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Factors associated with breastfeeding at discharge and duration of breastfeeding

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Objective: To identify determinants of the initiation and duration of breastfeeding amongst Australian women.
Methods: A prospective cohort study of 556 women in Perth, Western Australia and 503 women from the Darling Downs area, Queensland, Australia.
Results: Breastfeeding at discharge was most strongly associated with perceived paternal support of breastfeeding with an adjusted odds ratio of 9.13 (95% CI 4.83–17.26), using multivariate logistic regression analysis. Duration of breastfeeding was most strongly associated with the length of time a mother intended to breastfeed with an adjusted relative risk of 4.18 (95% CI 2.81–6.22) for ≥ 4 months relative to < 4 months.
Conclusions: Interventions which aim to increase the length of time a woman intends to breastfeed, and which highlight the role of the father in successful breastfeeding, are recommended to help achieve recommended targets for breastfeeding initiation and duration.

Key words: breastfeeding; determinants; duration; initiation.

Breastfeeding rates in Australia have remained relatively stable over the past decade with over 80% of women initiating breastfeeding and around 50% of women continuing to breastfeed for at least 6 months.[1–4] Nevertheless these rates still fall short of the recommended national targets of 90% of woman breastfeeding on discharge and 80% of women breastfeeding at 6 months.[5] In order to achieve these targets, it is important for health professionals to understand the factors that influence both the decision to breastfeed and the duration of breastfeeding.

The determinants of breastfeeding have been the subject of much research since the mid 1970s. Earlier studies were often limited by the fact that they did not consider the confounding of factors[6] and usually studied only one population of women. While the use of multivariate analysis allows for the control of confounding factors,[7] direct comparisons between breastfeeding studies are still difficult because the number and kind of variables studied usually vary from study to study.[6]

A number of small local, regional and state-level infant feeding studies have been conducted in Australia over the last 20–30 years.[8] However, such studies of sub-national populations cannot be used, in themselves, to infer trends and differentials in the national population. The first national survey was conducted by the Commonwealth Department of Health in 1983 to provide information for the Australian Delegation to the 1983 World Health Assembly.[1] This survey indicated that 85% of mothers were fully breastfeeding their babies at hospital discharge. This allowed breastfeeding rates at discharge to be compared across states for the first time. However, the data collected on the prevalence of breastfeeding at later infant ages were less reliable and could not be said to give a truly representative national picture.[8] In addition, data were not analyzed to give prevalence rates by socioeconomic or ethnic group.

In 1989–90, the Australian Bureau of Statistics conducted the first National Health Survey.[9] This survey included questions on breastfeeding, and had the potential to provide, for the first time, national age-specific prevalence data. It was the first of a series of quinqennial surveys and was seen as the vehicle to monitor progress towards national targets.[5] Data were collected retrospectively from women aged 18–50 years with children aged ≤ 5 years and a number of limitations in the design of the survey and the collection and analysis of data were identified.[10]

While not presenting national data, this paper combines the results of two prospective studies of Australian women that have been reported separately elsewhere.[11–13] Data were collected at the time to which they refer, so there was no problem of maternal recall.[14] The combination of data sets allowed the comparison and multivariate analysis of data from two regional studies, on opposite sides of the continent, including both rural and urban women.

METHODS

The data of two separately conducted but similarly designed studies were combined and analyzed as one data set. The first sample included 556 urban women delivering at two hospitals in Perth, Western Australia, between September 1992 and April

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1993. The second sample included 503 rural women delivering at two hospitals in the Darling Downs area in Queensland between November 1995 and July 1996.

Both studies used essentially the same survey instruments and participants were recruited in a similar fashion. New mothers were visited within the first 3 days following birth and invited to participate in an infant feeding study. Attempts were made to contact all women delivering during the study period. Participants completed the self-administered baseline questionnaire while in hospital.

