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Abstract

Breastfeeding provides optimal nutrition for infants, including short- and long-term health benefits for baby and mother. Maternity care practices supporting breastfeeding after delivery increase the likelihood of exclusive breastfeeding. This study explores trends in early infant feeding practices by maternal race and other characteristics in Hawai‘i. Data from a linked 2008–2015 Hawai‘i Newborn Metabolic Screening and Birth Certificate file for 128,399 singleton term infants were analyzed. Early infant feeding occurring 24–48 hours after delivery and before discharge was categorized: Early formula feeding; early mixed feeding; and early exclusive breastfeeding. Differences were assessed over time by maternal race and other socio-demographic characteristics. Further assessment of maternal race included a generalized logit model adjusting for maternal age, marital status, county of residence, type of birth attendant, and birth year. Statewide, early exclusive breastfeeding increased from 58.8% in 2008 to 79.1% in 2015 (relative increase=+35%); early mixed feeding declined from 31.1% to 16.0% (relative decrease=-49%) and early formula feeding declined from 10.1% to 4.9% (relative decrease=-51%). Most maternal race subgroups experienced increases in early exclusive breastfeeding and decreases in mixed and formula. Japanese mothers were 2.15 (95%CI=1.90–2.42) and Korean mothers were 1.73 (95%CI=1.37–2.18) times more likely to practice early exclusive breastfeeding compared with white mothers. Several subgroups were less likely to practice early exclusive breastfeeding compared with white mothers. Substantial increases in early exclusive breastfeeding in Hawai‘i occurred across all subgroups. Development of culturally appropriate hospital practices, particularly in those with persistently lower estimates, could help improve early exclusive breastfeeding.

Keywords

early infant feeding, breastmilk, disparities, exclusive breastfeeding, Native Hawaiian, Other Pacific Islanders, Asians, Hawai‘i

Abbreviations

NHOP= Native Hawaiian or Other Pacific Islander  
OHSM = Office of Health Status and Monitoring  
PRAMS = Pregnancy Risk Assessment Monitoring System  
WIC = Special Supplemental Nutrition Program for Women, Infant, and Children

Background

Breastfeeding is cost-effective and provides medical, nutritional, developmental, psychological, social, economic, and environmental advantages for the health of both mother and child. In contrast, formula-fed children may require more doctor visits and are at higher risk for childhood obesity, diabetes, asthma, and other health issues. To increase the uptake of breastfeeding, several organizations endorse its benefits. For example, the American Academy of Pediatrics, American College of Obstetricians and Gynecologists, and the American Academy of Family Physicians promote exclusive breastfeeding for approximately the first 6 months after delivery, followed by continued breastfeeding with complementary foods introduction, and ongoing support of breastfeeding for at least one year or as long as mutually desired by mother and child.

The Ten-Steps to Successful Breastfeeding (Ten-Steps) is accepted as the standard of care for maternity care in hospitals in establishing and promoting breastfeeding. These steps are a set of evidence-based practices that improve the maternity care provided to patients in the hospital that support optimal breastfeeding outcomes and include: written policies; ensure appropriate training of staff; inform all pregnant women on the benefits and management of breastfeeding; timely initiation of breastfeeding; ensure women are educated on maintaining lactation; ensure no food or drink other than breast milk are provided to infants unless medically indicated; practice rooming in (sharing a bedroom with the infant); encourage breastfeeding on demand; no use of teats or pacifiers; and foster breastfeeding support groups that women can access upon discharge.

In 2010, the Hawai‘i State Department of Health developed an initiative to promote breastfeeding using the Ten-Steps through the Baby-Friendly Hawai‘i Project. This project improves maternity care practices in the critical early postpartum period by supporting health systems through staff training and on-going technical assistance to all birthing hospitals in the State. In 2011 the US Surgeon General Call to Action outlined many barriers to breastfeeding. The report included a lack of maternal knowledge on the benefits of breastfeeding, social norms favorable toward formula feeding, embarrassment, lactation problems, poor family and social support, lack of supportive environments at work, and health services-related barriers. Health services related barriers included the early hospital experience of breastfeeding. The Call to Action included the Ten-Steps to Successful Breastfeeding (Ten-Steps) in the final recommendations.

