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Review article

Publicly available Australian hospital data on infant feeding: A review and comparative analysis of outcomes

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ABSTRACT

Background: Breastfeeding is the optimal method of providing infant nutrition. The Baby Friendly Health Initiative (BFHI) is a global strategy to promote breastfeeding. This study aimed to explore infant feeding data in Australian hospitals and compare outcomes between BFHI and non-BFHI accredited hospitals, and between public and private hospitals.

Methods: We targeted publicly available Australian public and private hospital data on breastfeeding outcomes at discharge from 2018 to 2019. We linked the data to the BFHI accredited hospitals and used t tests to compare mean breastfeeding rates and Chi square or Fisher's exact test for categorical variables.

Findings: Across all Australian states and territories, only New South Wales (NSW) and Victoria (VIC) provided the publicly available target data. Breastfeeding indicators were defined differently between these states. In NSW, breastfeeding at discharge was reported as a full breastfeeding rate among live born infants (71 %) whereas in VIC, it was reported as exclusive breastfeeding rates among term babies only (79 %). Comparing public with private hospitals, the rates of full breastfeeding at discharge in NSW and exclusive breastfeeding in VIC were significantly lower among private non-BFHI accredited hospitals compared to public non-BFHI accredited hospitals.

Conclusion: BFHI accreditation can be beneficial in decreasing the rates of commercial milk formula use. Consistent reinforcement of BFHI principles and implementation in both private and public hospitals is required. Regular state monitoring and national dissemination of aggregated data collected using standardised breastfeeding indicators is also essential.

Statement of Significance

Problem

Most women commence breastfeeding in Australia, but less achieve national and international targets. Unsupportive policies and practices can undermine breastfeeding outcomes.

What is already known

The Baby Friendly Health Initiative (BFHI) is a global strategy to support, protect and promote breastfeeding in hospitals, and the community, but there are very few BFHI accredited hospitals in Australia.

What this paper adds

Hospital based data across New South Wales and Victoria revealed a significantly higher rate of commercial milk formula use in private hospitals. Findings add support to the need for the implementation of standardised indicators, greater transparency in reporting outcomes and support for the BFHI.

Abbreviations: ACT, Australian Capital Territory; BFHI, Baby Friendly Health Initiative; LHD, Local Health District; NSW, New South Wales; NT, Northern Territory; QLD, Queensland; SA, South Australia; SEIFA, Socio-Economic Indexes for Areas; TAS, Tasmania; VIC, Victoria; WA, Western Australia; WHO, World Health Organisation.

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Introduction

Breastfeeding is a sociocultural practice that enhances survival of the next generation and represents the biologically normal way of providing optimal nutrition for infants [1]. National and international health services acknowledge the importance of breastfeeding, and following World Health Organisation recommendations to reach optimal population health. However, during the last decade, the low rate of exclusive breastfeeding of infants up to 6 months persists in high income countries such as Australia, the United States of America (USA), Europe, and the United Kingdom (UK) [2]. Instead, the use of commercial milk formula (CMF) is increasing every year and more than $55 billion dollars are spent on the sale of these products globally [3].

According to the last Australian national infant feeding survey conducted in 2010, the overall breastfeeding initiation rate across all jurisdictions was 96 %. However, exclusive breastfeeding rates were 61.4 % at one month, 39.2 % at three months and 15.4 % at five months [4]. These rates fall short of the World Health Organisation's recommendation for babies to be exclusively breastfed for the first six months [5].

Although the reasons for low breastfeeding rates and high consumption of CMF is multi factorial [6–8], one of the reasons could be related to the lack of effective legislation and policies against breast-milk substitute marketing in rich countries [2]. The term breast-milk substitute relates to any product that can interfere with breastfeeding and the scope extends beyond CMF [9]. The Australian policy commitment to supporting breastfeeding was first published in the 1980's with the Dietary Guidelines for Australians and ratifying the International Code of Marketing of Breast-milk Substitutes [10]. Australia's response to the International Code of Marketing is threefold; the National Health & Medical Research Council (NHMRC) dietary guidelines including infant feeding guidelines for health workers; the Food Act prohibition on claims on infant formula packaging, and the 'Marketing in Australia of Infant Formulas (MAIF) Agreement' which is a voluntary and self-regulated code with no effective legislative support [11].

The current Australian policy is the *National Breastfeeding Strategy 2019 and beyond* which aims to achieve an increase in exclusive breastfeeding at six months to 50 % by 2025 [12]. The policy identifies areas of priority and highlights the strategies necessary to achieve the stated goals of increasing breastfeeding prevalence nationally. The strategies include creating a National Breastfeeding Committee, expanding baby-friendly and breastfeeding-friendly environments, increasing pre-registration health professional's education, regulating breastmilk banks plus establishing a mechanism to monitor data [12].

