Abstract  Infant feeding research in Tasmania in the 1970s, the 1980s and the late 1990s has highlighted the lower rates of breastfeeding compared with levels in other Australian states. The objective of this pilot study was to contribute to the development of an infant feeding minimum data set for Tasmania with a survey using an established data collection system. A retrospective survey using an existing school entry data collection system was initiated, focusing on breastfeeding and introduction of solids amongst Tasmanian infants. A five-item questionnaire based on questions from the 1995 National Health Survey was distributed through Tasmanian schools to parents of year 1 children during the 1997 school year. Questions were attached to the existing annual Family and Child Health Service year 1 school health survey. A total of 5732 completed questionnaires were returned from an estimated population of 7062 Tasmanian six-year-olds in 1997, representing an 80% participation rate. Just over 80% of parents reported that their child had been breastfed and 76% were breastfeeding on discharge from hospital. This estimate was within 3% of the breastfeeding initiation rate determined prospectively by perinatal data collections in the year of this sample’s birth (1992). Of the children in this population reported to be breastfeeding on discharge, 71%, 63%, 52% and 40% were still breastfeeding at two weeks, six weeks, three months and six months, respectively. About one-third (34.3%) of all parents indicated introducing solids before four months of infant age. About three-quarters (77%) had introduced solids by six months and over 95% by seven months. About one-third (34.3%) of all parents indicated introducing solids before four months of infant age. About three-quarters (77%) had introduced solids by six months and over 95% by seven months. Given the need for statewide infant nutrition monitoring and surveillance data, this data collection method has potential as an efficient data collection system to support nutrition program planning and evaluation. Although limitations exist with respect to the limited data of demographic confounders and the precision of retrospective surveys of this nature, results confirm the relatively low breastfeeding initiation rates in Tasmania and highlight a need for interventions addressing the high prevalence of premature introduction of solids to infants. (Aust J Nutr Diet 2001;58:169–173)

Key words: breastfeeding, introduction of solids, monitoring and surveillance, Tasmania

Introduction

The development of food and nutrition monitoring and surveillance systems has been recognised in national and state level policy initiatives as an important public health nutrition priority (1–3). Considerable infant feeding research and monitoring occurred in Tasmania between 1970 and 1985 (4–7), highlighting the relatively low breastfeeding rates in Tasmania compared to other Australian states. Between 1985 and 1997, there was limited investigation or monitoring of breastfeeding and other infant feeding data to assist public health nutrition intervention planning and evaluation targeting infant nutrition. In 1994 a mandate was provided by the Tasmanian Food and Nutrition Policy to actively promote breastfeeding and develop and maintain nutrition monitoring and surveillance systems (2).

A number of Australian prospective cohort studies have been conducted to analyse the factors that influence breastfeeding initiation and duration (8–10). It is recognised that studies of this nature are preferable to retrospective surveys because they are less prone to the effects of imprecise maternal recall of feeding events. They are limited, however, by being much more resource intensive to conduct.

Evidence of the validity of retrospective data on breastfeeding and infant feeding practices in Australia is limited to two studies, one after three years (11) and another after 14 years (12). Even after an interval of 14 years, recall of initial infant feeding method was sensitive (82%) and specific (93%). Agreement between maternal recall and health records was better for first- and second-born children (86%) than later-born children (76%) but much less in mothers who had breastfed for less than a month (65%) (12). Agreement for the duration of breastfeeding after an interval of three years was within one month of the recorded duration in 79% of mothers and within two months of the recorded duration in 95% of mothers (11).

The current study did not require epidemiological analysis. In the context of nutrition monitoring and surveillance, retrospective data from maternal recall of infant feeding practices have been reported to likely be a valid measure of actual practice (13). It was therefore considered an appropriate method to investigate infant feeding practices in this study.

Method

In 1997, a minimum data set for monitoring and surveillance of infant feeding was proposed (14) based on a review of available data collection systems and consultation with the various professional and community-based member groups of the Tasmanian Breastfeeding Support Coalition (15).

Sampling

One of the existing data collection mechanisms identified in this process was a survey distributed to parents of...
year 1 (six-year-old) schoolchildren throughout Tasmania through the school-based Family and Child Health Service (FACHS) nursing service. This data collection mechanism was considered as an opportunity to assess year 1 children’s feeding histories retrospectively via a suite of questions added to the FACHS survey. The opportunistic nature of using an existing data collection system, its reportedly high target group population capture (estimated by FACHS to be approximately 90%) and low relative cost contributed to our interest in progressing this pilot of data collection.