There are about 18,000 births annually amongst a population of nearly 1.4 million people in Hawai‘i. Hawai‘i is composed of a diverse population that may have differences in early infant feeding. Analysis of data collected in the state of Hawai‘i of-
fers an opportunity to understand differences in breastfeeding
initiation or early experience of feeding among a wide variety
of racial and ethnic subgroups including Asian and Native
Hawaiian or Other Pacific Islander (NHOPI) subgroups. Asians
and NHOPI are a diverse population consisting of several
distinct subgroups with different characteristics that include
language, occupations, culture, and length of residence in the
United States.13-14

A Hawai‘i Pregnancy Risk Assessment Monitoring System
(PRAMS) study based on 2004-2008 data, prior to implement-
tion of the Baby-Friendly Hawai‘i Project, highlighted that
Asian and NHOPI subgroups were less likely to exclusively
breastfeed at least 8 weeks compared to white mothers.15 The
study highlighted differences among the Asian and NHOPI
subgroups at 8 weeks. However, it is unknown whether there are
differences in early infant feeding experience in the hospital at
the population level among the diverse race groups in Hawai‘i.

An overall increase occurred statewide in early exclusive
breastfeeding, indicated by Newborn Metabolic Screening data
in Hawai‘i between 2009 and 2014, covering the time since the
Baby-Friendly Hawai‘i Project started.16 However, it is unclear
if these improvements were seen across various maternal race
and other characteristic subgroups. The aims of this paper are
to report the trends in early infant feeding practices by maternal
race and other characteristics in Hawai‘i and to explore further
some differences in early infant feeding practices in maternal
race compared with white mothers accounting for the other
characteristics.

Methods

This is a retrospective, cross-sectional descriptive secondary
analysis of de-identified linked data provided to the researcher
after the linkage was completed. The analysis was considered
as exempt from Institutional Review Board approval by the
Hawai‘i State Department of Health.

The Hawai‘i Newborn Metabolic Screening Program collects
information and a blood spot specimen to identify 33 rare meta-
bolic conditions early for appropriate counseling and referral to
treatment among families with affected newborns. The Hawai‘i
State Department of Health Office of Health Status and Monitor-
ing (OHSM) collects vital statistics for the state on all births.
Linkage of birth certificate and metabolic screening data based
on patient identifiers (eg, names, dates, weight, times, institution)
using a combination of 3-4 variables per each of 15 iterations
was done by staff at OHSM. For the time period included in
this manuscript, the linkage rate between the two sources was
99.4% (n=963 not linked). A de-identified analytic file covering
data collected for births from 2008-2015 was provided to the
researchers for analysis. A total of 150,589 births were identi-
ified in the linked data set. Information on early infant feeding
was obtained from the Newborn Metabolic Screening program
data while maternal race, other socio-demographic, and some
clinical based information such as gestational age, birthweight,
delivery method, and maternal factors complicating delivery
were included in the linked OHSM birth certificate file. Analysis
was limited to term singleton deliveries (gestational age ≥37
weeks) to minimize concerns about a multiple gestation or
preterm infants having medical concerns that could influence
early infant feeding. The potential samples of 132,867 were
available for analysis.

The protocol for the Newborn Metabolic Screening test is to col-
lect the blood spot specimen and other information between 24
and 48 hours post-delivery for both hospital and out of hospital
births. Infant feeding information is based on an assessment
of the last 24 hours at time of newborn metabolic testing. If an
infant is discharged less than 24 hours after delivery, the speci-
men and other information is collected at time of discharge.
Infant feeding practices were based on reporting at discharge.
The information on infant feeding was categorized into three
mutually exclusive categories used for analysis in this paper:
Early exclusive breastfeeding (ie, received only human milk
in the last 24 hours), early mixed feeding (ie received both
human milk and formula, though not necessarily at the same
time, during the last 24 hours), and early formula feeding (ie,
received only infant formula in the last 24 hours). There were
4468 excluded records with a feeding status of “Other,” “Nil per
Os (“NPO”) or nothing by mouth, “Tube Feeding,” or missing,
resulting in the final study sample of 128,399 observations.