The baseline questionnaire was designed to identify feeding method while in hospital and to collect information on variables known or suspected to be associated with breastfeeding initiation and duration. As the baseline questionnaire was to be self-administered, a number of steps were taken to ensure that it was easy to read, comprehend and complete. The draft questionnaire was reviewed and modified by two adult literacy experts and then pilot-tested on a group of 20 new mothers; further modifications were made based on their comments.

Mothers who were breastfeeding at the time of completing the questionnaire were followed up by telephone interview. In the Perth study, these interviews were conducted at 2, 6, 10, 14, 18 and 24 weeks postpartum. As a result of budget and time constraints, the interviews were conducted less frequently in the Darling Downs study, at 2 weeks, 6 weeks, 3 months and 6 months.

The follow-up questionnaire was designed to elicit information on current feeding practices, the types of problems experienced by women during the course of lactation, and to pinpoint the time of weaning and identify reasons for the cessation of breastfeeding before 6 months postpartum. During the administration of both questionnaires care was taken not to motivate the mother towards any specific feeding method. No advice about breastfeeding was given during the follow-up interviews.

In Perth, women declining to participate in the study were requested to provide basic demographic information such as age, years of education, marital status and method of feeding. Ethical approval was not given to collect this data for these Darling Downs population.

The study conformed with the Principles of the Declaration of Helsinki and was approved by the Human Ethics Committees of Curtin University of Technology and the then Darling Downs Regional Health Authority Ethics Committee. Signed informed consent was obtained from participants.

Statistical methods

Data were entered and analyzed using the Statistical Package for Social Sciences, Advanced statistics. Release 6.0 (SPSS for Windows, SPSS Inc., Chicago, IL, USA). Statistical tests used to compare the characteristics of the two samples included Student's *t*-test and χ^2 test.

Multivariate logistic regression analysis was employed to determine which factors were associated with breastfeeding at discharge. Variables found to have a non-significant effect on the model were then removed in a backward stepwise fashion. All variables in the final model were variables for which, when excluded, the change in deviance compared with the corresponding χ^2 test statistic on the relevant degrees of freedom (d.f.) was significant.

Survival analysis was used to examine the duration of breastfeeding as it provides a good understanding of breastfeeding behaviour over time. This type of analysis is used due to the presence of censored data. The term 'censored data' refers to data from those cases where breastfeeding continued beyond the end of the study period or beyond the time at which the subject dropped out of the study.

Variables reported in the literature to have an effect on the duration of overall breastfeeding were investigated in a regression using Cox's proportional hazards model. This model allows joint estimation of the effects of predictor variables on the 'hazard' – *the risk of cessation of breastfeeding,* rather than the duration itself, and can be used to analyze data that contain censored observations.[15] It uses all available data and is a more powerful statistical technique than single point prevalence. The assumption of proportionality of categorical variables was tested by calculating the log-minus-log of the survival function of each explanatory variable and plotting this against log-time (duration). Variables of interest were included in the full model that was then reduced using the backward elimination procedure, using the 5% critical value of χ^2 test for the appropriate d.f.

Breastfeeding terms and definitions used in this study are those recommended by The Interagency Group for Action on Breastfeeding.[16] The extent and duration of breastfeeding are defined by the following terms: (1) full; (2) partial; and (3) overall. Fully breastfed infants received breast milk as their only source of milk, however, other fluids such as water or juice, or ritualistic feeds, may have been given infrequently. Partially breastfed infants received breast milk in combination with infant formula. Overall breastfeeding is defined as the length of time an infant received any breastfeeding.

RESULTS

In total, 1618 women were eligible to participate in the combined studies (948 urban, 670 rural). Of these, 1323 (717 urban, 606 rural) were contacted and 1059 (556 urban, 503 rural) completed baseline questionnaires, representing 80% (77% urban, 83% rural) of women contacted and 65% (58% urban and 75% rural) of those eligible to participate. Amongst urban women, there were no differences between participants and those who declined to participate with respect to age (χ^2 = 5.18, d.f. 5, P = 0.394), years of education (χ^2 = 0.55, d.f. 1, P = 0.457), marital status (χ^2 = 4.92, d.f. 3, P = 0.178) and method of feeding (χ^2 = 0.58, d.f. 2, P = 0.748). This information was not collected from rural women declining to participate, so no comparisons can be made.

