

**State of Food  
and Nutrition  
in NSW Series**



# **Report on breastfeeding in NSW 2004**



**The University of Sydney**

**NSW HEALTH**

*The NSW Centre for Public Health Nutrition is funded by the NSW Department of Health  
and supported by the Sydney Nutrition Research Foundation*

*State of Food and Nutrition in NSW Series*

## **Report on breastfeeding in NSW 2004**

A NSW Centre for Public Health Nutrition project for NSW Health  
prepared by Debra Hector, Karen Webb and Sharyn Lymer.

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# List of abbreviations

AAP	Australian Academy of Paediatrics	MAIF	Marketing in Australia of infant formula
ABA	Australian Breastfeeding Association	NEC	Necrotizing enterocolitis
ABS	Australian Bureau of Statistics	NHMRC	National Health and Medical Research Council
ACT	Australian Capital Territory	NHS	National Health Survey
AIHW	Australian Institute of Health and Welfare	NNS	National Nutrition Survey, 1995 (Australia)
APMAIF	Advisory panel for marketing in Australia of infant formula	NSW	New South Wales
bf	breastfeeding	NSW CHS	New South Wales Child Health Survey
CATI	Computer assisted telephone interview	UNICEF	United Nations Children's Fund
CPHN	Centre for Public Health Nutrition	RACGP	Royal Australian College of General Practitioners
DAA	Dietitians Association of Australia	RSV	Respiratory syncytial virus
ebf	exclusive breastfeeding	SEIFA	Australian Bureau of Statistics Socio-economic indexes for areas
FAO	Food and Agriculture Organisation of the United Nations	SIDS	Sudden Infant Death Syndrome
HOIST	Health Outcomes Information Statistical Toolkit	WHO	World Health Organisation
IBFAN	International Baby Food Action Network		

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## ***Adiposity rebound***

Adiposity (as indicated by BMI) increases during the first year of life and then decreases before beginning to rise again around the age of six years. The increase in adiposity that occurs after it reaches its lowest point is referred to as 'adiposity rebound'. This is a normal pattern of growth that occurs in all children.

Recent research has shown that the age when the adiposity rebound occurs may be a critical period in childhood for the development of obesity as an adult. An early 'adiposity' rebound, occurring before ages four to six, or an excessive rebound is associated with increased risk of obesity in adulthood.

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## ***Attributable risk (AR)***

Measures the additional risk of an outcome (eg respiratory infection, low intelligence) occurring with exposure to a study factor, in this instance 'not breastfeeding'. This measure of association between not breastfeeding and disease can only be used in studies where incidence can be measured.

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## ***Breastfeeding***

The child receives some breastmilk but can also receive any food or liquid including non-human milk.

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## ***Breastfeeding duration***

The total length of time an infant received any breastmilk at all – from initiation through until weaning is complete.

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## ***Breastfeeding intensity***

Referred to as 'dose' or the 'degree of exclusiveness' of breastmilk as the source of nourishment for the infant.

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## ***Breastmilk***

Human milk and colostrum

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## ***Breastmilk substitute***

Any milk (other than breastmilk), or food based fluid used in infant feeding as a replacement for breastmilk, whether or not it is suitable for that purpose (commonly includes infant formulae, cows milk, and other milks fed to infants)

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## ***Complementary feeding***

The child receives both breastmilk and solid or semi-solid food or breastmilk substitutes.

---

## ***Cohort studies***

A longitudinal or prospective study in which subsets of a defined population can be identified to assess their exposure to a factor (eg breastfeeding) hypothesised to influence the probability of an outcome.

---

## ***Cross sectional survey***

An investigation in which information is systematically collected, typically to describe the distribution of an attribute (eg behaviours) as it exists in a particular population at one point in time.

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## ***Current practices***

Respondents are asked about very recent infant feeding practices, usually in the previous 24 hours. This is distinct from 'recalled practices' which occurred sometime in the past, eg weeks, months or years ago.

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## ***Exclusively breastfed***

An infant has received only breastmilk from his/her mother or a wet nurse, or expressed breastmilk, and no other liquids or solids with the exception of drops or syrups consisting of vitamins, mineral supplements or medicines.

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## ***Ever breastfed***

An infant has been put to the breast, if only once, and/or an infant has received expressed breastmilk but has never been put to the breast.

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**Fully breastfed**

An infant is fully breastfed if he/she receives breastmilk as the main source of nourishment. This includes infants who are either a) exclusively breastfed or b) predominantly breastfed. That is, infants can be classified as fully breastfed if a) they receive only breastmilk with no other liquids or solids (except vitamins, mineral supplements, or medicines) or b) they receive breastmilk and any of: water, water-based drinks, fruit juice, ritual fluids (in limited quantities), or oral rehydration solution (ORS), but do not receive breastmilk substitutes or solids. The fully breastfed rate is the combined rate of exclusively breastfed and predominantly breastfed.

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**Incidence**

The number of new occurrences (of health events, risk behaviour or factor) in a population, over a period of time. For example, 30,000 new cases of respiratory illness in NSW in 1999 is the incidence of respiratory illness in NSW.

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**Indicator**

An indicator is used in the field of public health monitoring and surveillance to describe a specific and measurable statistical construct for monitoring progress towards a goal (a broad statement of desired improvement).

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**Infant**

Refers to those less than 12 months old. Children are 12 months or more.

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**Initiation**

The infant's first intake of breastmilk.

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**Odds ratio (OR)**

An odds ratio is a measure of the strength of association between disease and exposure. It is the odds of exposed individuals getting a particular disease compared to the odds of an unexposed individual getting that particular disease. For example, the odds of an infant who is not breastfed getting respiratory illness during the first year of life, compared to the odds of an infant exclusively breastfed to four months getting respiratory disease during the first year of life. It cannot be interpreted as a probability or risk like the relative risk, or risk ratio. It is used more often in cross-sectional studies, although it can be used in cohort studies and randomised trials.

---

**Prevalence**

The number of a defined population with an attribute of interest (health state – for example, a particular disease, or lifestyle characteristic such as smoking), at a particular time, eg the number of people in NSW with diabetes in 2003 would be the prevalence of diabetes in NSW. It would become the 'point prevalence' if the actual date was reported rather than, say, the year.

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**Prevalence rate**

Number of existing cases of a disease or occurrence of an attribute at a specified time, in a defined population that is at risk of experiencing that disease or attribute. Used in this report to refer to breastfeeding rates when children are at particular ages.

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**Predominant breastfeeding**

An infant's predominant source of nourishment has been breastmilk but the infant may also have received water and water-based drinks (sweetened and flavoured water, teas, infusions etc); fruit juice; oral rehydration solution (ORS); drop and syrup forms of vitamins, minerals and medicines; or ritual fluids (in limited quantities). All other food-based fluids, in particular breastmilk substitutes, and solids are excluded.

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***Randomised controlled trial (RCT)***

A study in which people are allocated at random to receive an intervention. The participants are allocated randomly to the comparison groups, usually comprising one or more interventions and a control. The control can be conventional practice, a placebo, or no intervention at all. RCTs are prospective, ie the participants are studied over a period of time. They are the optimal design for epidemiological studies.

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***Relative risk (RR)***

Relative risk (or risk ratio) is the ratio of the probability of disease in an exposed group to the probability in an unexposed group. As incidence is used in the calculation of RR, it can only be determined from prospective studies.

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***Retrospective (recalled) practices***

Practices measured retrospectively, that is, respondents are asked to recall and report their behaviour as it was some time in the past.