The Hawai‘i birth certificate collects information on all reported
race groups at delivery for both parents. This information is
converted to 1 of 22 single race groups by an algorithm imple-
mented by OHSM.16 The algorithm prioritizes Hawaiian for
those that list multiple race groups, followed by the first non-
Caucasian race reported. Thus, those that report being Hawaiian
in combination with another race group would be considered
part-Hawaiian. All other multiple race groups without Hawai-
ian listed are coded to a single race group in the algorithm.
For consistency with race reporting in Hawai‘i, this analysis
combines part-Hawaiian and Hawaiian single race groups to-
gether, referred to as Native Hawaiian. The 22 maternal single
race groups provided by OHSM were categorized into 9 total
race groups for this analysis which reflected those commonly
reported in Hawai‘i, and to ensure sufficient sample size for
reliable estimates: white (Caucasian), black, Native Hawaiian
(Hawaiian and part-Hawaiian), Samoan, Filipino, Japanese,
Chinese, Korean, and all others (including Vietnamese, Asian
Indian, Other Asian, Guamanian/Chamorro, other Pacific Is-
lander, Puerto Rican, Portuguese, Cuban, Mexican, American
Indian/Alaskan Native, all others). Maternal race was used for
this analysis to be consistent with general reporting of birth
outcomes by race.

Maternal age, calculated by mother’s age upon birth of the infant,
was categorized into the following 5 year age groups other than
at tails which included commonly used categories and ensured
at least 10% in the youngest group: Under 20, 20-24, 25-29,
30–34, and 35 or more years. Marital status was considered married or unmarried as reported at time of delivery on the birth certificate. Birth attendant was categorized as physician, midwife, or other. The other group may include out of hospital deliveries attended by bystanders, non-licensed providers, or where the attendant is unknown, but that specific level of detail was not available in analytic data set. Resident zip code, as collected in the birth certificate data, was used to categorize into the four counties of residence in the State.

Annual estimates for the prevalence of each feeding type and bivariate associations with maternal race, maternal age, marital status, type of birth attendant, and county of residence were calculated. Relative changes from 2008 to 2015 were calculated for each feeding type overall and among all maternal race and other subgroups. The Cochran-Armitage Trend test assesses unadjusted trends in prevalence over time for each outcome (ie, early exclusive breastfeeding, early mixed feeding, and early formula feeding) overall and among all subgroups.

To assess trends over time in each maternal race subgroup while accounting for other factors, individual generalized logit modeling determined crude and adjusted odd ratios for early exclusive breastfeeding and early mixed feeding compared with the reference group of early formula feeding for each maternal race subgroup. The models for each maternal race subgroup were performed with birth year as a primary predictor (categorical with comparison from 2015 to 2008) with adjustment for maternal age, marital status, birth attendant, and county of residence. The factors were selected based on their availability in the database and review of the general literature as possible predictors of infant feeding. For simplicity, only the results of the birth year odds ratios stratified by maternal race for early exclusive breastfeeding compared with formula feeding are shown in the manuscript.

To assess differences among maternal race subgroups for the entire time period of the study while accounting for the influence of these other factors, a generalized logit model was developed with maternal race subgroup as the primary predictor and adjustment for the other factors noted previously for the trend model along with using birth year as a categorical variable. SAS version 9.4 (SAS Institute, Inc., Cary, North Carolina) was used for analysis with a two-tailed P-value of <.05 considered statistically significant.

**Results**

Within the final analytic sample (N=128,399), nearly two-thirds of births were to mothers who identified within the following race groups: Native Hawaiian (26.8%), white (23.7%), and Filipino (16.9%; Table 1). Over half the births were to mothers who were 25-29 (28.1%) or 30-34 (25.3%) years of age. Nearly two-thirds of the births were to married (62.7%) mothers and nearly all births were delivered by a physician (89.6%). Nearly three-quarters of the births in the sample were to mothers residing in Honolulu County (71.9%).

Statewide, the prevalence of early exclusive breastfeeding increased from 58.8% in 2008 to 79.1% in 2015 (a relative increase of +35%; Table 2). Early exclusive breastfeeding increased among all maternal race groups with Samoan mothers having the largest relative increase (+71%), followed by all others (9.4%).
Table 2. Relative Changes in Early Infant Feeding* by Maternal Race and Other Characteristics, 2008–2015