Of the 1059 participants, 929 (87.7%) attempted to breastfeed whilst in hospital (88.1% urban, 87.3% rural). The percentage of women who continued to breastfeed at different time points is presented in Table 1. Overall, at discharge 83.1% of women were breastfeeding, indicating that approximately 5% of the sample population experienced difficulties with establishing breastfeeding and/or decided to stop breastfeeding before leaving hospital. By 6 months the proportion of women breastfeeding had fallen to 46.4%.

There were relatively few significant differences in the characteristics of urban and rural women participating in the studies. In general, rural women were younger (26.6 years *vs* 27.7 years, P = 0.002) more likely to have been born in Australia (95% *vs* 76%, χ^2 = 83.39 d.f. = 2 P = 0.000) and to

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Table 1 Percentage of women breastfeeding* at hospital discharge and selected time points†

Interview	Urban %	Rural %	Total %
At discharge	83.8	80.7	83.1
2 weeks	79.0	72.0	75.7
6 weeks	71.5	61.8	66.9
24 weeks	49.9	44.2	46.9

*Breastfeeding includes full and partial breastfeeding.
†Breastfeeding duration determined using survival analysis.

have more than one child (38% *vs* 31%, $\chi^2 = 6.61$ d.f. = 1 $P = 0.010$). There were no significant differences between rural and urban women for other sociodemographic (maternal education, marital status, employment and occupation or paternal occupation) and biomedical factors (method of delivery and infant birthweight).

Table 2 lists sociodemographic, biomedical and psychosocial factors of mother and infant that might be expected to have an influence on the establishment of breastfeeding at discharge. The numbers and percentage of breastfed infants for each variable are given. The univariate odds ratios indicate the likelihood of a mother breastfeeding at discharge from hospital. A lower level of maternal education, lower paternal occupational status, having more than one child, having had a caesarean delivery, infant admission to a Special Care Nursery (SCN) and having a low-birthweight infant were negatively associated with breastfeeding at discharge. A perceived preference of the partner and maternal grandmother for breastfeeding, attendance at antenatal classes and making the decision to breastfeed prior to pregnancy were positively associated with breastfeeding at discharge.

Variables in Table 2 were then analyzed using a backward stepwise multivariate logistic regression analysis. Variables with greater than 10% of missing cases, such as maternal and paternal occupation, were excluded from the full model, as their inclusion would have resulted in a relatively large number of subjects being excluded from the analysis. The factors that remained significantly associated with breastfeeding at discharge are shown in Table 3. Women who were older, had been born in Australia, had made their infant feeding decision before pregnancy and whose partners and own mothers were perceived to be supportive of breastfeeding were more likely to be breastfeeding at discharge. Whereas, women who had more than one child, intended to return to work or study within 6 months of the birth or whose infant had been admitted to the SCN, were less likely to be breastfeeding at discharge.

To identify variables associated with breastfeeding duration, a Cox regression analysis was performed on women who were breastfeeding at the time of discharge from hospital. Those variables included in the multivariate regression analysis, along with a number of hospital practices thought to be associated with breastfeeding duration were included in the model.

The hazard (or risk of cessation of breastfeeding) decreased with increasing maternal age and level of maternal education (Table 4). Biomedical factors negatively associated with breastfeeding duration were being male and having been admitted to a SCN.