The Baby Friendly Health Initiative (BFHI) `Ten Steps to Successful Breastfeeding,' is specifically identified in Priority 2 of the Australian National Breastfeeding Strategy [12]. The BFHI was launched globally in 1991 by both the World Health Organisation (WHO), and the United Nations International Children's Emergency Fund (UNICEF), to create supportive hospital environments that promote breastfeeding and reduce women's exposure to CMF via industry marketing by becoming compliant with the International Code of Marketing [9]. According to the WHO, for the purpose of BFHI accreditation, at least 75 % of the birthed babies including term and preterm infants must have breastfed or been breastmilk fed exclusively throughout their stay in the facility [9,13]. The BFHI Ten steps to Successful Breastfeeding [5] are shown in Table 1.

The Sax Institute's evidence informing the national policy shows that the BFHI is an effective evidence-based programme that creates an enabling environment for women and their babies to initiate and establish breastfeeding [14]. The reported evidence for effective strategies to promote breastfeeding demonstrates a clear correlation between the level of policy and operational support for the BFHI and positive outcomes for women and their babies [14]. Although BFHI accreditation demonstrates positive impact on women's breastfeeding practices, there is a need for close monitoring and resourcing at hospital level, but this has also been reported as a burden to the health service [15,16].

Prior to exploring state level breastfeeding monitoring systems, we reviewed the available published literature between 2016 and 2022 on breastfeeding rates. We located nine studies reporting on breastfeeding rates [17–25]. The rate of breastfeeding initiation varied between 96 % [23,24] to 86 % [17]. The reports on exclusive breastfeeding at one month varied between 44 [20] to 61 % [21], at three to four months were 33 [20] to 40 % [21] and at six months were between 18 [20] to 21 % [21]. Higher rates of breastfeeding were noted in non-Indigenous compared to Indigenous women [18] and culturally and linguistically diverse women [21]. No research on the impact of BFHI and breastfeeding rates was noted which warranted a further examination. Therefore, we aimed to have a better understanding on the prevalence of Australian hospital infant feeding outcomes and any differences between BFHI accreditation and non-accredited hospitals [17–24]. (Supplementary Table 1)

Method

Study design, aims and objectives

This study had a retrospective cohort design aiming to explore Australian hospital based breastfeeding outcomes and compare them between Baby Friendly Health Initiative (BFHI) accredited and non-accredited hospitals. The objectives were: (a) to gather publicly available data on infant feeding at discharge from hospitals with maternity services in all Australian states and territories; (b) to compare infant feeding indicators between BFHI accredited and non-accredited hospitals, and (c) to compare infant feeding outcomes between public and private hospitals.

Study settings and selection criteria

The study settings included all hospitals with maternity services

Table 1
BFHI ten steps to successful breastfeeding [5].

Ten Steps to Successful Breastfeeding
1a. Comply fully with the International Code of Marketing of Breast-milk Substitutes and relevant World Health Assembly resolutions.
1b. Have a written infant feeding policy that is routinely communicated to staff and parents.
1c. Establish ongoing monitoring and data-management systems.
2. Ensure that staff have sufficient knowledge, competence and skills to support breastfeeding.
3. Discuss the importance and management of breastfeeding with pregnant women and their families.
4. Facilitate immediate and uninterrupted skin-to-skin contact and support mothers to initiate breastfeeding as soon as possible after birth.
5. Support mothers to initiate and maintain breastfeeding and manage common difficulties.
6. Do not provide breastfed newborns any food or fluids other than breast milk, unless medically indicated.
7. Enable mothers and their infants to remain together and to practise rooming-in 24 hours a day.
8. Support mothers to recognise and respond to their infants' cues for feeding.
9. Counsel mothers on the use and risks of feeding bottles, teats and pacifiers.
10. Coordinate discharge so that parents and their infants have timely access to ongoing support and care.

across Australian jurisdictions with six states and two territories: New South Wales (NSW), Queensland (QLD), Victoria (VIC), Tasmania (TAS), South Australia (SA), Western Australia (WA), Australian Capital Territory (ACT) and Northern Territory (NT). The inclusion criteria were both public and private hospitals with maternity services that had hospital-based publicly available data on infant feeding rates. Any study settings without publicly available data on infant feeding rates were excluded from the study. We aimed to compare the infant feeding outcomes between BFHI and non-BFHI accredited hospitals, therefore datasets which did not provide individual hospital data were excluded.