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Early Exclusive Breastfeeding</th>
<th>Early Mixed Feeding</th>
<th>Early Formula Feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008 %</td>
<td>2015 %</td>
<td>Relative Change†</td>
</tr>
<tr>
<td>Maternal Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>white</td>
<td>75.9</td>
<td>87.7</td>
<td>16%</td>
</tr>
<tr>
<td>black</td>
<td>59.6</td>
<td>72.9</td>
<td>22%</td>
</tr>
<tr>
<td>Native Hawaiian</td>
<td>52.6</td>
<td>76.0</td>
<td>44%</td>
</tr>
<tr>
<td>Samoan</td>
<td>37.1</td>
<td>63.4</td>
<td>71%</td>
</tr>
<tr>
<td>Filipino</td>
<td>52.0</td>
<td>77.4</td>
<td>49%</td>
</tr>
<tr>
<td>Japanese</td>
<td>67.1</td>
<td>84.7</td>
<td>30%</td>
</tr>
<tr>
<td>Chinese</td>
<td>63.1</td>
<td>74.5</td>
<td>18%</td>
</tr>
<tr>
<td>Korean</td>
<td>66.1</td>
<td>83.9</td>
<td>27%</td>
</tr>
<tr>
<td>All others</td>
<td>45.8</td>
<td>70.7</td>
<td>54%</td>
</tr>
<tr>
<td>Maternal Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20 years</td>
<td>51.1</td>
<td>72.2</td>
<td>51%</td>
</tr>
<tr>
<td>20–24 years</td>
<td>55.4</td>
<td>77.4</td>
<td>40%</td>
</tr>
<tr>
<td>25–29 years</td>
<td>59.9</td>
<td>78.7</td>
<td>31%</td>
</tr>
<tr>
<td>30–34 years</td>
<td>62.7</td>
<td>81.3</td>
<td>30%</td>
</tr>
<tr>
<td>35 years and older</td>
<td>61.4</td>
<td>79.2</td>
<td>29%</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>64.2</td>
<td>81.6</td>
<td>27%</td>
</tr>
<tr>
<td>Unmarried</td>
<td>49.7</td>
<td>74.9</td>
<td>51%</td>
</tr>
<tr>
<td>Birth Attendant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physician</td>
<td>57.7</td>
<td>77.5</td>
<td>34%</td>
</tr>
<tr>
<td>Midwife</td>
<td>70.6</td>
<td>90.5</td>
<td>28%</td>
</tr>
<tr>
<td>Other</td>
<td>69.7</td>
<td>88.2</td>
<td>27%</td>
</tr>
<tr>
<td>County of Residence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawai‘i</td>
<td>59.1</td>
<td>71.5</td>
<td>21%</td>
</tr>
<tr>
<td>Honolulu</td>
<td>58.2</td>
<td>79.4</td>
<td>36%</td>
</tr>
<tr>
<td>Kauai</td>
<td>80.3</td>
<td>92.5</td>
<td>15%</td>
</tr>
<tr>
<td>Maui</td>
<td>52.7</td>
<td>81.1</td>
<td>54%</td>
</tr>
<tr>
<td>Overall</td>
<td>58.8</td>
<td>79.1</td>
<td>35%</td>
</tr>
</tbody>
</table>

Notes: Data source is the Newborn Metabolic Screening-Linked Birth Certificate File. Individual subgroup column totals may not sum to overall total due to missing/unknown data and row percentages may not sum to 100% due to rounding.
*Early is based on time of newborn metabolic screening test, less than 48 hours from discharge.
†Relative Change is defined by: (Prevalence in 2015 – Prevalence in 2008) / (Prevalence in 2008)
‡Trend p-value based on Cochrane-Armitage Trend Test
§All others include Vietnamese, Asian Indian, other Asian, Guamanian/Chamorro, other Pacific Islander, Puerto Rican, Portuguese, Cuban, Mexican, American Indian/Alaskan Native, and all others.

Conversely, the prevalence of early mixed feeding decreased from 31.1% in 2008 to 16.0% in 2015 (a relative decrease of -49%; Table 2). Early mixed feeding declined among all maternal race groups with Japanese mothers having the largest relative decrease (-61%), followed by Filipino (-53%), Korean (-52%), and Native Hawaiian (-48%) mothers (Table 2 and Figure 2). Declines in early mixed feeding were also seen across all characteristic subgroups categorized by maternal age, marital status, birth attendant, and county of residence (Table 2).