Hospital practices such as promoting demand feeding and early infant-to-breast contact (within 30 min or less of delivery) were not found to be associated with duration. However, mothers who roomed-in with their infants for 24 h per day were less likely to stop breastfeeding at any time than women who did not room-in. Intended duration was the psychological variable most strongly associated with prolonged breastfeeding. A decision to breastfeed prior to the pregnancy, as well as perceived social support for breastfeeding on the part of the infant's father were also positively associated with breastfeeding duration.

DISCUSSION

A limitation of the analysis was that overall only 65% of eligible women participated in the studies, introducing a potential response bias. However, for urban women there was no significant difference between participants and those declining to participate for key demographic factors investigated, suggesting that the sample was representative of the population from which it was drawn. Although, it was not possible to make these demographic comparisons for the rural women, the response rate of 75% for rural women was better than for the urban sample (58%), reducing the likelihood of a response bias.

The design of this study avoided the potential bias of other studies that often rely on women responding to self-administered mail-in questionnaires. There is evidence that underprivileged women are less likely to respond to mail-in questionnaire, leading to this group being under-represented in many studies.[17] In this study, efforts were made to increase the likelihood of participation of hard-to-reach and minority groups and to reduce respondent burden. The baseline questionnaire, while self-administered, was designed to accommodate low literacy levels, participants were recruited, and the questionnaire completed, whilst mothers were still in hospital and the follow-up interviews were conducted by telephone.

A possible selection bias may have been introduced as a result of the multivariate analysis procedures. In the statistical package used, and most other software packages, only cases with complete data sets can be entered into a multivariate model. To limit the number of cases excluded from the final analysis, only those variables with fewer than 10% of missing cases were loaded into the full model. As a result, neither the mother's nor father's occupation was entered in the model as both variables had 10.5% and 15.5% missing cases, respectively. In addition, for both occupation variables a relatively large number of responses were poorly defined and did not fit into any of the groups used to categorize occupation. In total, 886 of the total combined sample of 1059 mothers (84%) were analyzed using the multivariate logistic regression model. Similarly, 680 cases of a possible 880 breastfeeding mothers (77%) were analyzed using the Cox regression model. It was not possible to determine whether these cases were missing at random or whether the missing data was in some way connected to an explanatory variable or the independent variable.

Despite these limitations, the results are generally consistent with the literature and contribute towards an understanding of the determinants of the initiation and duration of breastfeeding.

A number of associations with sociodemographic variables were consistent with previous studies. In general, the older a

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Table 2 Number (percentage) and univariate odds ratios (95% confidence intervals) for breastfeeding at discharge from hospital