Sampling

Each member of the research team performed online searches for publicly available data in NSW and QLD(EB), VIC and TAS (JH), (SA) and (WA)(SM), ACT) and (NT) (MA). Despite a comprehensive search, we found only two Australian states (NSW and VIC) with publicly available hospital based infant feeding data at individual hospital level. In NSW, the data were accessed from the "Mothers and Babies 2019" report published in 2021 [26], and in VIC via the "Victorian Perinatal Services Performance Indicators Report 2018–2019" [27]. No publicly available breastfeeding data meeting the criteria were located in SA, WA, Queensland, ACT, or NT (Table 2). We found publicly available aggregated data on breastfeeding outcomes in Tasmania, which was excluded from the study as there were no data on individual hospitals. <Please insert Table 2 here>

Data extraction

We collated the raw data from all publicly available data sets in NSW and VIC that reported on infant feeding outcomes during 2019 [26,27].

Table 2
Publicly available hospital level data on breastfeeding outcomes from Australian states and territories (between 2018 and 2019).

States and territories	Availability of breastfeeding outcome data at hospital level	Notes
NSW	Yes	Breastfeeding data included in the NSW Mothers and Babies Report 2019 [26]
VIC	Yes	Breastfeeding data included in the Victorian Perinatal Services Performance Indicators Report 2018–2019 [27].
QLD	No	No breastfeeding data included in the Queensland Mothers and Babies Report 2016 and 2017 [28]
SA	No	No publicly available breastfeeding data located.
WA	No	No breastfeeding data included in the Western Australia Mothers and Babies Report 2015 [29]. Longitudinal data available in the Health and Wellbeing of Children in Western Australia 2018, nil hospital data [30]
TAS	No	Breastfeeding data included in the Council of Obstetric & Paediatric Mortality and Morbidity Annual Report 2018 [31]. Data aggregated across all hospitals and presented as 'any' breastfeeding at discharge at state level. Unable to compare data
NT	No	No publicly available breastfeeding data able to be found
ACT	No	No publicly available breastfeeding data able to be found

We manually inserted data from 125 hospitals into an excel spreadsheet and exported to SPSS software for analysis. The reported data in NSW were captured in 2019 by the Perinatal Data Collection system which is a population-based surveillance system [26]. The Perinatal Data Collection system covers all infant feeding data in NSW public and private hospitals, but does not have individual hospital report if the number of births in a facility is less than 200 per annum. The data is collected mainly from eMaternity and Cerner Systems where health professionals, including midwives, enter the information [26]. In VIC, the data were captured during the financial year period (2018–2019) via the Victorian Perinatal Data Collection system, Victorian Healthcare Experience Survey and the Victorian Admitted Episodes Dataset. The VIC data included every individual hospital's report from both public and private hospitals [27].

Considering that these data sets did not contain any information on the hospital BFHI accreditation status, we extracted the list of BFHI services through publicly available BFHI accreditation data on the Australian BFHI website in October 2020 [32]. We aligned the breastfeeding data from the individually reported hospitals (NSW, n=60 and VIC, n=62) with the list of BFHI accredited hospitals.

It is known that socio-economic status of the population can influence breastfeeding outcomes [33]. Therefore, we used the Socio-Economic Indexes for Areas (SEIFA scores) [34] to identify hospitals in areas of relative socio-economic advantage and disadvantage. SEIFA ranking data is gathered by the Australian Bureau of Statistics from the five yearly Census, and a score of five is for the highest level of advantage, whereas a score of one is for the lowest level of advantage (highest level of disadvantage) [34]. We used this to assess the socio-economic status of the population based on the geographic location of hospitals offering maternity services in the states or territories.

Reported breastfeeding indicators

The main breastfeeding indicators were full breastfeeding and exclusive breastfeeding rates at discharge from hospital. We noticed that the breastfeeding indicators were defined differently in each state. Table 3 provides a definition and description of breastfeeding indicators in each state. For example, breastfeeding indicators in hospitals in NSW were calculated based on the total number of live births regardless of the infant's gestational age at birth, whereas VIC data were based on the number of infants born at 37 weeks or later. Additionally, in VIC, exclusive breastfeeding was reported based on the last feed at the breast prior to discharge, whereas in NSW, fully breastfeeding (breastfed or received expressed breast milk only) at discharge was reported, without any definition of the timeframe. Due to the discrepancy in breastfeeding indicators, we have reported the breastfeeding data separately for each state.