Statewide, the prevalence of early formula feeding decreased from 10.1% in 2008 to 4.9% in 2015 (a relative decrease of -51%; Table 2). Early formula feeding declined among all maternal race groups with Japanese mothers having the largest relative decrease (-61%), followed by Filipino (-53%), Korean (-52%), and Native Hawaiian (-48%) mothers (Table 2 and Figure 2).
Figure 1. Early Exclusive Breastfeeding by Maternal Race, Hawai‘i Newborn Metabolic Screening-Linked Birth Certificate, File, 2008-2015

Figure 2. Early Formula Feeding by Maternal Race, Hawai‘i Newborn Metabolic Screening-Linked Birth Certificate File, 2008-2015
race groups (except Korean mothers) with Japanese mothers having the largest relative decrease (-65%; Table 2 and Figure 3). Declines in early formula feeding were also seen across all characteristic subgroups categorized by maternal age, marital status, birth attendant, and county of residence (Table 2).

Overall, there was a 2.78 times greater odds of early exclusive breastfeeding versus early formula feeding in 2015 compared to 2008 after adjustment for maternal race, maternal age, marital status, birth attendant, and county of residence (Table 3). Additionally, within each maternal race subgroup, adjusted odds ratios indicated women who delivered in 2015 were more likely to practice early exclusive breastfeeding than early formula feeding compared with women who delivered in 2008 (Table 3).

In the generalized logit model to compare differences by maternal race subgroups, Japanese and Korean mothers were more likely to practice early exclusive breastfeeding (reference=early formula feeding) compared with white mothers after adjusting for maternal age, marital status, birth attendant, county of residence, and birth year (Table 4). However, Samoan, Black, Native Hawaiian, Filipino, Chinese, and all others were all less likely to practice early exclusive breastfeeding compared with white mothers. In the adjusted analysis for early mixed feeding (reference=early formula feeding), Japanese, Korean, Filipino, Chinese, Native Hawaiian, Samoan, and all others were more likely to practice early mixed feeding compared with white mothers.

<table>
<thead>
<tr>
<th>Maternal Race</th>
<th>Crude OR (95% CI)</th>
<th>Adjusted OR a (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>white</td>
<td>2.60 (2.11 - 3.21)</td>
<td>2.41 (1.95 - 2.99)</td>
</tr>
<tr>
<td>black</td>
<td>2.40 (1.54 - 3.72)</td>
<td>2.11 (1.35 - 3.32)</td>
</tr>
<tr>
<td>Native Hawaiian</td>
<td>2.97 (2.55 - 3.46)</td>
<td>3.05 (2.60 - 3.56)</td>
</tr>
<tr>
<td>Samoan</td>
<td>3.59 (2.35 - 5.49)</td>
<td>3.48 (2.23 - 5.44)</td>
</tr>
<tr>
<td>Filipino</td>
<td>3.17 (2.53 - 3.97)</td>
<td>3.29 (2.62 - 4.13)</td>
</tr>
<tr>
<td>Japanese</td>
<td>3.79 (2.34 - 6.13)</td>
<td>3.80 (2.29 - 6.31)</td>
</tr>
<tr>
<td>Chinese</td>
<td>1.97 (1.26 - 3.10)</td>
<td>2.20 (1.39 - 3.46)</td>
</tr>
<tr>
<td>Korean</td>
<td>2.98 (1.04 - 8.49)</td>
<td>2.68 (0.93 - 7.74)</td>
</tr>
<tr>
<td>All others a</td>
<td>2.77 (2.12 - 3.82)</td>
<td>2.97 (2.26 - 3.89)</td>
</tr>
<tr>
<td>Overall</td>
<td>2.80 (2.56 - 3.06)</td>
<td>2.78 (2.54 - 3.05)</td>
</tr>
</tbody>
</table>

Note: Data source is the Newborn Metabolic Screening-Linked Birth Certificate File. Individual models for each Maternal Race group and overall were used to assess trend difference between 2015 and 2008.

a CI denotes Confidence interval around the odds ratio estimate

b Individual models were adjusted for maternal age, marital status, birth attendant, and county of residence

All others include Vietnamese, Asian Indian, other Asian, Guamanian/Chamorro, other Pacific Islander, Puerto Rican, Portuguese, Cuban, Mexican, American Indian/Alaskan Native, and all others.
Discussion

These findings highlight early infant feeding patterns among a diverse subgroup of maternal races not previously described in the general literature. There was an overall improvement in early exclusive breastfeeding and declines in early mixed feeding and in early formula feeding among almost all maternal race subgroups in Hawai‘i from 2008–2015. Further evaluation identified some persistent differences in maternal race subgroups. Additionally, there were improvements in early exclusive breastfeeding for other socio-demographic characteristics in the unadjusted analysis.