**Instrument**

A short five-item mixed-format questionnaire was developed using four existing questions relating to infant feeding from the 1995 National Health Survey (16) and an additional question about siblings. Information about siblings and parity was of interest given the potential effect of the number of siblings on maternal recall (12). This was attached to the annual FACHS year 1 school questionnaire administered by FACHS staff through all Tasmanian schools. Because of the need to limit respondent burden, demographic information collected was limited to region (represented by Department of Community and Health Services regional boundaries) and number of older siblings, in order to assess regional variations and the effect of parity on infant feeding practices. Extra explanatory and instructive information was included with the questions (Table 1). Questionnaires were distributed to all parents of year 1 Tasmanian school students through the school system and collated by FACHS school nursing staff during the 1997 school year. Questionnaires were then forwarded to the Community Nutrition Unit for data entry and analysis.

**Data analysis**

Data were entered and analysed using SPSS for Windows (SPSS Inc, Chicago, SPSS for Windows, release 9.0, 1999). Analysis included descriptive statistics for all question items. Response rates from this data collection system were calculated using two sampling frames, derived by Australian Bureau of Statistics estimates of the six-year-old Tasmanian population strata in 1997 and birth data from the cohort’s birth year of 1992 (17). Chi-squared association tests were used to analyse associations between breastfeeding initiation and region, and experience with older children (first child versus child with older siblings).

Survival plots were constructed for breastfeeding duration amongst children breastfeeding on discharge using length of breastfeeding as the terminal event, and breastfeeding duration by age of introduction of solids (categories collapsed to less than four months and equal to or greater than four months). Kaplan-Meier statistics were calculated by breastfeeding duration and age of introducing solids to assess differences in survival curve distribution. Age of introducing solids was plotted as a cumulative percentage chart. ANOVA was used to test differences in mean age of introducing solids by region and parity.

**Results**

**Response rates**

Completed questionnaires were obtained from a total of 5732 children over the 1997 school year collection period. Compared to Tasmanian birth data (17) for the birth year of this cohort (1992, n = 6987 births), this represents a target group capture in the vicinity of 82% of the school year 1 child population in Tasmania.

**Breastfeeding initiation**

Eighty percent of the 5468 respondents who replied, reported that their year 1 child had at some stage breastfed (‘ever breastfed’) (Table 2). As an estimate of breastfeeding initiation, 76% reported that they were breastfeeding their child on discharge from hospital (4347 of 5732).

The proportion of respondents indicating breastfeeding initiation as ‘ever breastfed’ was consistently higher than that expressed by ‘breastfeeding on discharge’ by three to five percentage points. There was a significant difference by region in the proportion of children reported to have had breastfeeding initiated, with respondents from the northern regions (north and north-west) more likely to have reported breastfeeding on discharge than those from southern Tasmania. There was a significant difference identified between breastfeeding initiation rates, as represented by breastfeeding on discharge, and parity ($\chi^2 = 63.5, P < 0.000$), with children with older siblings more likely to have breastfeeding initiated. Less than 4% of respondents indicated that their child was a first-born (i.e. no older siblings).

**Breastfeeding duration**

The mean length of breastfeeding was 36 weeks with a standard deviation of 32 weeks indicating a considerable spread of duration times. Mean breastfeeding duration (as represented by full and partial breastfeeding) tended towards significant difference by region (ANOVA, $F = 2.49, P = 0.052$) (Table 2), with mean duration higher in the southern region.

A survival plot for breastfeeding duration for all children who were breastfeeding on discharge is depicted in Figure 1. This plot illustrates that rate of breastfeeding cessation amongst breastfeeding initiators after discharge from hospital.