	Breastfeeding at discharge		Univariate odds ratio	
	Yes (%)	No (%)	OR	(95% CI)
Sociodemography				
Mother's age (years):				
< 25	288 (83.0)	59 (17.0)	1.00	
25–29	296 (82.7)	62 (17.3)	0.99	(0.76–1.22)
30–34	203 (85.3)	35 (14.7)	0.97	(0.74–1.26)
≥ 35	82 (81.2)	19 (18.8)	1.18	(0.85–1.63)
Mother's education (years of schooling):				
< 12	481 (80.7)	115 (19.3)	1.00	
≥ 12	347 (87.4)	50 (12.6)	1.66	(1.16–2.38)
Mother married:				
No	255 (79.7)	65 (20.3)	1.00	
Yes	608 (84.7)	110 (15.3)	1.41	(1.00–1.98)
Mother's country of birth:				
Other	53 (79.1)	14 (20.9)	1.00	
UK/Eire	69 (76.7)	21 (23.3)	0.87	(0.40–1.87)
Australia/New Zealand	743 (84.0)	141 (16.0)	1.39	(0.75–2.58)
Mother employed/studying part- or full-time at 6 months before birth:				
No	447 (81.0)	105 (19.0)	1.00	
Yes	414 (85.4)	71 (14.6)	1.37	(0.98–1.90)
Mother intended to be employed/studying part- or full time at 6 months postpartum:				
No	751 (83.7)	146 (16.3)	1.00	
Yes	111 (79.3)	29 (20.7)	0.74	(0.48–1.16)
Mothers occupation:				
Admin/managers/profess/paraprofess	125 (90.6)	13 (9.4)	1.00	
Clerical/sales/personal services	207 (85.5)	35 (14.5)	0.62	(0.28–1.34)
Trades/labourers/plant operators	93 (85.3)	16 (14.7)	0.60	(0.28–1.32)
Other	371 (79.3)	97 (20.7)	0.40	(0.11–2.82)
Father's occupation:				
Admin/managers/profess/paraprofess	183 (91.5)	17 (8.5)	1.00	
Clerical/sales/personal services	59 (80.8)	14 (19.2)	0.39	(0.18–0.84)
Trades/labourers/plant operators	472 (82.4)	101 (17.6)	0.43	(0.25–0.75)
Other	71 (84.5)	13 (15.5)	0.51	(0.23–1.10)
Location:				
Urban	466 (83.8)	90 (16.2)	1.00	
Rural	414 (82.3)	89 (17.7)	0.90	(0.65–1.24)
Biomedical				
Parity:				
Primiparous	319 (88.4)	42 (11.6)	1.00	
Multiparous	555 (80.3)	136 (19.7)	0.54	(0.37–0.78)
Vaginal delivery:				
No	137 (77.0)	41 (23.0)	1.00	
Yes	735 (84.3)	137 (15.7)	1.60	(1.08–2.38)
Sex in infant:				
Male	435 (82.4)	93 (17.6)	1.00	
Female	432 (83.6)	85 (16.4)	1.09	(0.79–1.50)
Birthweight (g):				
< 2500	33 (70.2)	14 (29.8)	1.00	
≥ 2500	834 (83.6)	164 (16.4)	2.16	(1.13–4.12)
Infant admitted to special care nursery:				
No	655 (85.1)	115 (14.9)	1.00	
Yes	197 (78.5)	54 (21.5)	0.64	(0.45–0.92)
Psychosocial				
Mother attended antenatal classes for this or previous pregnancy:				
No	332 (80.2)	82 (19.8)	1.00	
Yes	541 (84.9)	96 (15.1)	1.39	(1.01–1.92)
Father prefers breastfeeding:				
No or ambivalent	399 (71.5)	159 (28.5)	1.00	
Yes	466 (96.5)	17 (3.5)	10.92	(6.50–18.32)
Maternal grandmother prefers breastfeeding:				
No or ambivalent	570 (77.9)	162 (22.1)	1.00	
Yes	292 (95.4)	14 (4.6)	5.91	(3.37–10.39)
Maternal grandmother breastfed at least one infant:				
No or don't know	243 (76.4)	75 (23.6)	1.00	
Yes	630 (86.4)	99 (13.6)	1.96	(1.41–2.28)
Infant feeding decision made before pregnancy:				
No	294 (71.5)	117 (28.5)	1.00	
Yes	581 (90.5)	61 (9.5)	3.79	(2.70–5.32)

OR, Odds ratio.

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Table 3 Factors associated with breastfeeding at discharge after adjustment for potential confounders* (n = 886)

Variable†	n	Odds ratio	(95% CI)
Sociodemography			
Maternal age	886	1.51[c]	(1.00–2.29)‡
Mother's country of birth:			
Other countries	125	1.00	
Australia/New Zealand	761	1.98	(1.14–3.43)
Mother plans to return to work within 6 months postpartum:			
No	771	1.00	
Yes	115	0.61	(0.35–1.06)
Biomedical			
Parity:			
Multiparous	575	1.00	
Primiparous	311	2.08	(1.28–3.45)
Spent time in Special Care Nursery:			
No	679	1.00	
Yes	207	0.55	(0.35–0.86)
Psychosocial			
Father's preference:			
Prefers bottle-feeding or ambivalent	478	1.00	
Prefers breastfeeding	408	9.13	(4.83–17.26)
Maternal grandmother's preference:			
Prefers bottle-feeding or ambivalent	618	1.00	
Prefers breastfeeding	268	2.16	(1.15–4.03)
When decided feeding method:			
During or after pregnancy	340	1.00	
Before pregnancy	546	3.08	(2.04–4.67)

–2 log likelihood (deviance) 179.207 d.f. 8

*Non-significant variables were method of delivery, infant birthweight, infant sex, attendance at antenatal classes, whether maternal grandmother had breastfed, mother's employment status prior to birth, mother's marital status, level of education or location of residence.