There are likely several factors contributing to the noted improvements in early infant feeding patterns seen among maternal race subgroups. In 2010, the Baby Friendly Hawai‘i Project started promoting breastfeeding support in hospitals, through maternity care practices without giving specific attention to high-risk populations. The study results, showing improvement in all maternal race and other subgroups, support the premise that this system level change helped improve early infant feeding rates for all women. Additionally, other system level factors including the establishment of Joint Commission measures in 2010 for breastfeeding at hospitals or other smaller scale interventions may have contributed to this large-scale improvement. The increasing awareness of the benefits of breastfeeding in society over time also likely contributed to the improvement. The descriptive nature of this study does not allow further exploration but are briefly mentioned here. For example, breastfeeding is promoted though legislative laws to protect the ability of women to breastfeed in the workplace and in public. The Hawai‘i’s Special Supplemental Nutrition Program for Women Infants and Children (WIC) provides education on infant feeding to nearly half the mothers in the state on breastfeeding and supports policy and workplace efforts across the state. Despite the overall significant improvement noted, some notable differences remain in early infant feeding patterns, among maternal race subgroups. Understanding the reasons for these differences could help inform the development of programs to address disparities. Rates of breastfeeding change as immigrant populations become acculturated to living in the United States. Other key factors including employment where breastfeeding is not supported and general societal expectations are also important for breastfeeding. Finally, other factors including health literacy may also be related to early infant feeding as it has been associated with other perinatal outcomes in Hawai‘i including low birth weight, cesarean delivery, obstetric trauma, medical decision making, and vaginal birth after cesarean and in other settings for breastfeeding. Understanding and learning from differences within the diverse race groups in Hawai‘i is challenging but clarifying the influence due to immigration, acculturation, health literacy, employment, and cultural factors through both quantitative and qualitative approaches could be helpful in developing targeted interventions among these particular subgroups.

The accuracy of the feeding pattern reported on the Newborn Metabolic Screening data and the quality of the data collection may vary from hospital to hospital and for births outside a hospital potentially influencing our results. Additionally, the analysis is based on the feeding pattern noted within the first 24–48 hours of life only, but this is a critical time period that is predictive of future breastfeeding patterns. This analysis was limited to term newborns to minimize concerns about

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**Table 4. Maternal Race Generalized Logit Model of Early Exclusive Breastfeeding and Early Mixed Feeding.**

<table>
<thead>
<tr>
<th>Maternal Race</th>
<th>Early Exclusive Breastfeeding</th>
<th>Early Mixed Feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crude OR (95% CI)</td>
<td>Adjusted OR* (95% CI)</td>
</tr>
<tr>
<td>white</td>
<td>ref ref</td>
<td>ref ref</td>
</tr>
<tr>
<td>black</td>
<td>0.44 (0.39–0.50)</td>
<td>0.48 (0.42–0.54)</td>
</tr>
<tr>
<td>Native Hawaiian</td>
<td>0.44 (0.42–0.47)</td>
<td>0.57 (0.53–0.61)</td>
</tr>
<tr>
<td>Samoan</td>
<td>0.20 (0.18–0.23)</td>
<td>0.25 (0.23–0.28)</td>
</tr>
<tr>
<td>Filipino</td>
<td>0.68 (0.63–0.73)</td>
<td>0.80 (0.74–0.86)</td>
</tr>
<tr>
<td>Japanese</td>
<td>1.77 (1.58–1.99)</td>
<td>2.15 (1.90–2.42)</td>
</tr>
<tr>
<td>Chinese</td>
<td>0.74 (0.66–0.84)</td>
<td>0.83 (0.73–0.94)</td>
</tr>
<tr>
<td>Korean</td>
<td>1.54 (1.22–1.94)</td>
<td>1.73 (1.37–2.18)</td>
</tr>
<tr>
<td>All others*</td>
<td>0.55 (0.51–0.59)</td>
<td>0.65 (0.60–0.71)</td>
</tr>
</tbody>
</table>

Note: Data source is the Newborn Metabolic Screening-Linked Birth Certificate File. Formula Feeding is the referent comparison group for each outcome.

