0.4% each month (rate ratio [RR]: 1.004; 95% confidence interval [CI]: 1.002 to 1.005) (Table 2). For Black and White dyads, breastfeeding initiation increased by 21 and 4 percentage points, respectively ($P < .05$), and the disparity between Black and White dyads decreased by 17 percentage points, an average of 0.176 percentage points each month (95% CI: -0.060 to -0.292). (Table 3). Exclusive breastfeeding rates increased by 11 percentage points, from 26% to 37% ($P < .05$). The average monthly increase for Black dyads was 0.9% (RR: 1.009, 95% CI: 1.004 to 1.015) and 0.3% (RR: 1.003, 95% CI: 1.000 to 1.007) for White dyads. The disparity in breastfeeding exclusivity between Black and White dyads did not change significantly.

Skin-to-skin and rooming-in rates increased significantly for all dyads and when stratified by race (Fig 5). There was an increase from 31% to 91% ($P < .01$) for skin-to-skin rates after vaginal birth, from 20% to

86% ($P < .01$) for skin-to-skin rates after cesarean delivery, and from 19% to 86% ($P < .01$) for rooming-in rates. When looking at these increases by each month of data submission, there was a significant 1.9% monthly increase in skin-to-skin rates after vaginal birth (RR: 1.019; 95% CI: 1.014 to 1.024), a 3.2% monthly increase in skin-to-skin rates after cesarean delivery (RR: 1.032; 95% CI: 1.024 to 1.040), and a 3.6% monthly increase in rooming-in rates (RR: 1.036; 95% CI: 1.029 to 1.044) (Table 2). There were no initial disparities by race for skin-to-skin and rooming-in, and none emerged over the course of the program (Fig 5 C–E).

The proportion of CHAMPS hospitals paying for infant formula increased from 3% at baseline to 80%, and the proportion distributing free formula industry sample packs to patients decreased from 79% to 11%.

CHAMPS trained 1837 hospitals staff in 100 training sessions; ROSE trained 89 community transformers; and CHAMPS funded the opening of the first Baby Café in Mississippi, which led the way for 14 other Baby Cafés to open in the state. Hospitals

collected balancing measures individually. No hospital reported sentinel events related to this intervention to CHAMPS.

DISCUSSION

When CHAMPS began in Mississippi in 2014, no Mississippi hospitals were Baby-Friendly designated, and only 2 were on BFUSA's 4-D Pathway. By August 2020, 92% (36 of 39) of Mississippi CHAMPS hospitals were pursuing designation or already designated, and 88% (38 of 43) of all Mississippi birthing hospitals were designated or on the 4-D Pathway. With $>50\%$ of the births in the state now in Baby-Friendly facilities and $>50\%$ of facilities designated, Mississippi is a national leader in terms of Baby-Friendly work, and as of the 2017 birth cohort, breastfeeding rates in Mississippi are no longer the lowest in the nation.³⁵

Breastfeeding initiation and exclusivity significantly increased in Mississippi CHAMPS hospitals for all infants, and racial inequities declined. Among Black dyads, the average monthly increases in breastfeeding initiation and exclusivity were significant and greater than the increases among White dyads. Skin-to-skin and rooming-in rates increased dramatically over time, from negligible adoption to almost full compliance. This represents a tremendous gain to the birthing families of Mississippi, many of whom previously did not have

TABLE 3 Modeling Inequities Over Time for Breastfeeding and Practice Outcomes Between Black and White Dyads

Outcomes	Absolute Differences	
	Percentage Point Difference (95% CI)	<i>P</i>
Breastfeeding initiation	-0.176 (-0.060 to -0.292)	.003
Exclusive breastfeeding	0.005 (0.154 to -0.144)	.95
Skin-to-skin after vaginal birth	-0.024 (0.097 to -0.145)	.70
Skin-to-skin after cesarean birth	0.000 (0.136 to -0.136)	.998
Rooming-in	-0.043 (0.023 to -0.11)	.20

access to practices that have become the norm in much of the rest of the United States. These results add to the growing body of literature that suggests implementation of the BFHI improves breastfeeding rates in racial minorities and vulnerable groups.^{1,16–18}