Data analysis

After the data preparation, we cross checked all data and then imported them into IBM SPSS Statistics Software (Version 26) to conduct the analysis. Descriptive statistics were used to describe the demographic data including hospital characteristics. We used Independent Sample T test to compare the means of breastfeeding rates between the BFHI and non-BFHI accredited hospitals and between public and private hospitals. Pearson Chi Square test within the contingency tables was used to compare categorised variables such as infant feeding outcomes with SEIFA score groups [34]. The Fisher's exact test was used when there were more than 20 % of the cells with frequencies of less than five. Based on SEIFA scores, we categorised the hospitals locality into three groups: a) hospitals with the SEIFA score of 3 and less a, b) hospitals with SEIFA score of 4 or more, and c) hospitals with a mixed SEIFA scores ranged between 1 and 5. Then we utilised a 75 percent cutoff to categorise the exclusive breastfeeding rates at discharge from hospital, because this serves as the threshold for any BFHI accreditation

Table 3
Infant feeding indicators in NSW [26] and Breastfeeding indicators in VIC [27].

State	Indicator	Numerator	Denominator
NSW 2019 report	**Full breastfeeding rate**: a percentage of babies fully breastfed at the time of discharge from hospital (Breastfeeding at the breast or consuming expressed milk at discharge - not classified as an indicator but collected and reported).	The number of babies at discharge from the hospital who were reported to be breastfed or to be receiving expressed breastmilk (the neonate has never received any formula).	The total number of live births regardless of the infant's gestational age at birth.
	Any breastfeeding rate: a percentage of babies that received both breastmilk and infant formula at discharge form hospital (it is referred as partially breastfeeding in the report, it is not classified as an indicator but collected and reported).	The number of babies at discharge from the hospital who were reported to be receiving both breast milk and infant formula.	The total number of live births regardless of the infant's gestational age at birth.
	Formula feeding rate: a percentage of babies receiving infant formula only at discharge from hospital (not classified as an indicator but collected and reported).	The number of babies at discharge from the hospital who reported to received infant formula only (no breastfeeding).	The total number of live births regardless of the infant's gestational age at birth.
VIC 2018–19 report	**Breastfeeding initiation: r**ate of breastfeeding initiation for babies born at ≥ 37 weeks' gestation (Indicator 8a).	The number of women giving birth at 37 or more weeks' gestation attempting to breastfeed at least once (regardless of the success of the attempt).	The total number of women giving birth at 37 or more gestational weeks.
	Use of infant formula rate: rate of use of infant formula in hospital by breastfed babies born at ≥ 37 weeks' gestation (Indicator 8b).	The number of babies born at 37 or more weeks' gestation whose mother initiated breastfeeding and was given infant formula in hospital.	The total number of babies born at 37 or more weeks' gestation whose mother initiated breastfeeding.
	Exclusive breastfeeding rates: rate of final feed being taken directly from the breast by breastfed babies born at ≥ 37 weeks 'gestation at discharge (Indicator 8c).	The number of babies born at 37 or more weeks' gestation whose mother initiated breastfeeding and who fed directly and entirely from the breast at the last feed before discharge.	The total number of babies born at 37 or more weeks' gestation whose mother initiated breastfeeding.

assessment. The statistical significance level was set at $\alpha = 0.05$ (2-sided).

Results

Characteristics of the hospitals

The hospitals in both NSW and VIC had similar characteristics. Using descriptive statistics, findings demonstrated that more than two thirds of the hospitals were publicly funded and less than 15 % of hospitals were BFHI accredited services. In NSW, there were 15 private hospitals in our data set, and none were BFHI accredited. In VIC there were 17 private hospitals and only one was BFHI accredited (Table 4).

According to the SEIFA scores, more than half of the public hospitals were providing maternity services for a population with a mixed level of socio-economic status. One third of public hospitals had SEIFA scores of 3 or less whereas one third of private hospitals had SEIFA scores of 4 or more. Comparing public and private hospitals, we used Fisher's exact test and found statistically significant differences in SEIFA categories between public and private hospitals in NSW (p =.044) and VIC (p =.034).

Infant feeding indicators in NSW and VIC at state level

In "NSW Mothers and Babies 2019" report [26], the mean NSW rate of full breastfeeding (breastfed or received expressed breast milk only)

Table 4
Characteristics of the individual hospitals in NSW and VIC.

Characteristics	NSW Jan - Dec 2019 n (%)	VIC Jul 2018 - Jun 2019 n (%)						
Hospital Type								
Public Hospitals[a]								
Level 6	7 (11.7)	4 (6.5)						
Level 5	9 (15.0)	9 (14.5)						
Level 4	17 (28.3)	11 (17.7)						
Level 3	12 (20.0)	14 (22.6)						
Level 2	Missing data	7 (11.3)						
Private Hospitals	15 (25)	17 (27.4)						
Both Public and Private[b]	60	62						
BFHI Accredited								
Public Hospitals	n=45	n=45						
Yes	7 (15.6)	8 (17.7)						
No	38 (84.4)	37 (82.3)						
Private Hospitals	n=15	n=17						
Yes	0 (0.0)	1(5.88)						
No	15 (100)	16 (93.22)						
Both Public and Private	7 (11.7)	9 (14.5)						
Socio-Economic Indexes for Areas (SEIFA) Score[c]								
Type of Hospital	**SEIFA≤3 n (%)**	**SEIFA≥4 n (%)**	**Mixed SEIFA n (%)**	***p*[d]**	**SEIFA≤3 n (%)**	**SEIFA≥4 n (%)**	**Mixed SEIFA n (%)**	***p***
Public	15 (33.3)	5 (11.1)	25 (55.6)	.044	13 (28.9)	1 (2.2)	31 (68.9)	.034
Private	1 (6.7)	5 (33.3)	9 (60.0)		3 (17.6)	4 (23.5)	58.8)	