†All variables in the final model were variables for which when excluded the change in deviance compared with the corresponding χ^2 test statistic on the relevant degrees of freedom was significant.

‡Odds ratio and 95% CI calculated for a 10-year age difference (e.g. a 30-year-old woman relative to a 20-year-old woman).

woman is the more likely she is to choose to breastfeed[18–20] and to breastfeed for longer periods.[6,18,19,21,22] For instance, in this analysis, a woman aged 30 years was one and a half times more likely to be breastfeeding at discharge (OR = 1.51, 95% CI 1.00–2.29), and half as likely to stop breastfeeding at any time up to 6 months (relative risk (RR) = 0.49, 95% CI 0.38–0.65), when compared with a 20-year-old woman. Similarly, Rutishauser and Carlins, in an earlier study of Australian women, reported that women aged 30 years were significantly less likely to have stopped breastfeeding at any time compared with women aged 20 years (RR = 0.45 95% CI 0.32–0.67).[6] A positive association between educational level attained and both the incidence[18,19,23] and duration[18,19,22–24] of breastfeeding has been consistently reported. In this analysis, there was a positive association between level of maternal education and duration but no association with breastfeeding at discharge. Women who had completed 15 years of education were less likely to have stopped breastfeeding than women who had completed 10 years of education (RR = 0.49, 95% CI 0.33–0.72).

Women who were born in Australia or New Zealand were almost twice as likely to be breastfeeding at discharge than women born in other countries (OR = 1.98, 95% CI 1.14–3.43). However, once breastfeeding was initiated, there was no association between a woman's ethnic background and duration of breastfeeding. Similarly, after controlling for other potentially confounding factors there was no difference in the initiation and duration of breastfeeding amongst urban and rural women. This suggests that the differences in rural and urban breastfeeding rates in Australia, previously described,[25] may be due to differences in the sociodemographic characteristics of the rural and urban samples rather than to any intrinsic differences between rural and urban women.

Mothers who intended to return to full or part-time work or study within 6 months of the birth were less likely to be breastfeeding at discharge than mothers who intended to remain at home (OR = 0.61, 95% CI 0.35–1.06). However, there was no association between breastfeeding duration and a mother's intention to return to work. Of those breastfeeding women who intended to return to work, 43% were still breastfeeding at 6 months compared with 47% of mothers who intended to remain at home with their infant. However, it is unclear how many women actually fulfilled their intentions and returned to work within this period. It is possible that a number of women did not return to work within 6 months, as planned. In general, recent research suggests that maternal employment is negatively associated with both the initiation[19,23] and duration[21] of breastfeeding.

The association of parity with breastfeeding initiation and duration is inconsistent. Several studies employing multivariate analysis have found no difference between multiparous and primiparous women for either the initiation[20,23] or duration of breastfeeding.[20,22,23] Others, however, have found that primiparous women are more likely to initiate breastfeeding,[18] while

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Table 4 Factors associated with shorter overall duration of breastfeeding after adjustment for potential confounders* (n = 680)