It was beyond the scope of this study to conduct research into the specific reasons CHAMPS decreased racial disparities in breastfeeding rates. We postulate that our success was due to a range of factors. BFHI has decreased racial breastfeeding inequities in minority populations in previous studies,^{14,15} and thus this was the intervention selected. We proactively engaged the African American population, built trust and held difficult conversations with hospital management about institutional racism, and addressed improving breastfeeding rates in minority populations at our trainings.

Regarding data collection, no hospital in Mississippi that engaged with CHAMPS had previously collected any of the data cited herein by race. It is interesting that, overall, we found no significant differences by race at baseline in skin-to-skin and rooming-in rates, although differences did exist at some individual hospitals. We propose that simply raising awareness and measuring outcomes associated with race may have contributed to the decrease in disparities in breastfeeding rates.

Sustainability is important in such programs. In 2018, Mississippi CHAMPS obtained funding from the Bower Foundation in Mississippi, which outreached to CHAMPS to offer funds to sustain the CHAMPS initiative in Mississippi, with the expressed desire that measures be used to prevent backsliding. This funding allowed us to work directly with designated sites on maintaining

their Baby-Friendly status, continuing to collect data, and to provide support with ongoing training. Part of this funding was dedicated to ensuring change was embedded in the state and not dependent on long-term reliance on CHAMPS. Thus, for example, we created train-the-trainer programs to enable hospitals to train their own staff instead of relying on CHAMPS trainers. Of note, Baby-Friendly USA, which designates sites as Baby-Friendly, also includes a maintenance requirement for hospitals that requires ongoing QI. As of February 2021, all Mississippi CHAMPS hospitals that gained designation have retained the status. CHAMPS has also received funding from the Healthy Eating Research program of the Robert Wood Johnson Foundation (grant 77237; February 2020) to perform a Reach Effectiveness - Adoption Implementation Maintenance (RE-AIM) analysis³⁶ of the components of CHAMPS that appear to have been most effective in making change in Mississippi.

We note that, in early 2020, numerous Mississippi hospitals were scheduled for BFUSA assessments, but progress was halted by the coronavirus disease 2019 pandemic, as BFUSA postponed all on-site assessments in March 2020. As of August 2021, assessments resumed. One CHAMPS hospital has already gained designation since this resumption, and we anticipate more will follow. We estimate that many more Mississippi hospitals would have gained designation earlier had the pandemic not intervened.

The study has some limitations. Hospitals enrolled with a goal of improving maternity care practices and increasing breastfeeding rates. Hospitals collected their own data and were not blinded to the desired outcomes. Also, there is the potential for inaccuracies in the

monthly data in terms of race/ethnicity categories if hospitals used the medical record as the source for race/ethnicity instead of the birth certificate. We did not formally or informally assess which source hospitals used and, therefore, cannot comment on how often hospitals were able to use birth certificate data versus hospital record data. However, our analysis using GEEs allowed us to account for the autocorrelation of the data over time and quantify the strength of the relationship between key process measures and breastfeeding rates. Further study is warranted to examine actual internal processes and progress by hospitals that have contributed to how quickly they implemented change.

Another limitation is that the average rates we present in this article do not reflect the practices and outcomes at individual hospitals. Data were published in aggregate, but through our access to individual-level hospital data, we were aware of some racial inequities, for example, in skin-to-skin and rooming-in practices at baseline, which were not reflected in the overall analysis.

CONCLUSION

An initiative to increase compliance with the Ten Steps, incorporating community engagement as well as hospital-based change, decreased racial inequities in breastfeeding initiation in Mississippi, where breastfeeding rates are low and health outcomes are poor. The initiative also significantly increased breastfeeding initiation and exclusivity and skin-to-skin and rooming-in rates across enrolled hospitals and catalyzed activity throughout the state.