[a] Level of the hospitals in NSW were considered equivalent to capability levels in VIC.
[b] Hospitals with less than 200 births were grouped together and not identified individually in NSW report however, the report from VIC included all the hospitals.
[c] SEIFA categories are: a) hospitals with the SEIFA score of three and less a, b) hospitals with SEIFA score of four or more, and c) hospitals with a mixed SEIFA scores ranged between one to five.
[d] Fisher's Exact test was used as >20 % of the cells had expected frequencies of less than five.

in all hospitals at discharge among live birth infants was reported as 71.1 %. The rate of any breastfeeding (partially breastfeeding, namely received both breast milk and CMF) was 17.7 %, and CMF feeding only (not breastfeeding at all) was 8.3 %. Some hospitals did not report the type of breastfeeding rates (2.8 %) at discharge. According to the "Victorian Perinatal Services Performance Indicators Report 2018–2019" [27], 95.7 % of women with babies born at 37 gestational weeks or more, initiated breastfeeding at the state level. Of these breastfed babies 29.4 % received CMF during their hospital stay with 74.1 % having their last feed in hospital exclusively from the breast (Table 5).

Infant feeding indicators in NSW and VIC based on individual hospital reports

In NSW, there were nine BFHI accredited hospitals in 2020 and one accredited child and family health service [32]. Considering that there were no data on individual NSW hospitals with less than 200 births per year, we excluded two BFHI hospitals from our data analysis. Therefore, we compared the infant feeding indicators from seven BFHI accredited public hospitals against the 53 non BFHI hospitals. In VIC, in 2020 there were nine BFHI accredited hospitals, of which one was a private hospital [32]. We compared data from the 53 non-BFHI hospitals offering maternity services against the nine Victorian BFHI accredited hospitals. Considering that there was only on private BFHI hospital in VIC, comparing private BFHI and private non BFHI was not reasonable.

Table 5
Infant feeding indicators at state level in NSW and VIC.

NSW 2019		**VIC −2018–2019**	
Infant feeding (%) among all liveborn babies[a]		**Breastfeeding (%) among only full-term babies who initiated breastfeeding**[b]	
Breastfeeding initiation		**Breastfeeding initiation**	
	Not Reported	Public Hospitals	95.4
		Private Hospitals	96.7
		State Level	95.7
Full Breastfeeding at discharge[c]		**Final feed being taken directly from the breast**[d]	
Public Hospitals	72.4	Public Hospitals	75.3
Private Hospitals	66.0	Private Hospitals	69.6
State Level	71.1	State Level	74.1
Any Breastfeeding (partially breastfeeding) at discharge[e]		**Any Feeding at discharge**	
Public Hospitals	15.5		Not Reported
Private Hospitals	26.1		
State Level	17.7		
Formula Feeding only at discharge (not breastfeeding at all)[f]		**Formula Feeding only at discharge**	
Public Hospitals	9.5		Not Reported
Private Hospitals	4.0		
State Level	8.3		
Not Stated	2.6		Not Reported
Public Hospitals	3.9		
Private Hospitals	2.8		
State Level			
Use of infant formula during hospital stay		**Use of infant formula during hospital stay**	
	Not Reported	Public Hospitals	27
		Private Hospitals	37.8
		State Level	29.4

[a] Among live births regardless of gestational age among all hospitals including hospitals with less than 200 births.
[b] Only for babies born at ≥ 37 weeks' gestation.
[c] Full Breastfeeding at discharge in NSW: breastfed or to be receiving expressed breast milk.
[d] Exclusive breastfeeding at discharge in VIC: the final feed before discharge taken exclusively from the breast.
[e] Any Breastfeeding (partially breastfeeding) at discharge in NSW: to be receiving both breast milk and infant formula.
[f] Formula feeding only at discharge in NSW: not breastfeeding at all.

