

# BMJ Open Rates of breast feeding and associated factors for First Nations infants in a hospital with a culturally specific caseload midwifery model in Victoria, Australia: a cohort study

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## ABSTRACT

**Objectives** There is an urgent need to improve breast feeding rates for Australian First Nations (Aboriginal and Torres Strait Islander) infants. We explored breast feeding outcomes of women having a First Nations infant at three sites that introduced a culturally specific continuity of midwife care model.

**Design** Women having a First Nations infant booking for pregnancy care between March 2017 and November 2020 were invited to participate. Surveys at recruitment and 3 months post partum were developed with input from the First Nations Advisory Committee. We explored breast feeding intention, initiation, maintenance and reasons for stopping and factors associated with breast feeding.

**Setting** Three tertiary maternity services in Melbourne, Australia.

**Participants** Of 479/926 eligible women approached, 343 (72%) completed the recruitment survey, and 213/343 (62%) the postnatal survey.

**Outcomes** Primary: breast feeding initiation and maintenance. Secondary: breast feeding intention and reasons for stopping breast feeding.

**Results** Most women (298, 87%) received the culturally specific model. Breast feeding initiation (96%, 95% CI 0.93 to 0.98) was high. At 3 months, 71% were giving 'any' (95% CI 0.65 to 0.78) and 48% were giving 'only' breast milk (95% CI 0.41 to 0.55). Intending to breast feed 6 months (Adj OR 'any': 2.69, 95% CI 1.29 to 5.60; 'only': 2.22, 95% CI 1.20 to 4.12), and not smoking in pregnancy (Adj OR 'any': 2.48, 95% CI 1.05 to 5.86; 'only': 4.05, 95% CI 1.54 to 10.69) were associated with higher odds. Lower education (Adj OR 'any': 0.36, 95% CI 0.13 to 0.98; 'only': 0.50, 95% CI 0.26 to 0.96) and government benefits as the main household income (Adj OR 'any': 0.26, 95% CI 0.11 to 0.58) with lower odds.

**Conclusions** Breast feeding rates were high in the context of service-wide change. Our findings strengthen the evidence that culturally specific continuity models improve breast feeding outcomes for First Nations women and infants. We recommend implementing and upscaling First Nations specific midwifery continuity models within mainstream hospitals in Australia as a strategy to improve breast feeding.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Robust, prospectively collected data.
- ⇒ Community consultation with First Nations stakeholders to develop the methodology.
- ⇒ We could only adjust for available confounding factors.
- ⇒ Women lost to follow-up may have been less likely to breast feed.

## BACKGROUND

Breast milk is the most nutritious food for babies and reduces maternal and infant mortality and morbidity.<sup>1</sup> The WHO and the UNICEF recommend exclusive breast feeding to 6 months of age and continued breast feeding for 2 years and beyond.<sup>2,3</sup> In Australia, the National Health and Medical Research Council recommends exclusive breast feeding until around 6 months of age, with continuation until 12 months and beyond.<sup>4</sup>

Breast feeding initiation in Australia is relatively high (96%); however, by 6 months of age only 60% of infants are receiving any breast milk, and only 15% are exclusively breastfed to 5 months,<sup>5</sup> with little improvement over time.<sup>6</sup> National data report First Nations (Aboriginal and/or Torres Strait Islander) women and infants have lower breast feeding initiation (87%) and breast feeding maintenance to 12 months (12%) than the national average,<sup>6</sup> although a recent systematic review of 22 studies that aimed to determine rates of breast feeding for First Nations women and infants in Australia found that overall, only 79% of First Nations infants received breast milk after birth.<sup>7</sup>

A recent systematic review found that geographic location, attending a First

Nations specific service, the number of people living in a household, attending a regional service and the reported number of stressful events and social health issues in the previous year were associated with breast feeding outcomes among Australian First Nations women and infants.<sup>8</sup> The review found that rates of breast feeding were improved in three of fourteen studies when women attended a First Nations specific service (including models that provide continuity of midwifery care) in comparison to mainstream services.<sup>8</sup>

Numerous Australian government reports have identified the need to address lack of access to culturally appropriate maternity services, improve the quality of routine antenatal care and implement strategies to increase breast feeding for First Nations women.<sup>9 10</sup> In Victoria, the state government identified increasing breast feeding rates of First Nations infants as a priority area,<sup>11</sup> and the Victorian Aboriginal Community Controlled Health Organisation listed improving breast feeding rates as a significant factor in its strategy to close the nutrition gap and as a priority in its early childhood nutrition report.<sup>12</sup>

An overarching movement that aims to address these issues is 'Birthing on Country' (BoC), which was introduced in Australia as a framework to enable access to culturally safe continuity of care models for all First Nations families (including non-First Nations women having a First Nations infant), to return birthing services to First Nations communities, and improve birth outcomes for First Nations women and infants.<sup>13</sup> BoC models are based on underlying principles such as privileging Indigenous knowledge, strengthening the First Nations workforce and community capacity, woman-centred holistic care, and culturally competent and safe continuity of care with cultural guidance and oversight.<sup>13</sup> One type of continuity of care in the maternity setting is caseload midwifery, where care is provided by a 'known' midwife through the antenatal, intrapartum and postnatal period.<sup>14</sup> It results in improved outcomes for women and babies,<sup>14</sup> with some studies reporting increased rates of breast feeding (not initiating breast feeding: 1.8% vs 0.7%,<sup>15</sup> and breast feeding on discharge from hospital: 72.6% vs 68.5%,<sup>16</sup> at 6 weeks: 58% vs 44% and at 6 months: 45% vs 32%).<sup>17</sup> While this model of care should be offered to most women,<sup>14</sup> First Nations women in Australia often have reduced access, and lower rates of acceptance into continuity of care models.<sup>18</sup> Contributing factors include limited availability of models, exclusion criteria for higher-risk pregnancies and models not being culturally specific.<sup>19</sup>