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***Solid foods***

Any nutrient-containing foods (semi-solid or solid), eg dilute infant cereals. Does not include breastmilk or breastmilk substitutes, fruit and vegetable juices, sugar water, etc.

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***Weaning***

The period during which infants are introduced to breastmilk substitutes and/or solid foods with the intention of replacing some or all of the breastmilk in the diet.

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***Weaned***

The infant/child no longer receives any breastmilk.

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# Preface

## *The work of the NSW Centre for Public Health Nutrition*

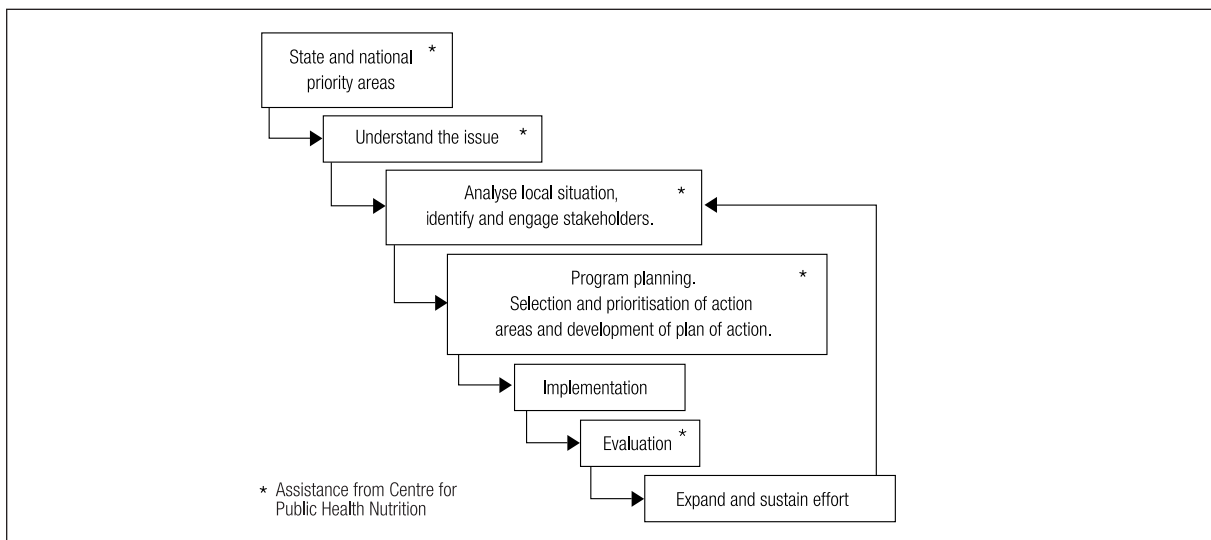
The NSW Centre for Public Health Nutrition (the Centre) was established in 2000 as an initiative of the NSW Department of Health in collaboration with the Sydney University Nutrition Research Foundation. It is located on campus at Sydney University. The Centre builds on previous work in planning a nutrition information system for NSW Health.

The Centre reviews research findings regarding nutrition policy and programs and produces authoritative documents and guidelines which help steer nutrition interventions in NSW. It undertakes work in four main streams of action:

- evidence-based planning
- food and nutrition monitoring and surveillance
- public health workforce development
- applied research and evaluation.

It is not intended that the work of the NSW Centre for Public Health Nutrition replace or supersede the usual health promotion planning processes of the public health nutrition workforce in NSW. Most health agencies and units work through a detailed process for the development, implementation, evaluation and expansion of nutrition actions within their community or target group, similar to the process set out in Figure A. The work program of the Centre is focussed upon producing reviews and analyses, which assist nutrition professionals to work through this process more efficiently and with a greater level of understanding and confidence. As such, the reports from the Centre are tools to help guide and facilitate rather than dictate practice.

**Figure A. The health promotion planning process with reference to actions supported by Centre for Public Health Nutrition work**



Source: Adapted from Hawe et al 1990.

# Executive summary

## *Policy context*

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Promoting, encouraging and supporting breastfeeding has been identified as a public health priority in NSW and nationally. 'Promoting breastfeeding' is one of five public health nutrition priority areas identified for action in *Eat Well NSW*, with the relevant goal being 'to increase the initiation and duration of breastfeeding'. 'The encouragement and support of breastfeeding' is included in the most recent *Dietary Guidelines for Children and Adolescents* (NHMRC, 2003) in acknowledgement of the nutritional, health, social and economic benefits it provides for the Australian community.

## *Benefits of breastfeeding*

---

One of the main reasons breastfeeding has achieved high priority is the numerous health benefits to both infants and mothers. Breastfeeding reduces the incidence, duration and severity of a number of illnesses and infections in infants. For infants, convincing evidence exists for a protective effect of breastfeeding against gastrointestinal illness, otitis media (ear infection), lower respiratory tract infection, eczema and necrotizing enterocolitis. Breastfeeding may also be protective against bacteraemia, meningitis, botulism, urinary tract infection and SIDS. There is conflicting evidence for the protective effect of breastfeeding against asthma and increasing evidence that breastfeeding increases intellectual and motor development which have long-term benefits. Breastfeeding's role in reducing the incidence of chronic diseases, such as obesity and diabetes, both in childhood and later in life, is now emerging in the literature. For mothers, breastfeeding promotes recovery from childbirth, reduces the risk of ovarian, endometrial and pre-menopausal breast cancers, and reduces longer-term risk of hip fractures.

## *Breastfeeding recommendations*

---

Epidemiological studies of the health benefits for infants of breastfeeding consistently emphasise the importance of exclusive breastfeeding for a number of months and breastfeeding for a long duration. Increasing evidence that exclusive breastfeeding to around six months is particularly beneficial has resulted in Australia recently changing its infant feeding guidelines to recommend exclusive breastfeeding for the first six months (previously the guideline was for four to six months), in line with WHO recommendations. Another NHMRC recommendation is that infants should be breastfed for at least 12 months.

## *Monitoring breastfeeding*

---

The NSW Child Health Survey, conducted in 2001 as part of the rolling NSW Health surveys, provides the first state-based population survey of breastfeeding practices in NSW. This survey was conducted prior to the development of recommended national breastfeeding indicators (Webb et al 2001) and does not provide data to report on all of them. However, a number of 'interim' indicators were developed, bringing together the data into an accessible and meaningful form, in order to provide a representative picture of breastfeeding practices in NSW.

In the NSW Child Health Survey information was collected on breastfeeding/infant feeding practices for a sub-set of the main survey sample of children 0-12 years, comprising infants and children aged 0-23 months at the time of the survey. This yielded a sample of 1,489 infants, with mothers as 87.7% of respondents and fathers as 12.3% of respondents recalling how their children were fed.

## *Patterns of breastfeeding in NSW*

---

The results for each indicator are reported for NSW as a whole, and for all Area Health Services in NSW. Data are also reported by maternal characteristics: age, education, index of social and economic disadvantage, country of birth, English-speaking background/non-English speaking background, indigenous status and place of residence (urban/rural).

Although 90% of infants in NSW were put to the breast, or offered expressed breastmilk at least once, only 77% of infants were receiving at least some breastmilk regularly at the end of their first month. An ongoing decline in breastfeeding over the next 11 months resulted in only 18% of infants receiving some breastmilk at 12 months.