Infant feeding outcomes between BFHI accredited and non-BFHI hospitals

We compared the mean of breastfeeding rates in each state between BFHI accredited hospitals and non-BFHI accredited hospitals. Apart from breastfeeding initiation, we found slightly higher breastfeeding rates in BFHI accredited hospitals compared to non-BFHI accredited hospitals. However, there were no statistically significant differences between the outcomes.

Infant feeding outcomes between public BFHI accredited and public non-BFHI accredited hospitals

We compared infant feeding outcomes between BFHI and non-BFHI accredited public hospitals. In NSW public hospitals, there was a high CMF feeding (only formula feeding) at discharge in non-BFHI accredited hospitals compared to BFHI accredited hospitals (10.4 % vs 5.8 %, p =.021). Comparing BFHI and non-BFHI accredited public hospitals in VIC, there was no differences in breastfeeding outcomes. We did not compare private BFHI and non-BFHI accredited hospitals as there was only one with current accreditation.

Infant feeding outcomes between non-BFHI accredited public and non-BFHI accredited private hospitals

We compared infant feeding outcomes between public non-BFHI and private non- BFHI hospitals. In NSW the mean of full breastfeeding rates at discharge was lower in private hospitals compared to public hospitals (67.7 vs 74.5, p =.020). In VIC, the mean of exclusive breastfeeding rates at discharge was lower in private hospitals compared to public hospitals (54.7 vs 73.4, p <.001). We compared the rates of CMF use among breastfeeding infants in private and public hospitals. CMF use was almost 100 % higher in private hospitals compared to public hospitals in both states. In NSW, the rates of partially breastfeeding with CMF in private hospitals was 24 % compared to 12 % in public hospitals (p <.001). The rate of only CMF feeding at discharge was higher in public non-BFHI hospitals compared to private hospitals (p <.001). In VIC, 42 % of the term babies born in private hospitals who initiated breastfeeding were also fed CMF during their hospital stay compared to 22 % in public hospitals (p <.001) (Table 6).

We utilised a 75 % indicator to categorise full breastfeeding rates at discharge in NSW and exclusive breastfeeding rates in VIC. Next, we compared breastfeeding categories in hospitals based on three groups of the SEIFA scores using the Chi square test. The findings demonstrated no differences between the breastfeeding outcomes at discharge based on the socio-economic categories of hospital localities (Table 7).

Discussion

This study explored publicly available infant feeding outcomes within Australian states and territories, then compared them between BFHI and non-BFHI accredited hospitals, and between public and private hospitals. The findings demonstrated that a limited number of reports existed at state and territory level and contained minimal consistency in their definitions of breastfeeding indicators. Only NSW and VIC had accessible reports on breastfeeding outcomes at hospital level. According to the individual reports, there were no statistically significant differences in breastfeeding rates between BFHI and non-BFHI accredited hospitals in each state. A key finding was a significant use of CMF in non-BFHI private hospitals compared with non-BFHI public hospitals in both Victoria and NSW.

Comparing public with private hospitals, the use of CMF with breastfeeding at discharge in NSW and the use of CMF during hospital stay in VIC, it was noted rates were higher in private non-BFHI hospitals compared to public non-BFHI hospitals. Similarly, there was a high CMF

Table 6
Infant feeding outcomes: BFHI vs Non-BFHI, and Public vs Private hospitals.