To address the gap in outcomes for women having a First Nations infant and increase access to continuity of midwifery models, a large study called 'Baggarrook Yurrongi' ('Women's Journey' in Woiwurrung language) and 'Nurragh Manma Buliana' (meaning 'All of us working together for pregnancy' in Yorta Yorta language) was conducted to implement culturally specific caseload midwifery models for women having a First Nations infant in three tertiary hospitals in Melbourne, Australia. In this

model of care, women were able to choose their type of care (hospital-based or shared care with local Aboriginal Health Services), with access to a known midwife who was the primary care provider for any hospital-based care. The model was implemented in partnership with existing hospital and community health services and tailored to each site and the needs of individual women.<sup>20</sup> One of the key outcomes was to explore women's satisfaction with care and birth experiences, and maternal and infant health outcomes at 3 months postpartum, including breast feeding.

This paper describes breast feeding initiation and maintenance for women having a First Nations infant attending one of the study sites.

## METHODS

### Study design

A cohort design was used. The study methodology was codesigned in partnership with the peak body for First Nations health in Victoria; the Victorian Aboriginal Community Controlled Health Organisation (VACCHO) and the First Nations health units of each participating health service. The study methodology and methods were informed by the First Nations Advisory Committee (comprising all First Nations project investigators, two Elders, a recent new First Nations mother and representatives from VACCHO).

### Participants and recruitment

All women having a First Nations infant at one of the three study sites during the Baggarrook Yurrongi study period were invited to participate in this study to explore their views, experiences and outcomes (including breast feeding outcomes). Participants were eligible regardless of whether they received the culturally specific caseload midwifery model for their maternity care.

Research assistants (mostly midwives) recruited women for the study. Where possible, First Nations research assistants were employed, and all non-Indigenous research assistants undertook cultural competency training. We aimed to recruit women in pregnancy, where possible at the visit after the booking visit, but if not, then any time in pregnancy. When this was not possible, women were approached in the postnatal ward after the birth. Women had the option to discuss participation with their families and the Aboriginal Hospital Liaison Officer prior to consenting to participate. For two of the sites, face-to-face recruitment was impacted by the COVID-19 pandemic, and women at these sites were recruited via telephone during this time. Signed consent was obtained and then the recruitment survey was completed.

### Patient and public involvement

The study's First Nations Advisory Committee (including two Elders and a recent new mother) provided cultural guidance and oversight regarding methods, community

engagement, discussion of findings and knowledge translation.

### Data collection

Women completed a structured questionnaire at recruitment (usually face-to-face, but able to be completed and sent back in a reply-paid envelope) and at three months postnatally (by telephone, where possible). Data collection tools were designed with input from stakeholders and the First Nations advisory committee, based on tools used previously by the research team and tools used in other similar studies, and adapted to suit the needs of the study. Semi-structured interviews, conducted by telephone were considered to be the most appropriate method to collect data regarding their breast feeding outcomes and experiences at three to six months to allow clarification of responses, as well as to maximise the response rate. It was also done this way to allow our researchers (mostly First Nations) to engage with women in a culturally sensitive way. Piloting was undertaken by a First Nations researcher with three First Nations women, who were midwives and were not directly involved in this project. Further detail on data collection tools is reported elsewhere.<sup>21</sup>

Questions relevant to this paper included demographic characteristics, worries experienced before and during pregnancy, antenatal breast feeding intention, type of birth, breast feeding initiation, breast feeding maintenance and reasons for ceasing breast feeding. Breast feeding specific questions included questions such as 'in the last 24 hours, what milk have you been feeding your baby', '... all the ways you have been feeding your baby since birth', 'has your baby had any formula since birth', what age formula was introduced and/or breast feeding was ceased and the reasons for this. Infant feeding data were collected using a mix of single and multiple-choice questions, with closed and open-ended questions offering the option to provide a free response in some sections, for example, 'yes/no', 'fully breast feeding, breast feeding and EBM (expressed breast milk), EBM, BF (breast feeding) and formula, BF and EBM and formula, EBM and formula, fully formula feeding' and 'other, please describe'.

The first survey was conducted at the time of recruitment to the study, usually during pregnancy, and the second one was when infants were between three and six months of age. The research team chose these time points to ensure optimal recall for the outcomes measured. Women were able to choose to complete the recruitment questionnaire by telephone, face-to-face or self-administer it online or by hard copy (sent by email). Women were then telephoned by a research assistant three months after birth to conduct the postnatal survey by telephone. Women confirmed their ongoing consent for participation in the study and then completed the survey. When non-Indigenous research assistants phoned women to complete the survey, they offered women the option of completing the survey with a First Nations research assistant and this was organised if requested. Participants were

considered lost to follow-up if no contact was made by six months post birth.

### Data management and analysis

Data were entered into REDcap and imported into STATA V.17<sup>22</sup> for cleaning and analysis. Data cleaning included checking for missing data, range and logic checks. Quantitative data were analysed using descriptive statistics, and presented as frequencies, and percentages for categorical variables and means and SD for continuous variables (or median and range where data were not normally distributed).