Of those infants that were breastfed, half of them continued to receive some breastmilk for at least six months (the median duration of breastfeeding). However, rates of full breastfeeding (no solid foods or breastmilk substitutes) were low. Only about half (53.5%) of these infants were fully breastfed to three months, and only about a quarter (27.1%) to four months. Rate of full breastfeeding at six months was very low (4.9%) but this is to be expected as infant feeding guidelines at the time of the survey were to introduce solid foods between four and six months. About 13% and 70% of infants were given solid foods regularly before four and before six months respectively. The current guidelines are that introduction of solid foods be delayed until around six months of age. 46.5% and 59.6% of infants were regularly given breastmilk substitutes before four and before six months respectively.

There was variation between health areas in breastfeeding practices. The rate of infants 'ever breastfed' in Central Sydney and Mid North Coast health areas was significantly higher than for NSW overall. The duration of breastfeeding in Northern Sydney health area was longer than for NSW overall. The Central Coast health area consistently emerged as having poorer breastfeeding practices, as indicated by substantially lower rates of any and full breastfeeding, shorter duration of breastfeeding and earlier introduction of breastmilk substitutes, than NSW overall. Low rates of full breastfeeding and early introduction of solids were evident in Wentworth health area. There was variation in the median duration of breastfeeding across NSW health areas. Among those infants ever breastfed, infants were breastfed for a shorter duration in Central Sydney (four months) and longer in Northern Sydney and Mid North Coast health areas (10 months) than for NSW as a whole (six months). However, it is important to note that differences between health areas may be partly attributable to differences in population characteristics.

Consistent differences in breastfeeding practices emerged for some population subgroups. Infants of mothers with less than a tertiary education and infants of young mothers less than 25 years old experienced poorer breastfeeding practices. Of the various population subgroups, infants of mothers aged less than 25 years had the shortest median duration of breastfeeding (three months), whilst infants of mothers with a tertiary education had the longest median duration of breastfeeding (nine months).

There was some indication that a larger proportion of infants of mothers in the least disadvantaged SEIFA quintile were receiving breastmilk at four, six and 12 months compared to infants of mothers in the most disadvantaged quintile. Breastfeeding duration was longer in infants of mothers in the least disadvantaged quintile compared to the most disadvantaged quintile. Also, a smaller proportion of infants of mothers in the least disadvantaged quintile received breastmilk substitutes before four and before six months.

The data indicate that a smaller proportion of infants of Aboriginal and Torres Strait Islander mothers ever receive any breastmilk than infants of non-Aboriginal and non-Torres Strait Islander mothers (72% of infants of Aboriginal and Torres Strait Islander mothers were 'ever breastfed' compared to 91% of infants of non-Aboriginal and non-Torres Strait Islander mothers). Also, of those infants of Aboriginal and Torres Strait Islander mothers that were 'ever breastfed', it was for a shorter duration, and full breastfeeding is more likely to stop earlier, than in infants of non-Aboriginal and non-Torres Strait Islander mothers. Additionally, a larger proportion of infants of Aboriginal and Torres Strait Islander mothers received breastmilk substitutes before four months and before six months, and received solids before four months, than infants of non-Aboriginal and non-Torres Strait Islander mothers.

Breastfeeding practices were generally similar between the 1995 National Health Survey (NSW sub-sample and Australia) and the 2001 NSW Child Health Survey. The major difference was the rate of full breastfeeding at six months – this rate was much higher in the national survey due to a smaller proportion of infants receiving solid foods and/or breastmilk substitutes before six months.

### *Burden of poor breastfeeding practices in NSW*

---

Many of the illnesses and diseases that breastfeeding protects against are major health problems in NSW and among the most frequent causes for hospital separation and problems managed by GPs in infants and children. Breast cancer in women, for which there is strong evidence of a protective effect from breastfeeding, is a major health burden in NSW. Conditions for which there is some evidence of a protective effect of breastfeeding are also among the most common and burdensome in NSW for children (eg asthma and eczema, obesity) and adults (obesity, diabetes, cardiovascular disease). As breastfeeding duration and intensity are well below recommended levels in NSW, any increases in breastfeeding would go some way towards reducing the health burden due to these illnesses.

The successful promotion and support of breastfeeding may depend, in part, on persuading mothers and society more widely that breastfeeding is not only nutritionally sound but economically beneficial as well (Weimer 2001). There are potential monetary savings from improved breastfeeding practices to many sectors of society – governments, health care institutions, families, employers. However, many of the benefits of breastfeeding are difficult (eg savings to employers and the environment) or impossible (eg the emotional benefits) to quantify; and thus most studies of the economics of breastfeeding have focused on the more easily determined health care savings. All studies, both nationally and overseas, conclude that the health care savings from improving breastfeeding rates are in the order of millions of dollars.

### *Determinants of breastfeeding*

---

The determinants of breastfeeding have not been fully identified nor are they well understood, and are not included as core indicators for monitoring breastfeeding in NSW or nationally (Webb et al 2001). This report presents a list of these factors, with the aim of indicating the complex array of variables affecting mothers' choice to breastfeed, breastfeeding duration and breastfeeding exclusivity.

### *Conclusions and recommendations*

---

The systematic use of indicators in efforts to protect, support and promote breastfeeding enhances comparability of results across programs and populations. Ideally, all states and territories will work towards using standardised definitions, indicators and measurement methods to monitor trends in breastfeeding, and to enable comparisons between areas and population sub-groups. Thus it is recommended that NSW adopt the nationally recommended indicators and pilot the recommended questions in future surveys of breastfeeding. At the same time, it would be desirable to retain the questions included in the 2001 survey in future surveys of breastfeeding for an interim period, to enable monitoring of trends in breastfeeding practices from 2001.

In addition to recommendations for further monitoring, the report recommends that NSW health professionals adopt the WHO standardised breastfeeding definitions.

The data indicate that promotional efforts should be focussed on the following breastfeeding practices: the decline in breastfeeding during the first few months, prolonged breastfeeding to at least 12 months, and exclusive breastfeeding to six months, particularly months three to four.

High-risk groups in the population should be targeted to address short duration and low intensity of breastfeeding. These groups are very young mothers (particularly less than 25 years), and mothers that do not have tertiary education. There is some indication that Aboriginal and Torres Strait Islander mothers should be targeted for breastfeeding initiation and intensity.

A recommended next step is to provide an overview of systematic reviews of interventions to promote breastfeeding with the aim of reporting on the most effective interventions and thus providing recommendations for breastfeeding promotion in NSW.

# 1 Introduction

## 1.1 *The context of this report*

---

### **Breastfeeding is a public health priority**

This report on the status of breastfeeding in NSW has been produced by the NSW Centre for Public Health Nutrition as part of the support material required to address the priority issues identified in *Eat Well NSW*, NSW Health's Strategic Directions for Public Health Nutrition 2003-2007.

*Eat Well NSW* is directed towards 'Better health for all people in NSW through effective and focused public health action to promote healthy eating and good nutrition'. It provides a clear statement of health sector priorities for public health nutrition in NSW in the context of broader government health policies and national nutrition priorities. The *Eat Well NSW* priorities are directly relevant to the main issues of a number of important NSW public health policies and strategies, particularly *Healthy People 2005* and the draft *NSW Health and Equity Statement*.

'Promoting breastfeeding' is one of five public health nutrition priority areas identified for action in *Eat Well NSW*. The relevant goal stated in *Eat Well NSW* is 'to increase the initiation and duration of breastfeeding'. Breastfeeding was highlighted at the 2002 NSW Childhood Obesity Summit as one of the key areas for intervention in public health.