Variable†	n	Relative risk	(95% CI)
Sociodemography			
Maternal age	680	0.49‡	(0.38–0.65)
Years of maternal education	680	0.49¶	(0.33–0.72)
Biomedical			
Infant sex:			
Female	344	1.00	
Male	336	1.28	(0.99–1.66)
Spent time in Special Care Nursery:			
No	540	1.00	
Yes	140	1.56	(1.16–2.08)
Hospital practices			
Infant roomed in for 24 h/day:			
No	415	1.00	
Yes	265	0.78	(0.59–1.03)
Psychosocial			
Father's preference:			
Prefers bottle-feeding or ambivalent	311	1.00	
Prefers breastfeeding	369	0.58	(0.45–0.75)
When decided feeding method:			
During or after pregnancy	215	1.00	
Before pregnancy	465	0.58	(0.44–0.77)
Intended duration of breastfeeding:			
≥ 4 months	490	1.00	
Undecided	141	1.64	(1.21–2.23)
< 4 months	49	4.18	(2.81–6.22)

–2 log likelihood (deviance) 2760.629 d.f. 9

*Non-significant variables were infant birthweight, method of delivery, parity, demand feeding, early infant-to-breast contact, attendance at antenatal classes, conflicting breastfeeding advice, maternal grandmother's feeding preference, whether maternal grandmother had breastfed, mother's employment status prior to birth, mother's future employment intentions, mother's marital status, country of birth or location of residence.

†All variables in the final model were variables for which when excluded the change in deviance compared with the corresponding χ^2 test statistic on the relevant degrees of freedom was significant.

‡Relative risk and 95% CI calculated for a 10-year age difference (e.g. a 30-year-old woman relative to a 20-year-old woman).

¶Relative risk and 95% CI calculated for a 5-year difference (e.g. 15 years of schooling *vs* 10 years).

multiparous women appear to continue breastfeeding for longer.[18,21] In this analysis, primiparous women were twice as likely to be breastfeeding at discharge compared with multiparous women (OR = 2.08, 95% CI 1.28–3.45) but no association was found between parity and overall duration of breastfeeding.

An unexpected finding of this analysis was the weak association between infant gender and breastfeeding duration. Male infants were more likely to have been weaned at any time compared with female infants (RR = 1.28, 95% CI 0.99–1.66). This trend has been reported previously,[26–28] and one possible explanation has been offered by Perez-Escamilla *et al*. who suggest that mothers and/or health workers perceive that male infants have higher nutritional needs and should therefore receive non-breast milk fluids and foods earlier than female infants.[28] While this association has not been consistently reported,[20,22] it nevertheless warrants further investigation. It is possible that male infants, as a result of early weaning, may be missing out on the well documented nutritive and immunological advantages of breastfeeding.[29]

In this analysis, mothers with infants who had been admitted to an SCN were less likely to be breastfeeding at discharge (OR = 0.55, 95% CI 0.35–0.86) and were more likely to have stopped breastfeeding before 6 months (RR = 1.56, 95% CI 1.16–2.08). The presence of infant health problems requiring admission to an SCN not only implies physical problems that may limit the infant's ability to feed but also restricts the mother's access to her baby for feeding. A negative association between infant health problems and both the initiation[18] and duration[24] of breastfeeding have been reported previously. However, Clements *et al*.[23] in a UK study, and Ford *et al*.[20] in a New Zealand study, failed to find any association between admission to the neonatal intensive care unit and either the initiation or duration of breastfeeding. These findings suggest that strong maternal commitment and a supportive hospital environment can overcome intervening events that contrive to make breastfeeding difficult.

A number of hospital practices which are currently encouraged to promote breastfeeding, such as early infant-to-breast contact, demand feeding and 24 h-rooming-in, were included in the Cox Regression analysis. Of these, only 24 h-rooming-in was found to be positively associated with the duration of breastfeeding. Although rooming-in was encouraged in all hospitals participating in the study, only 37% of women (29% urban and 46% rural) kept their infants with them for 24 h, usually out of consideration for other women in their shared ward/room. Mothers who roomed-in with their infants whilst in hospital were less likely to have stopped breastfeeding at any

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time, compared with mothers whose infants spent some time in the nursery (RR = 0.78, 95% CI 0.59–1.03). Lawson and Tulloch reported that breastfeeding duration was related to the extent of mother-infant contact in the first 72 h after birth.[24] Similarly, Ford *et al*. found that bed-sharing was positively associated with breastfeeding success.[20] It is difficult to determine the direction of the association between rooming-in or bed-sharing and breastfeeding duration. Rather than suggesting a cause–effect relationship, Ford *et al*.[20] contend that the association is likely to be indicative of attitude; mothers who choose to breastfeed and to breastfeed for longer duration are also those who are likely to share their bed (or in this case, room-in) with their baby.