Infant feeding questions included infant feeding in the previous 24 hours and infant feeding since birth. Using this data, we developed variables to identify breast feeding initiation as well as 'any' and 'only' breast milk feeding at 3 months. Where follow-up interviews were done later than 3 months, we used a series of questions to be able to understand infant feeding status at 3 months and coded the 'any' and 'only' variables accordingly. We used the terms breast feeding or breast milk feeding throughout, regardless of if the infant attached to the breast to feed, and the terms 'any' and 'only' breast milk feeding. 'Any' breast milk feeding includes the infant receiving breast milk, regardless of the introduction of other milk substitutes, liquids, or foods. 'Only' breast milk feeding includes the infant receiving breast milk as the only form of milk, and without introduction of artificial formula, however, may include introduction of other liquids or foods. We were unable to determine exclusive breast feeding rates and, therefore, 'only' breast milk feeding is not exclusive breast feeding. These outcomes and definitions have been used extensively in previous breast feeding studies conducted by the research group<sup>23 24</sup> and were informed by Australian breast feeding definitions.<sup>25</sup>

Logistic regression was used to explore what factors were associated with 'any' and 'only' breast feeding at 3 months. The research team concluded that for accurate statistical analysis breast feeding outcomes were explored at 3 months as breast feeding data were available for all participants at this time point. Variables were based on available data and existing literature. Separate models were used to explore 'any' and 'only' breast feeding. In each case, each variable was analysed initially using univariate analysis to explore its association with breast feeding. Factors with a Wald statistic p value of  $\leq 0.2$  at the univariate level were retained for the initial multivariate analyses. Only respondents without missing data for the relevant variables were included in the multivariate analysis. Subsequent regressions were conducted and variables with no association with 'any' or 'only' breast feeding (according to which model was being conducted) were eliminated one at a time. Regressions were repeated until only variables with a Wald statistic p value  $\leq 0.05$  remained. The likelihood ratio test used to test each subsequent model did not differ significantly from the previous model except that the variable had



been removed. Results are presented as ORs, adjusted ORs (adj ORs) and 95% CIs.

With some categorical variables we made decisions to dichotomise them (or make them into smaller categories) for the multivariate regression to make interpretation easier, but only after checking this did not affect the OR. This included age, education attainment, smoking, partner status, type of birth, worries experienced before or during pregnancy and First Nations status. With age, we explored it as both a continuous and categorical variable and decided to use it as continuous in the multivariate analysis given the small numbers in the youngest age group but have left both in the univariate analysis outcomes in the table so readers can look at the categories.

No sample size calculations were undertaken for this study as the aim was to offer all eligible women participation during the study period. After the study was conducted, we calculated 95% CIs on the proportions of women who initiated breast feeding and who were giving 'any' and 'only' breast milk, and these are presented in the results.

## RESULTS

### Participant characteristics

Between March 2017 and November 2020, 1040 First Nations families were identified across the three sites (figure 1). Of these families, 89% (926) met the study eligibility criteria. Of those eligible, 52% (479/926) of families were approached and 74% (353/479) agreed to participate, with 72% (343/479) completing the recruitment questionnaire. A total of 62% (213/343) completed the postnatal questionnaire (211 completed both the recruitment and postnatal questionnaires and two women completed the postnatal questionnaire only). There were 125 women lost to follow-up and 7 declined further participation. Those lost to follow-up were more often unpartnered (21% vs 8%,  $p=0.001$ ), had an education attainment  $\leq$  year 12 (61% vs 36%,  $p\leq 0.001$ ) and smoked in pregnancy (35% vs 17%,  $p=0.002$ ).

Participant characteristics for those who completed the recruitment and postnatal questionnaires are presented in table 1. Most women identified as First Nations (71% Aboriginal, 3% Torres Strait Islander and 3% both Aboriginal and Torres Strait Islander), and most women received caseload midwifery care (87%). Reasons for not receiving the model included not being offered the model by staff, not identified as First Nations until after birth, transferred care elsewhere prior to the model being offered or booked/transferred from another hospital later in pregnancy and not able to access the model.

### Breast feeding intention

Infant feeding intention was explored in the recruitment survey, with 77% (258/334) of women indicating that they would breast feed only, and a further 18% ( $n=59$ ) indicating they would breast and formula feed (table 1). More than half (54%, 181/335) planned to breast feed

for 3 months or more and just under half (48%, 159/335) planned to breast feed for 6 months or more.

### Breast feeding initiation and maintenance at three months

Table 2 presents the rates of breast feeding initiation and maintenance at 3 months. Breast feeding initiation was high (96%, 95% CI 0.93 to 0.98), with 71% of women giving 'any' breast milk at 3 months (95% CI 0.65 to 0.78) and 48% giving 'only' breast milk at 3 months (95% CI 0.41 to 0.55).

### Univariate and multivariate analysis of 'any' breast feeding

Factors known to be associated with breast feeding were included in the univariate analysis including breast feeding intention, age, parity, education, smoking in pregnancy, partner status, government benefit as the main household income, type of birth, the number of overall worries experienced in pregnancy and First Nations status. The initial multivariate model included the variables above with a Wald statistic  $p$  value of  $\leq 0.2$  (table 3). Complete data were available for 198 participants for variables included in the multivariate model (thus  $n=198$ ). Factors that remained associated with 'any' breast feeding at 3 months were intending to breast feed to 6 months or more (adj OR 2.69; 95% CI 1.29 to 5.60), education level up to and including diploma (adj OR 0.36; 95% CI 0.13 to 0.98), not smoking in pregnancy (adj OR 2.48; 95% CI 1.05 to 5.86) and receiving a government benefit as the main household income (adj OR 0.26; 95% CI 0.11 to 0.58).