Breastfeeding is also a national priority area. The \$2 million 'National Breastfeeding Strategy' was announced in 1996-97 as part of the Commonwealth 'Health Throughout Life' policy statement (Department of Health and Family Services 1996). Since then many resources and initiatives have been produced under this policy initiative ([www.health.gov.au/pubhlth/strateg/brfeed/](http://www.health.gov.au/pubhlth/strateg/brfeed/)).

Promoting, encouraging and supporting breastfeeding is a primary aim of nutrition and public health programs across Australia (NHMRC 2003). 'The encouragement and support of breastfeeding' is an Australian Dietary Guideline (NHMRC 2003), in acknowledgement of the nutritional, health, social and economic benefits it provides for the Australian community. The NHMRC has recently updated its policy guidelines on infant feeding, and has emphasised the need for infants to be exclusively breastfed for the first six months of life (NHMRC 2003).

### **Monitoring breastfeeding in NSW**

The document *Towards a national system for monitoring breastfeeding in Australia: Recommendations for population indicators, definitions and next steps* (Webb et al 2001) highlighted the need to focus on the minimum or core information required for decision-making and accountability, ie monitoring of population breastfeeding practices.

The purpose of monitoring rates of breastfeeding in NSW is to document the extent to which breastfeeding practices among the population and important sub-groups are consistent with those recommended by national policies. The information can be used to assess the impact over time of the statewide efforts to improve breastfeeding practices and to identify needs for further policy refinement and implementation.

*Food and nutrition in NSW: a catalogue of data* (NSW Health 1994) indicated the lack of reliable statewide data at that time on breastfeeding practices in NSW. *The National Health Survey (NHS) 1995 and 2001* collected data on breastfeeding practices in all states and territories in Australia. *The NSW Child Health Survey 2001* (NSW CHS 2001) is the first population survey of breastfeeding practices in NSW to provide easily accessible, comprehensive data. It thus provides the basis for reporting on the current status of breastfeeding in NSW.

## 1.2 The purpose of this report

---

The report aims to:

- provide a statewide overview of current breastfeeding practices and the extent and ways in which they do or do not meet recommended policy guidelines
- summarise the health benefits of breastfeeding to infants and mothers
- identify population sub-groups less likely to breastfeed, or likely to breastfeed for a shorter period than recommended
- describe key determinants and influences on breastfeeding practices
- provide recommendations for ongoing monitoring of breastfeeding practices in NSW
- support public health stakeholders in planning to address breastfeeding issues
- provide detailed data that underpin the objectives and areas for action in *Eat Well NSW*
- indicate the relevance of monitoring breastfeeding practices to the planning and evaluation of interventions to increase the initiation, duration and intensity of breastfeeding
- provide information on the importance of breastfeeding in NSW and encourage appropriate investment and focus by health decision-makers and practitioners.

This report **does not** make recommendations concerning actions and interventions most likely to increase initiation and duration of breastfeeding in NSW. Readers may wish to consult various review reports (Stickney and Webb 1995, Tedstone et al 1998, Green 1999, Fairbank et al 2000, Higgison 2001, Dennis 2002, NHMRC 2003). An overview of interventions to promote breastfeeding has been prepared by the CHPN and is due for publication by the NSW Department of Health in 2004.

Those interested in interventions aimed specifically towards improving breastfeeding practices among Aboriginal and Torres Strait Islanders are directed to the review by the Commonwealth Department of Health and Family Services (1998).

## 1.3 Target audience

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This report is intended for those working to improve breastfeeding practices of the NSW population. This includes maternal and child health staff and trainers, lactation consultants, general practitioners, public health nutritionists, public health epidemiologists, health promotion staff, health service planners, health professional organisations such as DAA and RACGP, health service decision-makers, and workers in non-government organisations, such as the ABA.

## 2 Health benefits of breastfeeding

### 2.1 The constituents of breastmilk

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*'It is clear that human milk is precisely engineered for the human infant.'*

*(Oddy 2001)*

Breastmilk is uniquely suited to the needs of infants throughout the duration of lactation and provides all the nutrients required for at least the first six months (NHMRC 2003). No infant formula can resemble breastmilk, which is constantly changing throughout lactation and throughout the feed. Constituents of breastmilk are still being discovered and many of the constituents in breastmilk cannot be replicated (Newburg and Street 1997). The composition of breastmilk is only compromised in mothers with severe malnutrition.

Human milk contains a number of 'bioactive factors' that are transferred directly from the mothers' milk to the infant and serve to prevent and reduce the severity of infection in the neonatal period, and subsequently work to develop the baby's own immune system (see Appendix A and Hamosh 2001 concerning the numerous bioactive factors unique to human milk).

Of note is IgA, the most abundant antibody in breastmilk. IgA is manufactured in and excreted by the breast in response to specific bacteria and viruses (pathogens) to which the mother is exposed. This provides protection against pathogens that the infant is most likely to encounter in his/her local environment (NHMRC 2003).

'The main reason for neonatal morbidity and mortality is an under-developed immune system at birth, a finding that is true for pre-term as well as term infants, and breastmilk enhances the development of the immune system resulting in less illness and disease. The major nutrients in human milk, proteins, lipids and carbohydrates, fulfil multiple functions including protection of the infant against infection.' (Oddy 2001)

### 2.2 Health benefits of breastfeeding for mothers and infants

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There are many benefits to mothers and infants from breastfeeding, although the strength of the protective effects ranges greatly between studies for many of the health outcomes. The recent *Dietary Guidelines for Children and Adolescents in Australia* (NHMRC 2003) includes a summary of the health benefits of breastfeeding (see Table 2.2 in this section).

Despite extensive research, conclusive evidence has not been forthcoming for some of the major diseases or illnesses thought to be associated with not breastfeeding, due to methodological complexities. These are discussed in Section 2.4 below. Thus, many of the significant review articles on breastfeeding and health outcomes have applied stringent methodological criteria (see Table 2.4) to the large number of studies that have been conducted since the 1980s. These reviews are:

- León-Cava et al (2002) *Quantifying the benefits of breastfeeding: A summary of the evidence*
- Labbock (2001) *Effects of breastfeeding on the mother*
- Heinig (2001) *Host defence benefits of breastfeeding for the infant: Effect of breastfeeding duration and intensity*
- Oddy (2001) *Breastfeeding protects against illness and infection in infants and children: a review of the evidence*
- Bick D (1999) *The benefits of breastfeeding for the infant*
- Heinig & Dewey (1996) *Health advantages of breastfeeding for infants: A critical review.*

Readers are directed to the review by León-Cava et al (2002) for a complete list of quantitative measures of the strength of association shown in studies.

A description of each of the major illnesses or diseases which breastfeeding confers protection against, together with a summary of the research evidence, is provided in Appendix B.

### Mothers

*'Because the physiologic processes of breastfeeding are a normal part of the maturation of the female body, it is not surprising that breastfeeding seems to have attributes of a preventive health measure for women. Breastfeeding is beneficial for women's health.'*

*(Labbok 2001).*

It has long been acknowledged that breastfeeding increases levels of oxytocin, resulting in less postpartum bleeding and more rapid uterine involution. Lactational amenorrhea causes less menstrual blood loss over the months after delivery. Recent research demonstrates that lactating women have an earlier return to pre-pregnant weight, delayed resumption of ovulation with increased child spacing, and improved bone remineralisation postpartum with associated reduction in hip fractures in the postmenopausal period. There are also reduced risks of pre-menopausal breast cancer and ovarian cancer (American Academy of Pediatrics 1997, NHMRC 2003).