*Adjusted for maternal age, marital status, birth attendant, county of residence, and birth year.

*All others include Vietnamese, Asian Indian, other Asian, Guamanian/Chamorro, other Pacific Islander, Puerto Rican, Portuguese, Cuban, Mexican, American Indian/Alaskan Native, and all others.

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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crude OR (95% CI)</td>
<td>Adjusted OR* (95% CI)</td>
</tr>
<tr>
<td>white</td>
<td>ref ref</td>
<td>ref ref</td>
</tr>
<tr>
<td>black</td>
<td>0.44 (0.39–0.50)</td>
<td>0.48 (0.42–0.54)</td>
</tr>
<tr>
<td>Native Hawaiian</td>
<td>0.44 (0.42–0.47)</td>
<td>0.57 (0.53–0.61)</td>
</tr>
<tr>
<td>Samoan</td>
<td>0.20 (0.18–0.23)</td>
<td>0.25 (0.23–0.28)</td>
</tr>
<tr>
<td>Filipino</td>
<td>0.68 (0.63–0.73)</td>
<td>0.80 (0.74–0.86)</td>
</tr>
<tr>
<td>Japanese</td>
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</tr>
<tr>
<td>Chinese</td>
<td>0.74 (0.66–0.84)</td>
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</tr>
<tr>
<td>Korean</td>
<td>1.54 (1.22–1.94)</td>
<td>1.73 (1.37–2.18)</td>
</tr>
<tr>
<td>All others*</td>
<td>0.55 (0.51–0.59)</td>
<td>0.65 (0.60–0.71)</td>
</tr>
</tbody>
</table>

Note: Data source is the Newborn Metabolic Screening-Linked Birth Certificate File. Formula Feeding is the referent comparison group for each outcome.

*Adjusted for maternal age, marital status, birth attendant, county of residence, and birth year.

*All others include Vietnamese, Asian Indian, other Asian, Guamanian/Chamorro, other Pacific Islander, Puerto Rican, Portuguese, Cuban, Mexican, American Indian/Alaskan Native, and all others.
medical conditions associated with prematurity that could influence early breastfeeding, but overall results without this exclusion demonstrated very similar patterns and rates (data not shown). Moreover, race was based on the maternal single race provided by OHSM, which limits the ability to generalize these results to all Asian and NHOPHI subgroups particularly due to the inability to separate out those women who were of more than 1 race. Additionally, the number of births among some of the other smaller Asian or NHOPHI subgroups were too small (ie, Vietnamese, Micronesian) to be analyzed and may result in different patterns. Moreover, race is a social construct that is not even homogenous within a population and thus there are limitations on its use to characterize populations. Further, the ability to look at the combination of mother and father race or of proportions of various race groups for those that were multirace were not possible with the data provided. Other limitations include the lack of ability to look at other social determinants (ie, income, household federal poverty level, and insurance status) and cultural practices that likely influence infant feeding patterns. The data did not include a woman’s past experience with breastfeeding or familial support of breastfeeding, which are both important predictors for breastfeeding experience and continuation.\textsuperscript{20,39,40} Finally, this study was based on a diverse population in Hawai‘i and although many of these same populations live in communities across the country, these results may not be generalizable to those populations due to acculturation and cultural differences from those found outside Hawai‘i. However, these results may provide insight into early infant feeding patterns in these subgroups, and it will be important to validate these results in other states.

Conclusions

There was substantial improvement in early exclusive breastfeeding in the state of Hawai‘i, coinciding with systemic changes implemented by hospitals. However, some persistent disparities exist among maternal race groups. Further understanding of reasons why certain maternal race subgroups continue to have lower while others have high estimates of early exclusive breastfeeding may help in the development of culturally appropriate hospital practices to address disparities in early infant feeding in Hawai‘i.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the Hawai‘i State Department of Health.

Conflict of Interest

None of the authors identify a conflict of interest.

Disclosure

Donald Hayes initiated his work on the reported research while affiliated with the Hawai‘i State Department of Health. Currently, he is affiliated with the Centers for Disease Control and Prevention’s Division for Heart Disease and Stroke Prevention. The research in this manuscript was completed and submitted outside of the official duties of his current position.

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References