### Univariate and multivariate analysis of 'only' breast feeding

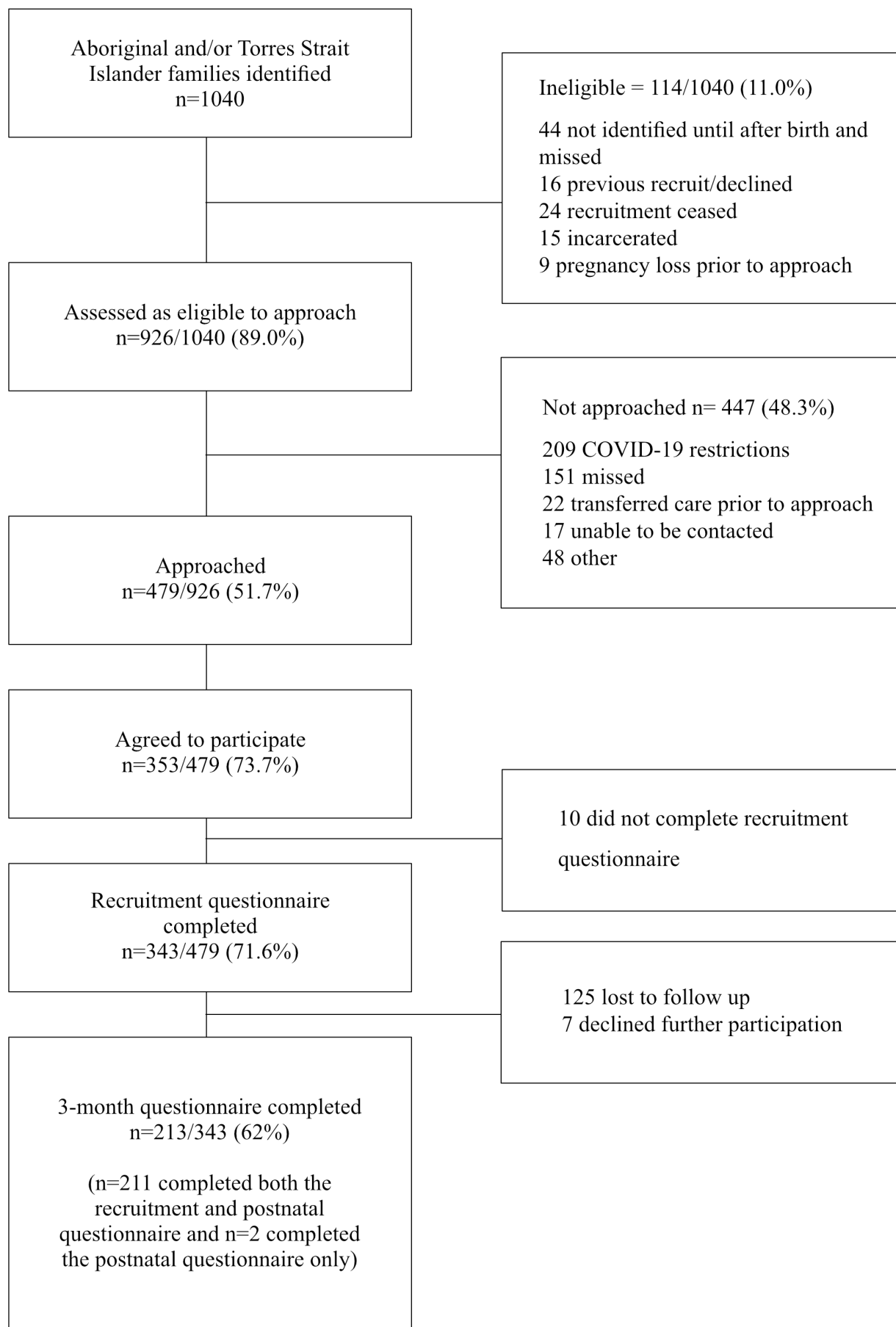
The same factors that were included in the univariate analysis for 'any' breast feeding were included for 'only' breast feeding. The initial multivariate model exploring 'only' breast feeding included the variables from the univariate analysis with a Wald statistic  $p$  value of  $\leq 0.2$  (table 4). Complete data were available for 198 participants for the included variables (thus  $n=198$ ). The factors that remained associated with 'only' breast feeding at 3 months were intending to breast feed to 6 months or more (adj OR 2.22; 95% CI 1.20 to 4.12), education level up to and including diploma (adj OR 0.50; 95% CI 0.26 to 0.96) and not smoking in pregnancy (adj OR 4.05; 95% CI 1.54 to 10.69). Age was associated with breast feeding maintenance at the univariate level but did not remain significant in the multivariate model.

### Reasons for stopping breast feeding

We asked participants to identify the most important reason for stopping breast feeding. The most common response was feeling there was not enough milk or not knowing if the baby had enough milk (21/65, 32%) (table 5).