### Infants

Similarly strong evidence exists of the protective effect of breastfeeding against many illnesses during infancy and early childhood. Two of the major review articles (Heinig and Dewey 1996, Bick 1999) conclude that evidence is strong that breastfeeding protects against gastrointestinal infection and otitis media. Heinig and Dewey (1996) considered that the evidence for protection against lower respiratory tract infection and necrotising enterocolitis (NEC) was also strong.

Certainly those researchers involved in assigning economic benefits of breastfeeding (see Section 5) have generally considered the most convincing evidence to exist for gastrointestinal illness, otitis media (ear infection), respiratory illness (particularly respiratory syncytial virus, RSV), eczema and NEC in infants. Both reviews conclude that breastfeeding may be protective against bacteraemia, meningitis, botulism, urinary tract infection and SIDS. Conflicting evidence exists for the protective effect of breastfeeding against asthma.

**Table 2.2 Health advantages of breastfeeding for infants and mothers**

Infant	Mother
<ul style="list-style-type: none"> <li>• reduced incidence and duration of diarrhoeal illnesses</li> <li>• protection against respiratory infection and reduced prevalence of asthma</li> <li>• reduced occurrence of otitis media and recurrent otitis media</li> <li>• possible protection against neonatal necrotising enterocolitis, bacteraemia, meningitis, botulism and urinary tract infection</li> <li>• possible reduced risk of auto-immune disease, such as type 1 diabetes and inflammatory bowel disease</li> <li>• possible reduced risk of developing cow's milk allergy</li> <li>• possible reduced risk of adiposity later in childhood</li> <li>• improved visual acuity and psychomotor development, which may be caused by polyunsaturated fatty acids in the milk, particularly decosahexaenoic acid</li> <li>• higher IQ scores, which may be the result of factors present in the milk or of greater stimulation</li> <li>• reduced malocclusion as a result of better jaw shape and development.</li> </ul>	<ul style="list-style-type: none"> <li>• promotion of maternal recovery from childbirth – accelerated uterine involution and reduced risk of haemorrhaging (thus reducing maternal mortality) and preservation of maternal haemoglobin stores through reduced blood loss, leading to improved iron status</li> <li>• prolonged period of postpartum infertility, leading to increased spacing between pregnancies</li> <li>• possible accelerated weight loss and return to pre-pregnancy body weight</li> <li>• reduced risk of pre-menopausal breast cancer</li> <li>• possible reduced risk of ovarian cancer</li> <li>• possible improved bone mineralisation and thereby decreased risk of post-menopausal hip fracture.</li> </ul>

Source: From *Dietary Guidelines for Children and Adolescents in Australia* (NHMRC 2003).

There is increasing evidence that breastfeeding increases intellectual and motor development which has long-term benefits to the individual and society (NHMRC, 2003; Heinig & Dewey, 1996). Its role in reducing the incidence of chronic diseases, such as obesity and diabetes, both in childhood and later in life, is now emerging in the literature (Leon-Cava et al 2002; NHMRC 2003).

Table 2.2 is a summary of those health conditions in infants and mothers for which there is strong or fairly strong evidence of reduced risk from breastfeeding and a protective effect in mothers who breastfed their infants.

### 2.3 *The health benefits of exclusive breastfeeding to six months*

Early in 2000, the WHO commissioned a systematic review of the published scientific literature on the optimal duration of exclusive breastfeeding. More than 3000 references were identified for independent review and evaluation (Kramer & Kakuma 2001, WHO 2002). This led to the revised recommendation of exclusive breastfeeding for six months.

The studies included in the review compared exclusive or predominant breastfeeding for about four months with the same pattern of feeding for about six months. The expert committee concluded that exclusive breastfeeding to six months of age protects against gastrointestinal infection, even in settings where hygienically prepared complementary foods are used, and that exclusive or predominant breastfeeding for about six months did not show an adverse effect on growth and major morbidity.

More recently, in a study of 2,277 infants aged six to 24 months, Chantry et al (2002) found that infants fully breastfed for six months had a significantly lower risk for respiratory infections in the first two years, when compared with babies who were fully breastfed for four months. Specifically, the chance of contracting

pneumonia was reduced fivefold with two additional months of full breastfeeding, while the risk of recurrent ear infections was minimised two-fold. The study is the first to demonstrate that an additional two months of full breastfeeding substantially increases an infant's protection against respiratory tract infection, including pneumonia, and recurrent ear infections. This finding, coupled with the proven increased protection babies receive against gastrointestinal infections, adds to the mounting evidence that the longer a mother breastfeeds her infant, the greater the health benefits.

### 2.4 *Methodological issues in research on the benefits of breastfeeding*

Some of the methodological reasons why the research to date on the benefits of breastfeeding has not always been convincing include:

- The impossibility of conducting randomised controlled trials assigning infants to receive breastmilk or formula.
- Problems in defining and classifying breastfeeding practices (degree of exclusivity (intensity) and duration). For example, groups of breastfed infants may include infants who were offered breastmilk only once or twice, as well as those who were exclusively breastfed for four to six months. Similarly, breastfeeding infants that received other nutritive fluids and foods are commonly classified as 'partly breastfed' and lumped into one group, despite the enormous differences in how these infants are fed.
- Problems with the definition of outcome measures (illness or disease).
- Problems with methods used for data collection.

A checklist to ensure methodological stringency in studies on breastfeeding and health outcomes is shown in Table 2.4.

**Table 2.4 Checklist for methodological stringency in studies of breastfeeding**

- Avoidance of detection bias and reverse causality through use of an adequate study design
- Adequate control for confounding factors through statistical analysis
- Clear definition of breastfeeding
- Clear definition of outcome measure(s)
- Non-reliance on prolonged maternal recall
- Blind ascertainment of infant feeding history
- Blind ascertainment of outcome
- Assessment of dose-response effect
- Assessment of effect in children at high risk.

*\* It should be noted that some of these problems are inherent to many epidemiological studies.*

Source: Kramer 1988 and Buachner et al 1986

Despite the methodological limitations, León-Cava et al (2002) indicate that, as the epidemiological evidence favouring breastfeeding is generally derived from multiple studies in a variety of situations, the evidence is, in sum, convincing.

Another line of support comes from being able to document a 'dose-response' relationship (Raisler et al 1999, Leon-Cava et al 2002). This term refers to a relationship in which the response (eg the observed benefit of breastfeeding) is proportional to or appears to be a function of the dose (eg amount, duration, exclusiveness, etc). A dose-response relationship is taken to suggest a causal link between the dose and the response. Many of the epidemiological studies described in the reviews listed below and in the more recent studies (see Appendix B), identify a dose-response relationship between breastfeeding and infant and maternal health. There is also biological plausibility to the putative associations between breastfeeding and the nominated health outcomes.

## 2.5 Contraindications for breastfeeding

- There are few contraindications to breastfeeding. Most medications required by mothers are compatible with breastfeeding, but each drug needs to be specifically checked with a reliable reference (Ito 2000).
- Some disease situations, such as HIV/AIDS may be a contraindication (NHMRC 2003).
- Exclusive breastfeeding for periods much beyond six months of age can result in undernutrition and micronutrient deficiency (WHO 2001). Beyond the age of six months, additional sources of iron are required, usually from iron-fortified cereals or other foods (Calvo et al 1992).