Reported Infant feeding data	Mean	SD	t	df	*Two-Sided P*
Infant feeding at discharge in NSW (2019 report)[a,b]					
Full breastfeeding	76.4	6.8	.99	58	.324
BFHI accredited hospitals n=7					
Non-BFHI accredited hospitals n=53	72.6	9.7			
Public BFHI accredited hospitals n=7	76.4	6.8	.52	43	.604
	74.6	8.9			
Public non-BFHI accredited hospitals n= 38					
Public non-BFHI accredited hospitals n= 38	74.5	8.9	2.40	51	**.020**
	67.7	10.3			
Private non-BFHI accredited hospitals n=15					
Any Breastfeeding (partially breastfeeding)	15.7	6.2	.08	58	.938
	15.4	9.1			
BFHI accredited hospitals n=7					
Non-BFHI accredited hospitals n=53					
Public BFHI accredited hospitals n=7	15.7	6.2	1.22	43	.227
	12.1	7.4			
Public non-BFHI accredited hospitals n= 38					
Public non-BFHI accredited hospitals n= 38	12.1	7.4	-4.89	51	**<.001**
	23.9	9.2			
Private non-BFHI accredited hospitals n=15					
Only formula feeding	5.8	3.1	-1.39	58	.169
BFHI accredited hospitals n=7	8.7	5.3			
Non-BFHI accredited hospitals n=53					
Public BFHI accredited hospitals n=7	5.8	3.1	-2.4	43	**.021**
	10.4	4.8			
Public non-BFHI accredited hospitals n= 38					
Public non-BFHI accredited hospitals n= 38	10.4	4.8	4.22	51	**<.001**
	4.4	4.1			
Private non-BFHI accredited hospitals n=15					
Breastfeeding report at VIC (2018–2019 report)[c]					
BF Initiation	95.0	2.4	-.53	60	.598
BFHI accredited n=9	95.5	2.7			
Non-BFHI accredited n=53					
Public BFHI accredited hospitals n=8	95.0	2.5	-.21	43	.831
	95.2	2.9			
Public non-BFHI accredited hospitals n= 38					
Public non-BFHI accredited hospitals n=37	95.2	2.9	-1.40	51	.166
	96.3	1.9			
Private non-BFHI accredited hospitals n=16					
Breastfeeding/ breastmilk feeding in hospital	73.6	8.4	1.33	60	.190
	67.4	13.5			
BFHI accredited n=9					
Non-BFHI accredited n=53					
Public BFHI accredited hospitals n=8	75.0	7.8	.51	43	.614
	73.1	9.8			
Public non-BFHI accredited hospitals n= 38					
Public non-BFHI accredited hospitals n=37	73.1	9.8	6.06	51	**<.001**
	54.3	11.6			
Private non-BFHI accredited hospitals n=16					
Use of infant formula (commercial milk formula) in hospital (only for breastfeeding infants)	21.4	8.3	-1.51	60	.137
	28.1	12.8			
BFHI accredited n=9					
Non-BFHI accredited n=53					
Public BFHI accredited hospitals n=8	20.1	7.6	-.67	43	.501
	22.1	8.1			
Public non-BFHI accredited hospitals n= 38					
Public non-BFHI accredited hospitals n= 38	22.1	8.1	-7.45	51	**<.001**
	42.0	10.7			
Private non-BFHI accredited hospitals n=16					
Exclusive BF at discharge	82.0	7.8	.85	60	.396
BFHI accredited n=9	78.5	11.8			
Non-BFHI accredited n=53					
Public BFHI accredited hospitals n=8	82.8	8.3	-.20	43	.841
	82.9	9.9			
Public non-BFHI accredited hospitals n= 38					
Public non-BFHI accredited hospitals n=37	82.9	9.8	5.03	51	**<.001**
	68.2	9.4			
Private non-BFHI accredited hospitals n=16					

[a] Hospitals with less than 200 births were not identified individually.
[b] Breastfeeding reports include live births including term and preterm newborns
[c] Breastfeeding reports include only term babies

Table 7
Breastfeeding outcomes with 75 % cut off category and SEIFA scores.

	SEIFA≤3	SEIFA≥4	Mixed SEIFA		
Breastfeeding rates at discharge	**n (%)**	**n (%)**	**n (%)**	**χ^2**	**p-value**
Fully Breastfed at discharge NSW[a]					
<75 %	9(29.0)	7(22.6)	15 (44.1)	2.256	.355
≥75 %	7(24.1)	3(10.3)	19 (55.9)		
Exclusively Breastfed at discharge VIC[b]					
<75 %	5(23.8)	3(14.3)	13(61.9)	1.698[c]	.470
≥75 %	11(26.8)	2(4.9)	28(68.3)		

[a] Breastfeeding reports include live births including term and preterm newborns from the hospitals with birth number of greater than 200
[b] Breastfeeding reports include only term babies
[c] Fisher's Exact test was used as >20 % of the cells had expected frequencies of less than 5

feeding at discharge in public non-BFHI hospitals compared to public-BFHI accredited hospitals. The higher CMF use in private or non- BFHI public hospitals could suggests that the MAIF agreement [11] may not be effective when there is no formal BFHI reinforcement to comply fully with the International Code of Marketing of Breast-milk Substitutes (Step 1). The findings of a study in the US comparing 110 BFHI and 176 non-BFHI services (n=286), demonstrated that only half of the non-BFHI services were compliant with International Code of Marketing of Breast-milk Substitutes where as 91.8 % of BFHI services were compliant with the Code [35].

Although BFHI accreditation requirements can create enabling breastfeeding environments and limit exposure to breast-milk substitutes advertising and the associated products, women's decision to breastfeed are influenced by multiple external factors such as social media [36]. Without effective legislation in the broader community, protecting the International Code of Marketing of Breast-milk Substitute, a variety of marketing strategies are enabled.