## DISCUSSION

This study explored the breast feeding practices of First Nations infants at one of three major hospitals in Victoria,



**Figure 1** Participant recruitment.

**Table 1** Participant demographics and other characteristics

|                                                     | Recruitment survey |      | Postnatal survey |      |
|-----------------------------------------------------|--------------------|------|------------------|------|
|                                                     | n                  | %    | n                | %    |
| Age                                                 | (n=339)            |      | (n=213)          |      |
| ≤20                                                 | 24                 | 7.1  | 10               | 4.7  |
| 21–25                                               | 92                 | 27.1 | 50               | 23.5 |
| 26–30                                               | 109                | 32.2 | 74               | 34.7 |
| 31–35                                               | 79                 | 23.3 | 57               | 26.8 |
| 36–40                                               | 31                 | 9.1  | 19               | 8.9  |
| ≥40                                                 | 4                  | 1.2  | 3                | 1.4  |
| Parity                                              | (n=343)            |      | (n=211)          |      |
| Primiparous                                         | 158                | 46.1 | 102              | 48.3 |
| Partnered                                           | (n=340)            |      | (n=209)          |      |
| Yes                                                 | 296                | 87.1 | 192              | 91.9 |
| Education                                           | (n=339)            |      | (n=209)          |      |
| Year 10 or less                                     | 63                 | 18.6 | 31               | 14.8 |
| 11 or 12                                            | 90                 | 26.6 | 45               | 21.5 |
| Cert III/IV/diploma                                 | 98                 | 28.9 | 64               | 30.6 |
| Degree                                              | 88                 | 26.0 | 69               | 33.0 |
| Smoking in pregnancy                                | (n=338)            |      | (n=208)          |      |
| None                                                | 256                | 75.7 | 172              | 82.7 |
| 1–9                                                 | 57                 | 16.9 | 26               | 12.5 |
| 10–19                                               | 23                 | 6.8  | 9                | 4.3  |
| 20–29                                               | 2                  | 0.6  | 1                | 0.5  |
| First Nations status (mother)                       | (n=343)            |      | (n=211)          |      |
| Aboriginal                                          | 243                | 70.9 | 146              | 69.2 |
| Torres Strait Islander                              | 9                  | 2.6  | 7                | 3.3  |
| Both Aboriginal and Torres Strait Islander          | 10                 | 2.9  | 9                | 4.3  |
| Not First Nations                                   | 81                 | 23.6 | 49               | 23.2 |
| Received caseload                                   | (n=343)            |      | (n=213)          |      |
| Yes                                                 | 298                | 86.9 | 186              | 87.3 |
| How do you plan to feed your baby?                  | (n=334)            |      |                  |      |
| Breast feed                                         | 258                | 77.3 | NA               | NA   |
| Breast feed and formula                             | 59                 | 17.7 | NA               | NA   |
| Formula only                                        | 17                 | 5.1  | NA               | NA   |
| How long do you plan to feed your baby breast milk? | (n=335)            |      |                  |      |
| 3 months or more*                                   | 181                | 54.0 | NA               | NA   |
| 6 months or more                                    | 159                | 47.5 |                  |      |
| Type of birth                                       |                    |      | (n=211)          |      |
| SVD                                                 | NA                 | NA   | 121              | 57.4 |
| Forceps                                             | NA                 | NA   | 8                | 3.8  |
| Vacuum                                              | NA                 | NA   | 13               | 6.2  |
| Caesarean (planned)                                 | NA                 | NA   | 27               | 12.8 |
| Caesarean (unplanned)                               | NA                 | NA   | 42               | 19.9 |

\*Includes those who planned to feed baby breast milk for 6 months or more. NA, Not applicable; SVD, spontaneous vaginal delivery.

Australia. Very few studies have prospectively collected this data with a sample of this size. Most women having a First Nations infant were cared for in a First Nations

**Table 2** Breast feeding initiation and maintenance

|                                       | n (n=202) | %    | 95% CI       |
|---------------------------------------|-----------|------|--------------|
| Breast feeding initiation             | 193       | 95.5 | 0.93 to 0.98 |
| Any breast milk feeding at 3 months   | 144       | 71.3 | 0.65 to 0.78 |
| Only* breast milk feeding at 3 months | 97        | 48.0 | 0.41 to 0.55 |

\*Receiving breast milk as only form of milk, regardless of introduction of other fluids or foods.

specific caseload midwifery model that was implemented and offered at the three hospitals. Most women intended to breast feed, with more than half for 3 months or more, and just under half for 6 months or more. Rates of breast feeding initiation were very high (96%, 95% CI 0.93 to 0.98), with high rates of ‘any’ (95% CI 0.65 to 0.78) and ‘only’ (95% CI 0.41 to 0.55) breast milk feeding at 3 months. Breast feeding intention to 6 months, and not smoking in pregnancy were associated with higher odds of breast feeding, and education attainment of a diploma or lower and receiving a government benefit as the main household income were associated with lower odds of breast feeding at 3 months.

A recent study conducted in Queensland, Australia, that implemented a similar model of care to the one implemented in this study also reported improved rates of breast feeding on discharge for First Nations women and infants who attended the ‘Birthing in Our Community’ service (a culturally safe continuity of care model incorporating BoC principles).<sup>16</sup> In addition, a recent analysis of routinely collected population-based data in Victoria found that 87% of First Nations women and infants attempted to breast feed their baby, in comparison to 95% of non-Indigenous women and infants,<sup>26</sup> and this is similar to the rates reported in the Aboriginal and Torres Strait Islander Health Performance Framework (87% and 93%, respectively).<sup>6</sup> Nationally, a recent systematic review reported that 79% of First Nations women and infants initiated breast feeding.<sup>7</sup> For First Nations women and infants in this study, rates of breast feeding initiation (96%) are equivalent to those reported for non-Indigenous women.