## 3 Monitoring breastfeeding practices

### 3.1 Defining breastfeeding

The term 'breastfeeding' encompasses many different infant feeding behaviours that relate to when and how breastfeeding commences (or is initiated), the intensity of breastfeeding, the duration of breastfeeding at different intensities, and when other foods and milk substitutes are introduced (Webb et al 2001, NHMRC 2001). Consistent 'operational' definitions of terms relating to breastfeeding practices contribute to clearer promotion, and better measurement and monitoring of breastfeeding over time.

In 1991, the WHO developed standardised definitions of breastfeeding terms for use in global monitoring of breastfeeding (WHO 1991). While other terms and

definitions had been previously proposed, the WHO definitions have been regarded as superior and have been used by many countries to monitor and report breastfeeding rates. The use of these definitions has been recommended and supported by key stakeholders for monitoring breastfeeding in Australia. The features of the WHO definitions are described in Table 3.1, and the logical connections between the terms are shown in Figure 3.1. It is anticipated that these definitions will be incorporated into the National Health Data Dictionary, to encourage standardisation by researchers and health information agencies (Webb et al 2001).

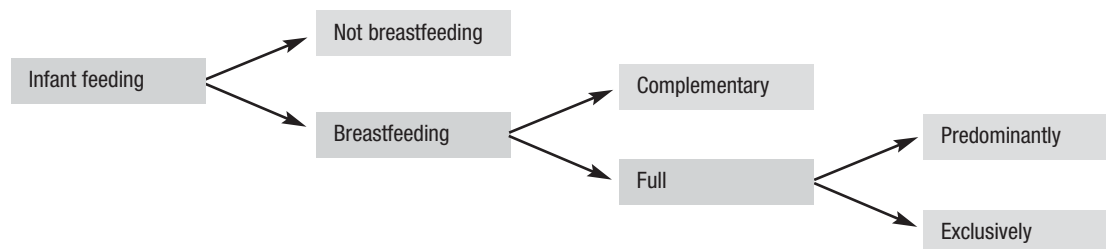
These definitions have been used throughout this report (refer to the glossary for detailed definitions).

**Table 3.1 Summary of key aspects of the WHO definitions of breastfeeding practices**

Category of infant feeding	Requires that the infant receive	Allows the infant to receive	Does not allow the infant to receive
Non-breastfeeding (NBF)	No breastmilk	Any food or liquid including non-human milk	Breastmilk, including expressed breastmilk or breastmilk from wet nurse
Breastfeeding (BF)	Breastmilk	Any food or liquid including non-human milk, as well as breastmilk	
Complementary breastfeeding (CBF)	Breastmilk and solid or semisolid foods or non-human milk	Any food or liquid including non-human milk, as well as breastmilk	
Full breastfeeding (FBF) (sum of exclusive and predominant BF)	Breastmilk, including expressed breastmilk or breastmilk from wet nurse	Substances specified for predominant breastfeeding	Anything else (in particular, non-human milk, food-based fluids)
Predominant breastfeeding (PBF) <sup>a</sup>	Breastmilk, including expressed breastmilk or breastmilk from wet nurse, as the predominant source of nourishment	Liquids (water and water-based drinks, fruit juice, oral rehydration syrup, ritual fluids and drops or syrups (vitamins, minerals, medicines)	Anything else (in particular, non-human milk, food-based fluids)
Exclusive breastfeeding	Breastmilk, including colostrum, expressed breastmilk or breastmilk from wet nurse	Drops, syrups (vitamins, minerals, medicines)	Anything else

Source: Adapted from Webb et al (2001).

**Figure 3.1** Connections between types of breastfeeding



### 3.2 Breastfeeding policy and recommendations

Until the 1950s and 60s, breastfeeding was the norm in infant feeding internationally and in Australia; hence policy guidelines and strategies for promotion were unnecessary. However, in the 1950s, breastfeeding rates declined internationally and hit an all-time low in the 1970s in Australia (Lund-Adams and Heywood 1995, Scott and Binns 1998, Lester 1994). These low breastfeeding rates coincided with the development and rigorous marketing of breastmilk substitutes, and a substantial increase in artificial feeding.

Considerable concern was expressed internationally over this situation and its impact on the health of infants. Of concern was the loss of knowledge, skills, support systems and social norms regarding breastfeeding that occurred after only one generation of artificial feeding.

In response, WHO and UNICEF have emerged as world leaders in the development of scientifically based policy regarding breastfeeding practices, and in monitoring global rates of breastfeeding. A detailed account of the timeline of events in international breastfeeding policy development and monitoring and an account of the evolution of breastfeeding policy in Australia is provided in Webb et al 2001.

#### 3.2.1 International recommendation for the duration of exclusive breastfeeding

As outlined in Section 2.3 of this report, the WHO recommendation for the duration of exclusive breastfeeding has recently increased from four to six months to six months. In March 2001, a WHO resolution urged Member States to

*'... support exclusive breastfeeding for six months as a global health recommendation taking into account the findings of the WHO Expert Technical Consultation on optimal duration of exclusive breastfeeding and to provide safe and appropriate complementary foods, with continued breastfeeding for up to two years or beyond ...'*

*[Resolution World Health Assembly 54.2 (ref. Agenda Item 13.1, Infant and young child nutrition, A54/45) in para 2(4)]*

The American Academy of Pediatrics has been recommending six months as the optimal duration of exclusive breastfeeding since 1997 (AAP 1997). Canada has also determined that six months is the optimal duration of exclusive breastfeeding (Effective Public Health Practice project 2002).

### 3.2.2 Australian recommendations

Australian policies about infant feeding have been greatly influenced by those of the WHO. The key policy document that outlines the NHMRC recommendations about infant feeding and breastfeeding is *Dietary Guidelines for Children and Adolescents* which includes *Infant Feeding Guidelines for Health Workers* (NHMRC 2003).

The dissemination of the NHMRC recommendations in Australia occurs through state and territory health departments, local hospitals and health services, health professional organisations, and non-government organisations. These groups endorsed the recommendations in the NHMRC consultation process and are encouraged to promote the use of the recommendations among their constituencies.

**Table 3.2 Summary of recommended breastfeeding practices in Australia**

Dietary guideline: Encourage and support breastfeeding
Key recommendations comprise:
<ul style="list-style-type: none"> <li>• early initiation of breastfeeding (within the first hour of birth) and frequent, on-demand feeding of newborns</li> <li>• exclusive breastfeeding until six months of age*</li> <li>• breastfeeding complemented with appropriate, hygienically prepared food from six months</li> <li>• continued breastfeeding until 12 months of age, while receiving appropriate complementary foods, and beyond if both mother and infant wish.</li> </ul>

\* It is recognised that a small number of babies may benefit from the introduction of solids before the age of six months (Lanigan 2001, NHMRC 2003).

Source: *Dietary Guidelines for Children and Adolescents and Infant Feeding Guidelines for Health Workers* (NHMRC 2003)

### 3.3 Indicators for monitoring breastfeeding in Australia and NSW

#### 3.3.1 National breastfeeding indicators

A set of national indicators for monitoring breastfeeding has been developed by the Australian Food and Nutrition Monitoring Unit for the Commonwealth Department of Health and Ageing (Webb et al 2001). The main purpose of the indicators is to focus data collection on the key aspects of breastfeeding and to encourage the collection and analysis of data in standardised ways among all agencies and groups who conduct population health and nutrition surveys.

A set of criteria were agreed upon and used to formulate the national indicators (refer Webb et al 2001). Based on these criteria, many of the WHO indicators, with some modifications, were applicable to Australia (WHO 1991, WHO 1996). Table 3.3.1 lists the recommended indicators for use in Australia.