The results of this study suggest that a woman's partner and family have an important influence on her decision to breastfeed and to wean. Women who perceived their partner to prefer breastfeeding were more likely to be breastfeeding at discharge (OR = 9.13, 95% CI 4.83–17.26) and were less likely to stop breastfeeding at any time (RR = 0.58, 95% CI 0.45–0.75) than women who perceived their partner to either prefer bottle-feeding or to be ambivalent about how they fed their baby. Similarly, women who perceived their own mother to prefer breastfeeding were more likely to be breastfeeding at discharge (OR = 2.16, 95% CI 1.15–4.03). Other studies conducted in the US have reported a positive association between partner's support for breastfeeding and both the initiation and duration of breastfeeding. Giugliani *et al*. reported that women whose partners favoured breastfeeding were more likely to breastfeed, compared with mothers whose partners either preferred bottle feeding or were ambivalent about infant feeding (OR = 32.8).[30] Similarly, Howard *et al*. reported that women whose partner did not favour breastfeeding were more likely to discontinue breastfeeding at anytime compared with women whose partners favoured breastfeeding (RR = 1.30).[31] These results indicate that fathers participate in, and influence, the choice of infant feeding method, and influence duration by acting as key supports or deterrents to breastfeeding by the mother.

In this present study, women were more likely to be breastfeeding at discharge (OR = 3.08, 95% CI 2.04–4.67) and less likely to wean before 6 months (RR = 0.58, 95% CI 0.44–0.77) if they had decided how they would feed their infant before becoming pregnant. Women who have considered their infant feeding options and chosen breastfeeding prior to pregnancy may have a stronger desire and determination to breastfeed than women who do not consider infant feeding until later in their pregnancy. It would be logical to assume that women without this strong determination are more likely to stop breastfeeding if and when they encounter difficulties and problems.

The theory that women have a predetermined breastfeeding goal is further strengthened by the finding in this study that intended duration was the strongest predictor of actual breastfeeding duration. Women who intended to breastfeed for less than 4 months were just over four times more likely to have stopped breastfeeding (OR = 4.18, 95% CI 2.81–6.22) than women who intended to breastfeed for 4 months or more. This association has been reported previously[24] and is consistent with the theory of reasoned action, which states that most actions of social relevance are under volitional control and that individual intention to perform an action is an immediate determinant of that action.[32] O'Campo *et al*. suggest that simply asking a woman how long she intends to breastfeed is an efficient method of identifying who is at risk of breastfeeding for a short duration.[33]

In conclusion, the results of this study suggest a continued need to target breastfeeding promotion initiatives at young women, less well educated women and migrant women, identified in this and previous studies as groups with lower rates of breastfeeding. The finding that the initiation of breastfeeding was not independently associated with whether a woman lived in rural Queensland or urban Western Australia suggests that nationwide strategies to promote breastfeeding are feasible. While most strategies aimed at encouraging and supporting breastfeeding focus attention on the mother–infant pair, the results of this study highlight the potential for including fathers in breastfeeding discussions. Carefully designed and evaluated interventions which prepare partners to offer the emotional and practical support required by their partners could potentially increase the initiation and duration of breastfeeding in Australia. Interventions that aim to influence prenatal infant feeding intentions are also supported. Further study is required to identify the most effective method of positively influencing the length of time an expectant mother intends to breastfeed.

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