ABBREVIATIONS

BFHI: Baby-Friendly Hospital Initiative
BFUSA: Baby-Friendly United States of America
CHAMPS: Communities and Hospitals Advancing Maternity Practices
CI: confidence interval
GEE: generalized estimating equation
QI: quality improvement
RR: rate ratio
ROSE: Reaching our Sisters Everywhere
WIC: Supplemental Nutrition Program for Women, Infants, and Children

REFERENCES

1. Anstey EH, Chen J, Elam-Evans LD, Perrine CG. Racial and geographic differences in breastfeeding - United States, 2011-2015. *MMWR Morb Mortal Wkly Rep.* 2017; 66(27):723-727
2. Beaugregard JL, Hamner HC, Chen J, Avila-Rodriguez W, Elam-Evans LD, Perrine CG. Racial disparities in breastfeeding initiation and duration among U.S. infants born in 2015. *MMWR Morb Mortal Wkly Rep.* 2019;68(34):745-748
3. Gallo S, Kogan K, Kitsantas P. Racial and ethnic differences in reasons for breastfeeding cessation among women participating in the Special Supplemental Nutrition Program for Women, Infants, and Children. *J Midwifery Womens Health.* 2019;64(6):725-733
4. 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 Pediatr.* 2019;173(12):e193319
5. Croft JB, Wheaton AG, Liu Y, et al. Urban-rural county and state differences in chronic obstructive pulmonary disease - United States, 2015. *MMWR Morb Mortal Wkly Rep.* 2018;67(7):205-211
6. Dwyer-Lindgren L, Bertozzi-Villa A, Stubbs RW, et al. Trends and patterns of differences in chronic respiratory disease mortality among US counties, 1980-2014. *JAMA.* 2017;318(12):1136-1149
7. Robbins C, Boulet SL, Morgan I, et al. Disparities in preconception health indicators - Behavioral Risk Factor Surveillance System, 2013-2015, and Pregnancy Risk Assessment Monitoring System, 2013-2014. *MMWR Surveill Summ.* 2018;67(1): 1-16
8. Liu L, Yin X, Chen M, Jia H, Eisen HJ, Hofman A. Geographic variation in heart failure mortality and its association with hypertension, diabetes, and behavioral-related risk factors in 1,723 counties of the United States. *Front Public Health.* 2018;6:132
9. Aranmolate R. Prevalence of obesity among youths in Mississippi: United States, 1999-2015. *Int J Adolesc Med Health.* 2017;32(3)
10. Mendy VL, Vargas R, Cannon-Smith G, Payton M. Overweight, obesity, and extreme obesity among Mississippi adults, 2001-2010 and 2011-2015. *Prev Chronic Dis.* 2017;14:E49
11. Victora CG, Bahl R, Barros AJ, et al; Lancet Breastfeeding Series Group. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *Lancet.* 2016;387(10017):475-490
12. Connell CL, Wang SC, Crook L, Yadrick K. Barriers to healthcare seeking and provision among African American adults in the rural Mississippi Delta region: community and provider perspectives. *J Community Health.* 2019;44(4):636-645
13. Feldman-Winter L, Ustianov J, Anastasio J, et al. Best Fed Beginnings: a nationwide quality improvement initiative to increase breastfeeding. *Pediatrics.* 2017;140(1):e20163121
14. Philipp BL, Merewood A, Miller LW, et al. Baby-friendly hospital initiative improves breastfeeding initiation rates in a US hospital setting. *Pediatrics.* 2001;108(3): 677-681
15. Merewood A, Bugg K, Burnham L, et al. Addressing racial inequities in breastfeeding in the southern United States. *Pediatrics.* 2019;143(2): e20181897
16. Ware JL, Schetzina KE, Morad A, Barker B, Scott TA, Grubb PH. A statewide quality improvement collaborative to increase breastfeeding rates in Tennessee. *Breastfeed Med.* 2018;13(4): 292-300
17. Jung S, Nobari TZ, Whaley SE. Breastfeeding outcomes among WIC-participating infants and their relationships to Baby-Friendly Hospital practices. *Breastfeed Med.* 2019;14(6):424-431
18. Nobari TZ, Jiang L, Wang MC, Whaley SE. Baby-Friendly Hospital Initiative and breastfeeding among WIC-participating infants in Los Angeles County. *J Hum Lact.* 2017;33(4):677-683
19. Kramer MS, Chalmers B, Hodnett ED, et al; PROBIT Study Group (Promotion of Breastfeeding Intervention Trial). Promotion of Breastfeeding Intervention Trial (PROBIT): a randomized trial in the Republic of Belarus. *JAMA.* 2001;285(4): 413-420
20. Li Z, Mannava P, Murray JCS, et al; Western Pacific Region Early Essential Newborn Care Working Group. Association between early essential newborn care and breastfeeding outcomes in eight countries in Asia and the Pacific: a cross-sectional observational study. *BMJ Glob Health.* 2020;5(8):e002581
21. Patterson JA, Keuler NS, Olson BH. The effect of Baby-friendly status on exclusive breastfeeding in U.S. hospitals. *Matern Child Nutr.* 2018;14(3):e12589
22. Taylor EC, Nickel NC, Labbok MH. Implementing the Ten Steps for Successful Breastfeeding in hospitals serving low-wealth patients. *Am J Public Health.* 2012;102(12):2262-2268
23. Karol S, Tah T, Kenon C, et al. Bringing Baby-Friendly to the Indian Health Service: a systemwide approach to implementation. *J Hum Lact.* 2016;32(2): 369-372
24. Merewood A. Baby-Friendly and the Indian Health Service: a new standard of care. *J Hum Lact.* 2015;31(2): 207-208
25. Merewood A, Mehta SD, Chamberlain LB, Philipp BL, Bauchner H. Breastfeeding rates in US Baby-Friendly hospitals: results of a national survey. *Pediatrics.* 2005;116(3):628-634
26. Merewood A, Philipp BL, Chawla N, Cimo S. The baby-friendly hospital initiative increases breastfeeding rates in a US neonatal intensive care unit. *J Hum Lact.* 2003;19(2):166-171
27. Philipp BL, Malone KL, Cimo S, Merewood A. Sustained breastfeeding rates at a US baby-friendly hospital. *Pediatrics.*