**Table 3.3.1 Recommended breastfeeding indicators for Australia**

#### Indicators based on mothers' recalled practice among children aged less than four years:

- percent ever breastfed
- percent breastfed at each completed month of age to 12 months
- median duration of breastfeeding among 'ever breastfed' children.

#### Indicators based on mothers' reported current practice (previous 24 hours) among infants aged less than six months:

- percent exclusively breastfeeding in the previous 24 hours among infants at each completed month of age to six months
- percent fully breastfeeding in the previous 24 hours among infants at each completed month of age to six months
- percent receiving solid foods in the previous 24 hours among infants at each completed month of age to six months
- percent receiving breastmilk substitutes in the previous 24 hours among infants at each completed month of age to six months.

Source: *Towards a national system for monitoring breastfeeding in Australia*. Webb et al 2001.

Measurement issues and survey methods were also considered in formulating these indicators and identifying the data requirements (Webb et al 2001). Key recommendations include:

- using large-scale cross-sectional population based health surveys that are repeated over time
- collecting recall information from parents of children aged up to four years to maximise the sample size
- distinguishing indicators where information can be recalled accurately – and thus collected retrospectively, from information on intensity of breastfeeding which is based on current practice – and thus gathered only from parents of infants aged zero to six months
- using recommended questions in national and state/territory health surveys to report on Australian breastfeeding indicators (see Appendix E).

These indicators are recommended for use commencing with the *2005 National Health Survey*, and rates are to be reported for population sub-groups who are at risk of not breastfeeding, including mothers who have at least one of the following characteristics: under age 25 years, single, no post school qualifications, resident of a lower socio-economic area, indigenous, or born in a country other than Australia, Oceania, Europe or America.

Separate development of indicators for hospitals and other health facilities was recommended. These relate to the timing of the first breastfeed after birth, feeding practices on discharge from hospital, and so forth (Webb et al 2001). These would be similar to the health facility breastfeeding indicators developed by WHO (1991).

### 3.3.2 Breastfeeding indicators for NSW

Ideally, all states and territories should work towards using standardised definitions, indicators and measurement methods to monitor trends in breastfeeding, and to enable comparisons between areas and population sub-groups. To this end, the national indicators are intended for use by states, territories and others, to guide their survey planning, and question selection.

However, the *2001 NSW Child Health Survey* (NSW CHS), the main data source for breastfeeding information in NSW (see section 3.4), was planned and conducted prior to the development of the nationally recommended indicators. The survey questions relating to breastfeeding were adapted from those used in the *1995 National Health Survey*, which have some limitations for use in applying the new indicators. Specifically all of the questions were based on recall of infant feeding practices (versus current practice) and there were no questions that would enable exclusive breastfeeding to be distinguished from predominant breastfeeding. Moreover, the sample definition for the breastfeeding component of the NSW CHS differed from that outlined for the national indicators and included all children less than age two years.

Consequently, an 'interim' set of breastfeeding indicators was devised for NSW based on the information available from the 2001 NSW CHS (see Table 3.3.2). The rationale behind each of these indicators is described in Chapter 4.

**Table 3.3.2 Interim breastfeeding indicators for NSW**

#### Among all children zero to two years:

- 1 Percent ever breastfed.
- 2 Percent breastfed at each completed month of age to 12 months.
- 3 Percent of children regularly given solid foods before four months and six months.
- 4 Percent regularly given breastmilk substitutes before four months and six months.
- 5A Percent fully breastfed to at least four months and six months.

#### Among children zero to two years who were ever breastfed:

- 5B Percent fully breastfed to at least four months and six months.
- 6 Median duration of breastfeeding.

*Note: Only interim indicators 1, 2 and 6 will be comparable to future surveys if they are based on nationally recommended indicators.*

### 3.4 *The 2001 NSW Child Health Survey*

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The 2001 NSW CHS is the first state-based population survey of breastfeeding practices in NSW. Whilst it is not the optimal vehicle for providing information about breastfeeding practices in NSW, it does provide a representative picture of breastfeeding for the state, and for individual geographic areas (Area Health Services both rural and urban) within the state. It also provides information about breastfeeding practices relating to the NHMRC policy guidelines. Data collection about breastfeeding will be repeated at regular intervals, making it an appropriate survey vehicle for monitoring breastfeeding in NSW.

Prior to this survey there have been individual studies (often small and ad hoc) and surveys of selected hospitals and communities in NSW, which have used a variety of definitions and survey questions about breastfeeding, and reported only on a sub-set of the indicators outlined in this report (NSW Health 1994).

The NSW CHS was a computer assisted telephone interview survey (CATI) conducted in 2001. The respondents were mothers or carers of children 0-12 years from households selected by list-assisted random digit dialling across the state, with a target of 500 children from each of the 17 Area Health Services in NSW.

The overall response rate was 84%, with a total sample of 9,425 children. The NSW CHS was the first in NSW to focus on children under 12 years. Questions examined the determinants of health, health behaviours (including infant feeding practices), health status and use of health services.

The survey component relating to breastfeeding/infant feeding practices was conducted on a sub-set of the main survey sample of children 0-12 years. This subset was infants and children aged 0-23 months at the time of the survey (a sample of 1,489), thereby limiting the time period over which the respondents (87.7% were mothers, 12.3% were fathers) had to recall their children's feeding practices.

Further details of the survey methods and results can be found in the survey report (NSW Department of Health 2002).



## 4 Breastfeeding practices in NSW

### 4.1 Presentation of the results

This section summarises the results of a secondary analysis of data collected in the NSW Child Health Survey 2001 pertaining to breastfeeding practices.

The purpose of including breastfeeding questions in the survey was to provide baseline data about the prevalence of recommended breastfeeding practices in NSW, and to inform policy and programs that promote breastfeeding.

The survey questions in the NSW CHS 2001 that relate to breastfeeding are shown in Appendix C. The six indicators to which the survey questions relate were outlined in Table 3.3.2 Section 3.3. Details of statistical analysis of the NSW CHS 2001 data used to report on the interim indicators are provided in Appendix F.

The results for each indicator are reported for NSW as a whole and for all Area Health Services (AHS) in NSW. Data are also reported by population characteristics of mothers (described in Table 4.1.1) as many of these have been identified as risk factors for low breastfeeding rates.

The following points should be borne in mind when interpreting the data (see Appendix F for more detail and sample sizes):

- The subgroup estimates do not account for possible confounders, and hence are crude estimates.

For example, the place of residence sub-populations – urban and rural – are not adjusted for differences in the proportion of Aboriginal and Torres Strait Islander mothers in these two groups.

- The strength of evidence for differences between population subgroups and Area Health Service (AHS) is affected by the size of the sample in each of these groups or areas. The smaller the sample size, the greater the variability of the estimate and the less the power to distinguish a significant difference between subgroups. Notably Illawarra, Northern Rivers, Mid North Coast and New England have only between 60 and 70 respondents in each health area.
- The statistical methods used to report on the indicators did not permit statistically significant differences in breastfeeding practices to be identified between Area Health Services and between population subgroups, except for rates of breastfeeding initiation.
- Areas are advised to compare their local data with state estimates rather than with other Areas.
- The sample size for the Aboriginal and Torres Strait Islanders group is very small compared to the non-Aboriginal and Torres Strait Islanders group.
- The 95% confidence intervals were not calculated for indicators 2-6 as these are not readily calculated in standard software due to the complex survey design.