In addition, these rates are higher than those reported in Victorian state government reports. Analysis of data between 2017–2018 and 2018–2019 reported that rates of ‘any’ breast milk feeding between one and six months for First Nations infants was lower in comparison to non-Indigenous infants (12.8% vs 21.4%).<sup>6</sup> The rates of both ‘any’ and ‘only’ breast milk feeding for women accessing a First Nations specific midwifery continuity of care model are similar to rates reported for non-Indigenous infants and are higher than those reported for First Nations infants. The women lost to follow-up in this study were more often unpartnered, had an education attainment ≤year 12 and smoked in pregnancy, which are factors known to influence breast feeding outcomes at 3 months.

**Table 3** Factors associated with any breast feeding at 3 months

|                                                    | n       | %    | Unadjusted OR | 95% CI        | Adjusted OR | 95% CI       |
|----------------------------------------------------|---------|------|---------------|---------------|-------------|--------------|
| <b>BF intention to 6 months</b>                    |         |      |               |               |             |              |
| <6 months (ref)                                    | 54/94   | 57.5 | 1             | –             | 1           | –            |
| ≥6 months                                          | 83/100  | 83.0 | 3.62          | 1.86 to 7.02  | 2.69        | 1.29 to 5.60 |
| <b>Age (categorical)</b>                           |         |      |               |               |             |              |
| ≤20                                                | 4/10    | 40.0 | 1             | –             | –           | –            |
| 21–25                                              | 31/47   | 66.0 | 2.91          | 0.72 to 11.80 | –           | –            |
| 26–30                                              | 49/70   | 70.0 | 3.5           | 0.89 to 13.70 | –           | –            |
| 31–35                                              | 42/54   | 77.8 | 5.25          | 1.27 to 21.69 | –           | –            |
| 46–40                                              | 15/18   | 83.3 | 7.5           | 1.28 to 44.08 | –           | –            |
| ≥41                                                | 3/3     | 100  | 1             | –             | –           | –            |
| <b>Age continuous</b>                              |         |      |               |               |             |              |
| 18–44                                              | 144/202 | 71.3 | 1.07          | 1.01 to 1.14  | –           | –            |
| <b>Parity</b>                                      |         |      |               |               |             |              |
| Multiparous (ref)                                  | 69/103  | 67.0 | 1             | –             | –           | –            |
| Primiparous                                        | 73/97   | 75.3 | 1.50          | 0.81 to 2.78  | –           | –            |
| <b>Education</b>                                   |         |      |               |               |             |              |
| Degree (ref)                                       | 61/67   | 91.0 | 1             | –             | 1           | –            |
| Up to diploma                                      | 80/131  | 61.1 | 0.15          | 0.06 to 0.38  | 0.36        | 0.13 to 0.98 |
| <b>Smoking in pregnancy</b>                        |         |      |               |               |             |              |
| Yes (ref)                                          | 15/35   | 42.9 | 1             | –             | 1           | –            |
| No                                                 | 125/162 | 77.2 | 4.50          | 2.10 to 9.66  | 2.48        | 1.05 to 5.86 |
| <b>Partner status</b>                              |         |      |               |               |             |              |
| Not partnered (ref)                                | 8/16    | 50.0 | 1             | –             | –           | –            |
| Partnered                                          | 133/182 | 73.1 | 2.71          | 0.97 to 7.63  | –           | –            |
| <b>Government benefit as main household income</b> |         |      |               |               |             |              |
| No (ref)                                           | 125/155 | 80.7 | 1             | –             | 1           | –            |
| Yes                                                | 16/43   | 37.2 | 0.14          | 0.07 to 0.30  | 0.26        | 0.11 to 0.58 |
| <b>Type of birth</b>                               |         |      |               |               |             |              |
| Vaginal (ref)                                      | 99/137  | 72.3 | 1             | –             | –           | –            |
| C/S                                                | 45/65   | 69.2 | 0.86          | 0.45 to 1.65  | –           | –            |
| <b>Overall worries</b>                             |         |      |               |               |             |              |
| 6 or less (ref)                                    | 98/128  | 76.6 | 1             | –             | –           | –            |
| 7 or more                                          | 39/65   | 60.0 | 0.46          | 0.24 to 0.87  | –           | –            |
| <b>First Nations status</b>                        |         |      |               |               |             |              |
| Non-Indigenous (ref)                               | 35/47   | 74.5 | 1             | –             | –           | –            |
| First Nations                                      | 107/153 | 69.9 | 0.80          | 0.38 to 1.67  | –           | –            |

BF, breast feed/ing; C/S, caesarean.

Therefore, the high rates of ‘any’ and ‘only’ breast milk feeding at 3 months should be interpreted with caution.

The rates of breast feeding reported in this study are higher than those for Indigenous populations in other similarly colonised countries. In Canada (2009–2010), 78% of Aboriginal mothers initiated breast feeding.<sup>27</sup> In addition, 81% of American Indian and Alaskan Native women initiated breast feeding in the USA.<sup>28</sup> While New Zealand does not routinely collect breast feeding

initiation data, data are available for Māori infants at 2 weeks of age. Māori infants have the closest rates of breast feeding comparable to the findings of this study at 90% but continue to experience lower rates in comparison to non-Māori infants.<sup>29</sup> The breast feeding definitions used in this research align with those used in the Australian context and, therefore, between country comparisons are often difficult and differences in rates of breast feeding should be interpreted with caution.