The findings of our study have also highlighted that despite annual reporting systems in NSW and VIC, there is no consistent approach to data collection between states. Lack of consistency in the reports is in opposition to the Australian National Breastfeeding Strategy priorities, which highlights the Federal government's obligation to monitor the country's performance on breastfeeding [12]. The findings of a cohort study among midwives and nurses in NSW (n=319), demonstrated that the timeframes utilised by maternity staff when entering breastfeeding

information into the hospital data system varied. For instance, midwives and nurses considered 'infant feeding at hospital discharge' to include all feedings since birth, or feeding within the last 12 hours, or the last few feeds before discharge [37]. Collecting consistent data on infant feeding from birth to discharge, from all hospitals within states and territories, using a consistent definition for each feeding indicator is an important reform measure.

Our study provides evidence of potential hospital breaches of Step 1 relating to monitoring of breastfeeding and breast milk substitutes and Step 6 on the introduction of CMF. There are international standardised tools such as International Baby Food Action Network, United Nations Standing Committee on Nutrition, the World Alliance for Breastfeeding Action and Becoming Breastfeeding Friendly (BBF) toolbox to measure the influence of breastfeeding support initiatives on a larger scale [38]. There is a need to consider including the BFHI Ten Steps to Successful Breastfeeding into the national quality and safety accreditation requirements for maternity hospitals. Nationally agreed definitions informed by previous work [39] can support the implementation of a set of indicators, and standardised reporting measures to be used across states and territories [37].

The findings of our analysis raise questions for future research; for example, examining why women in high SEIFA locations who give birth in private hospitals seem to have different outcomes such as higher CMF use than women in high SEIFA locations who give birth in public hospitals. Research indicates an association exists between high socio-economic status and breastfeeding prevalence in Australia [40]. However, our research suggests women birthing in private hospitals were less likely to exclusively breastfeed.

Strengths and limitations

This is the first study to compare publicly available breastfeeding data across BFHI and non-BFHI hospitals in Australia. The comparison of infant feeding outcomes for public and private hospitals, with Table 6 showing statistically significant differences indicating higher breastfeeding in non-BFHI public hospitals compared with non-BFHI private hospitals in NSW and Victoria. This finding adds strength to the need for future research examining the association between infant feeding intention and place of birth.

There are several limitations into this study. The lack of consistency in defining and monitoring infant feeding indicators in Australian hospitals, made it impossible to compare interstate breastfeeding outcomes, or benchmark against the BFHI requirements. For instance, the VIC report excludes data from babies born less than 37 gestation weeks and provides exclusive breastfeeding rates based on the last feed prior discharge. These indicators will give upward bias to reported BF rates and downward bias to CMF and mixed feeding use in VIC data. In NSW, there was no report on the breastfeeding initiation rate; therefore, it was not possible to determine whether the cases of exclusive CMF feeding at discharge were related to women who initiated breastfeeding and then changed their intention to CMF feeding, or if women intended to give CMF from birth without altering their practices. Due to this inconsistency, we were unable to conduct a logistic regression analysis with potential confounding factors and identify predictors of breastfeeding outcomes at discharge. Another limit to this study was that we could not confirm if there were any socio-economic factors influencing infant feeding outcomes because of mixed SEIFA scores among the population who live around the hospitals.

Recommendations for practice

High-level executive support is needed in both the health and government sectors to influence the implementation of BFHI strategies and monitor their progress in Australian healthcare settings. Additionally, we agree with other authors who highlighted the need for scaling up Australia's commitment to intersectoral coordination for breastfeeding advocacy, political will, legislation, policy, funding, training, research, and evaluation, along with implementing a standardised monitoring system across different states and territories [38]. It is important to note that any promotion and support for women must be done within a woman-centred care framework, ensuring that women feel empowered, heard, and supported, regardless of their socio-economic status.

Conclusion

Evidence from publicly available data indicated that BFHI accreditation is beneficial in decreasing the amount of CMF used in Australian public and private hospitals offering maternity care services. Consistent definitions in the publicly available data both at state and national level are critical for generating robust data. The absence of comparable indicators and data collections of infant feeding results in a lack of transparency about maternity hospitals' performance both locally and nationally. Performance indicators in all jurisdictions should identify optimal breastfeeding, include supplementation with CMF, and reveal any public private disparities in practice. To meet the breastfeeding goals stated in the National Breastfeeding Strategy, there is a need for State, Territories, and the Commonwealth to demonstrate a genuine multi-level commitment to support the widespread implementation of the BFHI Ten Steps to Successful Breastfeeding.

Ethics approval and consent to participate

NA.

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Declaration of Competing Interest

The authors declare that they have no competing interests.

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Nil.

Authors' contributions

Conceptualization - EB, MA, SM, JH, Data curation - MA, JH, EB, SM, Project administration – EB, Methodology and Formal analysis – SM, Visualization - JH, SM, MA, EB, Original draft Writing - SM, JH, EB, MA, Review & editing - SM, EB, MA, JH

Consent for publication

Not applicable.

Avail-ability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.wombi.2024.101658.

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