**Table 1. Questionnaire items**

<table>
<thead>
<tr>
<th>Item</th>
<th>Response options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has your child ever been breastfed? [Please circle]. If no, please go to question 4</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Was your child breastfed when he/she first came home from hospital? [Please circle]</td>
<td>Yes, no, or not born in hospital</td>
</tr>
<tr>
<td>Including times of weaning, what was the total time your child was breastfed? (i.e. what was your child’s age when you finally stopped breastfeeding) Please write number, e.g. [6] weeks</td>
<td>Open ended</td>
</tr>
<tr>
<td>At what age was your child first given solid food? Solid food is foods other than milks, waters or juices, e.g. pureed fruit, e.g. [10] weeks</td>
<td>Open ended</td>
</tr>
<tr>
<td>How many older brothers or sisters does your child have?</td>
<td>None, 1, 2, 3, 4 or more than 4</td>
</tr>
</tbody>
</table>
Breastfeeding and introduction of solids

The rate of breastfeeding cessation as depicted by a decline in proportion breastfeeding in the first 12 weeks (averaging greater than 2% decline per week) was more than twice the decline in proportion breastfeeding from weeks 12 to 52 (averaging 1% per week). Of the children in this population reported to be breastfeeding on discharge (76% of total sample), 71%, 63%, 52% and 40% were still breastfeeding at two weeks, six weeks, three months and six months, respectively (Table 3).

There was no significant difference in mean breastfeeding duration between first-born children and children with older siblings (ANOVA $F = 1.42, P = 0.285$).

There was a significantly different survival curve for breastfeeding duration amongst infants who had been introduced to solids before four months of age and those after four months of age (Kaplan-Meier: $\chi^2 = 249.20, 1$ degree of freedom, $P < 0.001$). Children who were introduced to solids before four months of age were more likely to cease breastfeeding before those with later introduction of solids (Figure 2).

Comparison of the mean duration of breastfeeding between children who had solids introduced before four months and those who had solids introduced after four months also showed significant differences (t-test, $P < 0.001$) in favour of longer mean breastfeeding duration with later introduction of solids (mean 40 weeks versus 29 weeks).

### Introduction of solids

Over one-third (34.3%) of all parents indicated introducing solids before four months of infant age (Figure 3). Over three-quarters (77%) had introduced solids before six months, 93% had introduced solids by six months and over 95% by seven months. The rate of reported introduc-

### Figure 1. Survival plot of breastfeeding duration amongst children who were breastfeeding on discharge from hospital

![Cumulative survival curve for breastfeeding duration](image)

### Figure 2. Survival plot of breastfeeding duration amongst children who were breastfeeding on discharge from hospital, by age of introduction of solids

![Survival curve by age of introduction of solids](image)

### Table 2. Breastfeeding initiation rates and breastfeeding duration by region

<table>
<thead>
<tr>
<th>Region</th>
<th>South</th>
<th>North</th>
<th>North-west</th>
<th>Tasmania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever breastfed</td>
<td>77.2</td>
<td>83.4</td>
<td>82.1</td>
<td>79.2</td>
</tr>
<tr>
<td>Breastfeeding on discharge</td>
<td>73.7</td>
<td>78.1</td>
<td>79.2</td>
<td>76.0</td>
</tr>
<tr>
<td>n</td>
<td>2814</td>
<td>1601</td>
<td>1053</td>
<td>5468</td>
</tr>
</tbody>
</table>

(ANOVA $F = 2.49, P = 0.052$)

(1) 264 missing.

### Table 3. Reported prevalence of breastfeeding at different infant age points

<table>
<thead>
<tr>
<th>Infant age</th>
<th>Proportion of sample breastfeeding, fully or partially (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge from hospital</td>
<td>76.0</td>
</tr>
<tr>
<td>2 weeks</td>
<td>70.5</td>
</tr>
<tr>
<td>6 weeks</td>
<td>62.5</td>
</tr>
<tr>
<td>12 weeks</td>
<td>52.0</td>
</tr>
<tr>
<td>24 weeks</td>
<td>40.2</td>
</tr>
</tbody>
</table>

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tation of solids was greatest between two and four months of age (increase by 49%) compared with between four and six months (increase by 32%). There was no significant difference in mean age of introducing solids by region (ANOVA, \( P = 0.743 \)) or by presence of older siblings (ANOVA, \( P = 0.213 \)), with the mean age of introduction being 4.18 ± 1.77 months.

**Discussion**

This school-based data collection system targeting year 1 (six-year-old) children was efficient, achieving a good statewide population capture in excess of 5700 subjects (over 80%) in a total estimated statewide population of 7062 six-year-old children in 1997 and the 6987 births in 1992 (17).