- 2003;112(3, Pt 1). Available at: www.pediatrics.org/cgi/content/full/112/3Pt1/e234
28. The Joint Commission. *Specifications Manual for Joint Commission National Quality Measures*. Oakbrook Terrace, IL: The Joint Commission; 2012
 29. Moore ER, Bergman N, Anderson GC, Medley N. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database Syst Rev*. 2016;11(11):CD003519
 30. Jaafar SH, Ho JJ, Lee KS. Rooming-in for new mother and infant versus separate care for increasing the duration of breastfeeding. *Cochrane Database Syst Rev*. 2016;(8):CD006641
 31. Kusko M, Benko R. Skin-to-skin contact for improved duration of breastfeeding. *Am Fam Physician*. 2019;100(3): online
 32. Burnham L, Gambari A, Beliveau P, Ustianov J, Parker MG, Merewood A. Perspectives of nurses in Mississippi on implementation of the Baby-Friendly Hospital Initiative [published online ahead of print March 26, 2021]. *J Obstet Gynecol Neonatal Nurs*. doi: 10.1016/j.jogn.2021.02.010
 33. Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. Standards for Quality Improvement Reporting Excellence 2.0: revised publication guidelines from a detailed consensus process. *J Surg Res*. 2016;200(2):676–682
 34. Mitty E. Hastings Center special report: the ethics of using QI methods to improve health care quality and safety. *J Nurs Care Qual*. 2007;22(2): 97–101
 35. Division of Nutrition Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion. *Breastfeeding Rates from the National Immunization Study*. Atlanta, GA: Centers for Disease Control and Prevention; 2020
 36. Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *Am J Public Health*. 1999;89(9): 1322–1327