**Table 4** Factors associated with only breast feeding at 3 months

|                                             | N      | %    | Unadjusted OR | 95% CI        | Adjusted OR | 95% CI        |
|---------------------------------------------|--------|------|---------------|---------------|-------------|---------------|
| BF intention to six months                  |        |      |               |               |             |               |
| < 6 months (ref)                            | 33/94  | 35.1 | 1             | –             | 1           | –             |
| ≥ 6 months                                  | 59/100 | 59.0 | 2.66          | 1.49 to 4.76  | 2.22        | 1.20 to 4.12  |
| Age                                         |        |      |               |               |             |               |
| ≤20 (ref)                                   | 4/10   | 40.0 | 1             | –             | –           | –             |
| 21–25                                       | 17/47  | 36.2 | 0.85          | 0.21 to 3.44  | –           | –             |
| 26–30                                       | 32/70  | 45.7 | 1.26          | 0.33 to 4.87  | –           | –             |
| 31–35                                       | 29/50  | 58.0 | 2.07          | 0.52 to 8.27  | –           | –             |
| 46–40                                       | 10/18  | 55.6 | 1.88          | 0.39 to 9.01  | –           | –             |
| ≥41                                         | 3/3    | 100  | 1             | –             | –           | –             |
| Age continuous                              |        |      |               |               |             |               |
| 18–44                                       | 97/202 | 48.0 | 1.06          | 1.00 to 1.12  | –           | –             |
| Parity                                      |        |      |               |               |             |               |
| Multiparous (ref)                           | 48/103 | 46.6 | 1             | –             | –           | –             |
| Primiparous                                 | 48/97  | 49.5 | 1.12          | 0.64 to 1.96  | –           | –             |
| Education                                   |        |      |               |               |             |               |
| University or higher (ref)                  | 44/67  | 65.7 | 1             | –             | 1           | –             |
| Up to diploma                               | 51/131 | 38.9 | 0.33          | 0.18 to 0.62  | 0.50        | 0.26 to 0.96  |
| Smoking in pregnancy                        |        |      |               |               |             |               |
| Yes (ref)                                   | 6/35   | 17.1 | 1             | –             | 1           | –             |
| No                                          | 88/162 | 54.3 | 5.75          | 2.26 to 14.59 | 4.05        | 1.54 to 10.69 |
| Partner status                              |        |      |               |               |             |               |
| Partnered (ref)                             | 89/182 | 48.9 | 1             | –             | –           | –             |
| Not partnered                               | 6/16   | 37.5 | 1.59          | 0.56 to 4.57  | –           | –             |
| Government benefit as main household income |        |      |               |               |             |               |
| No (ref)                                    | 84/155 | 54.2 | 1             | –             | –           | –             |
| Yes                                         | 11/43  | 25.6 | 0.29          | 0.14 to 0.62  | –           | –             |
| Type of birth                               |        |      |               |               |             |               |
| Vaginal (ref)                               | 71/137 | 51.8 | 1             | –             | –           | –             |
| C/S                                         | 26/65  | 40.0 | 0.62          | 0.34 to 1.13  | –           | –             |
| Overall worries                             |        |      |               |               |             |               |
| 6 or less (ref)                             | 67/128 | 52.3 | 1             | –             | –           | –             |
| 7 or more                                   | 25/65  | 38.5 | 0.57          | 0.31 to 1.05  | –           | –             |
| First Nations status                        |        |      |               |               |             |               |
| Non-Indigenous (ref)                        | 22/47  | 46.8 | 1             | –             | –           | –             |
| First Nations                               | 74/153 | 48.4 | 1.06          | 0.55 to 2.05  | –           | –             |

BF, breast feed/ing; C/S, caesarean.

Regardless, comparison with other Indigenous communities reinforces the disparities experienced and the need for continued effort to improve breast feeding outcomes for Indigenous populations.

There were both similarities and differences for women who participated in this study in comparison to First Nations women nationally and in Victoria. The women in this study were similar in age to the First Nations community nationally, however, were more likely to be aged 34

years or less in comparison to Victorian data (90% vs 86%).<sup>26</sup> The participants in this study were also more likely to be non-smokers (75%) than First Nations women nationally (55%)<sup>30</sup> and in Victoria (68%).<sup>26</sup> Nationally, First Nations women were more likely to be partnered than participants in our study (96% vs 87%),<sup>30</sup> however, participants in our study were more likely to be partnered than Victorian First Nations women (87% vs 56%).<sup>26</sup> Additionally, the participants in this study were more likely to



**Table 5** Most important reason for stopping breast feeding

|                                                                             | n (n=65*) | %  |
|-----------------------------------------------------------------------------|-----------|----|
| Felt there was not enough milk/did not know if baby had enough milk         | 21        | 32 |
| Unable to get baby to attach/suck/difficulties attaching baby to the breast | 5         | 8  |
| Mental health                                                               | 4         | 6  |
| Use of medication/treatment                                                 | 3         | 5  |
| Did not want to breast feed/did not want to breast feed any longer          | 2         | 3  |
| Lack of help/support/supervision with breast feeding                        | 2         | 3  |
| Self-weaned                                                                 | 2         | 3  |
| Weight loss                                                                 | 2         | 3  |
| Other†                                                                      | 24        | 37 |

\*This includes only those women who stopped breast feeding and provided a reason for stopping.  
 †Five participants provided a response to other (eg, breast surgery, baby not in mothers care, cow's milk protein allergy).

be having their first baby (46% vs 32%),<sup>26 30</sup> more likely to have an education level of certificate III or above (55% vs 49%)<sup>31</sup> and were less likely to have had a vaginal birth (67% vs 75%).<sup>26</sup>