Non-responses to the data collection may have been due to children being away from school at the time of the survey and non-return of surveys. Generalisability of these data from such a large proportion (80%) of the total population to the whole population is considered appropriate, despite having no information about the 20% who were non-respondents. This confidence in the generalisability, however, is limited by the unexpectedly low proportion of children in this respondent sample being first-born children (less than 4%). This suggests that responses from parents of children who were first-born are under-represented in this response sample. This may introduce bias leading to an over-reporting of breastfeeding initiation given the relationship observed between prior maternal exposure to infant feeding (older siblings) and breastfeeding initiation. Without data of actual proportions of first-born babies with which to compare, this potential bias must be considered when interpreting the results.

The assumption used in this retrospective analysis is that all children included in the data collection in 1997 were born in Tasmania in 1992, which is reasonable considering turnover in the general Tasmanian population in the period 1996 to 1998 was less than 1% per annum (18).

The examples and instructions used in the survey instrument had the potential to bias responses in favour of compliance with the example given. Analysis of the proportion of responses for each question, however, showed that less than 4% of respondents listed six weeks specifically as the length of breastfeeding duration and less than 1% specifically listed ten weeks as the age of introducing solids. This suggests the examples used in the survey had little if any effect on influencing responses.

**Initiation**

Breastfeeding initiation rates, as measured by this method, fell well short of the national goals and targets for breastfeeding initiation for the year 2000 and beyond (90%) (19). The 3% to 5% difference in proportion of parents reporting their child had ‘ever breastfed’ versus ‘breastfeeding on discharge from hospital’ may reflect the small percentage of mothers who attempted to breastfeed initially but resorted to artificial feeding before discharge, or alternatively those who fed initially with a bottle and then tried breastfeeding after discharge. This retrospective difference is similar in magnitude to that experienced in Tasmanian maternity unit data collections previously reported (20).

Concern about the limited precision of retrospective surveys of infant feeding practices is obvious, particularly with so little literature reporting on the validity of this method. Comparisons with 1992 (the cohort birth year) perinatal data collections of breastfeeding at discharge from hospital (76% versus 78%) indicate that the retrospective estimate of breastfeeding initiation rates is within 2% of actual recordings (20). This adds weight to the argument that retrospective estimates of breastfeeding initiation are a reliable source of monitoring data. The regional differences observed for breastfeeding initiation rates probably reflect statewide socio-demographic differences that have previously been linked to breastfeeding initiation (8–10). The inability to calculate region-specific response rates using this data collection system may also be an explanation for this difference, as the intra-regional sample socio-economic profile may have varied.

**Duration**

Breastfeeding duration data presented identify the first few months following discharge from hospital as the greatest breastfeeding cessation period amongst babies who were initially breastfed. This period therefore represents a priority intervention period for breastfeeding support and promotion initiatives that aim to prolong breastfeeding duration. The observation that premature introduction of solids (i.e. before four months of age) was associated with less desirable breastfeeding duration in this sample supports results from another study in Queensland (21). This result, however, sheds no light on the chronological relationship of this association (i.e. what event comes first). It is possible that early introduction of solids causes breastfeeding cessation by interfering with breast milk supply (22) or alternatively it may simply reflect an earlier than recommended weaning.

Whilst it is possible that maternal recall may affect precision when reporting age of introducing solids, the detection of such a significant proportion of infants reportedly introduced to solids prematurely (34% before four months) and the widely acknowledged associated risks to infant morbidity (22), supports the development of broad community (and targeted) infant feeding interven-
tions promoting the most appropriate progression of food introduction for Tasmanian infants. Further research, however, will be required to investigate the reasons for this apparent premature introduction of solids and identify the sequence of solid introduction in order to develop effective interventions.

This retrospective study has provided data from a large sample of Tasmanian children on breastfeeding initiation, duration and age of introduction of solids. Intrastate comparisons of breastfeeding initiation data with perinatal collections indicate reasonable agreement supporting the reliance on this retrospective method as a nutrition monitoring and surveillance tool for infants in Tasmania. Inclusion of more demographic information in this data collection system would provide an opportunity for more detailed analytical study of the factors influencing infant feeding, increasing its utility for population-based research.

Acknowledgments

This study was initiated by the author whilst in the position of Coordinator of the Community Nutrition Unit in collaboration with nursing and managerial staff of Family and Child Health Services of the Tasmanian Department of Community and Health Services. Without this collegiate support this data collection would not have been possible. The contribution of the thousands of parents who participated by responding to questionnaires is similarly acknowledged. Support from the Community Nutrition Unit staff in data entry is also acknowledged. The constructive input of the anonymous reviewers is acknowledged.

References