The most significant factor for predicting breast feeding outcomes is breast feeding intention.<sup>32</sup> In this study, women who intended to breast feed for 6 months or more had increased odds of initiating breast feeding and breast feeding at 3 months. Intention to breast feed is complex however, and further research is required to understand the factors that influence intention to breast feed for women having a First Nations infant. We hypothesise that these factors may include family support, cultural support, culturally safe breast feeding information, attitudes about breast feeding and breast feeding knowledge. A recent scoping narrative review supports some of these hypotheses, finding that sources of support, culturally appropriate care, intention to breast feed and social determinants (lifestyle factors, age, education and place of residence) were factors influencing First Nations women's breast feeding practice.<sup>33</sup>

We also found that maternal education attainment was a predictive factor for First Nations women and infants, and women who had commenced or completed a degree or above were more likely to be breast feeding at 3 months. Education attainment is a factor identified consistently in breast feeding literature that is associated with breast feeding outcomes, and women who have higher education attainment are more likely to start breast feeding, and to breast feed for longer.<sup>34 35</sup> Increasing education attainment for First Nations peoples is a key goal of the Closing the Gap campaign<sup>36</sup> and while this factor is unable to be modified before or during pregnancy, ongoing funding, and support to increase education attainment is required

to positively impact breast feeding outcomes for future First Nations generations.

Smoking in pregnancy is another factor associated with breast feeding outcomes that is well reported in the literature<sup>26 35</sup> and is also associated with socioeconomic status.<sup>35</sup> In this study, we found that women who did not smoke were more likely to breast feed at 3 months. Early and targeted culturally appropriate smoking cessation advice is required,<sup>37 38</sup> with ongoing support during and after pregnancy to prevent relapse. In this study, although maternal age was associated with breast feeding at the univariate level (younger women being less likely to breast feed), this did not remain significant in the multivariate model. We theorise that this may have dropped out of the multivariate analysis due to the sample size and potentially would remain significant with a larger sample size and is an important consideration for inclusion in future research.

In addition, receiving a government benefit as the main household income was included in both the 'any' and 'only' multivariate models, but only remained significant in the 'any' breast feeding model, where women had lower odds of 'any' breast feeding at 3 months. This could be attributed to the fact that the number of women 'only' breast feeding was lower, and with a larger sample size government benefit may retain significance. Education attainment has an impact on breast feeding intention, which may be attributed to increased knowledge, or the ability to source knowledge, about the benefits of breast feeding,<sup>39</sup> and breast feeding intention is a strong predictor of commencing and continuing breast feeding. In turn, women who have higher levels of education attainment are more likely to be earning their main income from employment and less likely to rely on government benefits.<sup>40</sup> It may also be that receiving a government benefit is correlated with the other factors that remained significant in the model (eg, if you receive a government benefit you are more likely to have a lower level of education attainment, be a smoker and less likely to intend to breast feed) and, therefore, dropped out because of this correlation.

### Strengths and limitations

This study used robust, prospectively collected data in a population where collection and reporting of breast feeding is historically poor. Ongoing consultation was a key component of this research project, occurring with First Nations stakeholders to develop the methodology. The well-being of participants was a priority and maintaining women's dignity and honouring First Nations cultural values and principles was integral; we wanted to ensure effective collaboration and prioritise women's voices and experiences. We adjusted for factors commonly associated with breast feeding, however, there are possibly confounding factors that we did not have data on (such as antenatal attendance, and admission to a neonatal nursery) that may have affected the findings. A further consideration is that those women who were

lost to follow-up may have been less likely to be breast feeding at 3 months, for example a higher proportion of the non-responders had an education attainment of year 12 or less and more smoked in pregnancy, both associated here with less breast feeding, so the results reported here maybe be slightly higher breast feeding rates than that of the whole population of women recruited to the study initially. This is a cohort study of women having a First Nations infant at three sites introducing a culturally specific midwifery caseload model. We, therefore, do not have before and after data to be able to compare the rates of breast feeding before and after implementation of the culturally specific model, however, this research is similar to other studies exploring breast feeding for First Nations infants and adds to the strengths of the findings. In addition, as in all studies, the cohort of women and infants who participated in this study may not be generalisable to all First Nations populations in Victoria or Australia.

### Recommendations

In this study, we found high rates of breast feeding for First Nations infants in three hospitals in Victoria that implemented service wide change, where most women having a First Nations infant accessed a First Nations specific midwifery caseload model. The findings from the service wide introduction of a culturally specific caseload midwifery model adds strength to other evidence that culturally safe continuity of care improves breast feeding outcomes for First Nations women and infants. Therefore, we recommend implementation and upscaling of First Nations specific midwifery continuity models for First Nations women and infants within mainstream hospitals in Australia. In addition, we recommend further research exploring the impact of First Nations specific continuity of midwifery model on breast feeding in similar populations. We recommend consideration and targeted approaches in relation to the factors associated with breast feeding for First Nations women and infants in practice, with a specific focus on the factors amenable to change and that strongly predict breast feeding outcomes, such as breast feeding intention and smoking in pregnancy. To target education attainment and receiving a government benefit as the main household income, governments must engage in and implement effective policy action and work in collaboration with First Nations people to break down the barriers in accessing education and employment.

### CONCLUSION

This study found high rates of breast feeding initiation and maintenance for First Nations infants who received care in three hospitals that implemented service wide change. These rates of breast feeding were higher in comparison to Victorian and national rates and similar to population wide rates. For First Nations women and infants in urban Victoria, we found that women who intended to breast feed to 6 months or more and women who reported having a degree or higher were more likely

to breast feed at 3 months, and women who smoked in pregnancy and who received a government benefit as the main household income were less likely to breast feed at 3 months. Breast feeding intention and smoking in pregnancy require culturally safe targeted approaches within maternity care settings, supported by government action, to improve breast feeding outcomes.

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