**Table 4.1.1 Relevant population characteristics of mothers**

**Maternal age** – less than or greater than 25 years. Many studies in the literature (eg Vogel et al 1999, Scott et al 2001) indicate a positive association between age and breastfeeding initiation and duration, ie more younger mothers breastfeed less or for shorter periods than older mothers.

**Maternal education** – tertiary/less than tertiary. A consistent and strong positive association is indicated in the literature, ie more mothers with a higher education breastfeed and breastfeed for longer than mothers with a lower education (North et al 2000).

**Australian Bureau of Statistics Socio-economic indexes for areas (SEIFA) quintiles** – in Australia, breastfeeding initiation and duration are positively associated with socioeconomic status (Hitchcock and Coy 1988, ABS 1996).

**Maternal country of birth** – born in Australia/born overseas. Overseas born women tend to breastfeed for a shorter time (Jain 1996, Scott 1997).

**Background** – English speaking background/non English speaking background. The closest approximation to this covariate asked in the NSW CHS was whether a language other than English was spoken at home.

**Indigenous status** – Aboriginal or Torres Strait Islanders/non Aboriginal or Torres Strait Islanders, with the former being less likely to initiate breastfeeding or breastfeed for a shorter duration.

**Place of residence** – urban/rural. Health areas in Greater Sydney, Hunter and Illawarra were classified as urban, the rest as rural.

Consequently, differences between population subgroups and between Area Health Service should be interpreted with caution.

To assist interpretation of the following tables, the birth rate for NSW and each Area Health Service are shown below in Table 4.1.2. Numbers for NSW are between 85,000 and 90,000 per year (1996-2000).

**Table 4.1.2 Distribution of births in NSW 1996-2000, by year of birth and Area Health Service of residence**

Area Health Service of residence	Birth year					1996-2000
	1996	1997	1998	1999	2000	
Central Sydney	6,863	6,738	6,668	6,713	6,916	33,898
Northern Sydney	8,963	9,114	8,966	9,427	9,600	46,070
Western Sydney	9,790	10,712	10,675	10,859	10,956	52,992
Wentworth	3,974	4,907	4,906	4,911	5,005	23,703
South Western Sydney	12,091	12,682	12,208	12,420	12,748	62,149
Central Coast	3,459	3,859	3,783	3,729	3,836	18,666
Hunter	7,423	7,131	6,980	7,085	7,095	35,714
Illawarra	4,395	4,491	4,422	4,485	4,489	22,282
South Eastern Sydney	8,784	9,288	9,294	9,578	9,880	46,824
Northern Rivers	2,927	2,999	2,977	2,938	2,795	14,636
Mid North Coast	2,943	3,116	2,997	2,949	2,857	14,862
New England	3,277	2,492	2,417	2,373	2,298	12,857
Macquarie	1,868	1,614	1,610	1,613	1,624	8,329
Mid Western	2,643	2,474	2,375	2,335	2,312	12,139
Far West	914	605	564	538	535	3,156
Greater Murray	3,559	3,405	2,984	2,652	2,551	15,151
Southern	1,828	1,789	1,801	1,863	1,782	9,063
<b>Total NSW</b>	<b>85,701</b>	<b>87,416</b>	<b>85,627</b>	<b>86,468</b>	<b>87,279</b>	<b>432,491</b>

#### 4.2 Indicator 1: Initiation of breastfeeding (percent 'ever breastfed')

'Ever breastfed' refers to infants who were breastfed from birth, or who were put to the breast only once, as well as those infants who received expressed breastmilk but were never put to the breast. The indicator provides a measure of the extent to which women are initiating breastfeeding.

Table 4.2.1 shows the percentage of infants less than two years who were 'ever breastfed' in each NSW Area Health Service.

**Table 4.2.1 Percentage of children 'ever breastfed', by Area Health Service of residence, children aged less than 2 years, NSW 2001**

Area Health Service of residence	Percent 'ever breastfed' (95% confidence interval)
Central Sydney	98.7 (96.1-100.0)
Northern Sydney	93.4 (87.2-99.6)
SE Sydney	91.7 (85.4-98.0)
SW Sydney	82.6 (71.9-93.3)
Western Sydney	86.9 (79.0-94.8)
Central Coast	88.4 (81.3-95.6)
Wentworth	87.0 (78.4-95.5)
Hunter	93.7 (88.5-99.0)
Illawarra	90.8 (82.2-99.4)
Northern Rivers	93.6 (87.1-100.0)
Mid North Coast	98.4 (95.1-100.0)
New England	93.5 (87.5-99.6)
Macquarie	85.7 (76.3-95.0)
Far West	82.2 (73.4-91.1)
Mid Western	84.6 (75.4-93.8)
Greater Murray	89.0 (82.2-95.8)
Southern	94.5 (90.2-98.7)
<b>Total NSW</b>	<b>90.2 (87.8-92.5)</b>

Source: NSW Child Health Survey 2001 (HOIST).

Key points:

- In NSW, approximately 90% of all infants were 'ever breastfed'.
- The percent of children aged 0 to 23 months 'ever breastfed' ranged from 82.2% in the Far West AHS to almost 99% in Central Sydney AHS.

- The breastfeeding initiation rates in Central Sydney AHS and Mid North Coast AHS were significantly higher than for NSW overall.
- The breastfeeding rates in the other AHSs were not significantly different from the overall NSW rate.

Some of the variation between Area Health Services may be due to differences in their population characteristics. For example, the Far West AHS has a high proportion of women under age 25 years, a population with greater socioeconomic disadvantage, and a higher proportion of mothers of Aboriginal and Torres Strait Islanders background than NSW overall. Percentage ever breastfed for population subgroups is shown in Table 4.2.2.

**Table 4.2.2 Percentage of children 'ever breastfed', by population characteristics of mothers, children aged less than 2 years, NSW 2001**

Population characteristics of mothers	Percent 'ever breastfed' (95% confidence interval)
<b>Maternal age</b>	
< 25 yrs	84.5 (78.2-90.9)
≥ 25 yrs	90.4 (87.6-93.2)
<b>Maternal education</b>	
Primary/secondary	86.8 (83.4-90.1)
Tertiary	96.1 (94.0-98.3)
<b>SEIFA</b>	
1st quintile (least disadvantaged)	95.5 (92.6-98.5)
2nd quintile	89.8 (85.3-94.2)
3rd quintile	87.3 (81.9-92.7)
4th quintile	92.4 (87.7-97.1)
5th quintile (most disadvantaged)	86.2 (79.0-93.3)
<b>Maternal country of birth</b>	
Australia	90.4 (87.9-92.9)
Overseas	88.0 (82.3-93.7)
<b>Maternal background</b>	
English speaking background	90.9 (88.5-93.3)
Non English speaking background	87.9 (82.1-93.7)
<b>Indigenous status (maternal)</b>	
Aboriginal and Torres Strait Islanders	72.4 (52.2-92.7)
Non-Aboriginal and Torres Strait Islanders	90.6 (88.3-92.9)
<b>Place of residence</b>	
Urban	89.8 (87.0-92.7)
Rural	91.4 (89.0-93.8)

Source: NSW Child Health Survey 2001 (HOIST).

Key points:

- Rates of breastfeeding initiation were notably higher for infants whose mothers had a tertiary education (96.1%) compared with infants of mothers without a tertiary education (86.8%). This was the only population subgroup with significant differences.
- Rates of 'ever breastfed' were particularly low in infants of mothers with Aboriginal and Torres Strait Islander background. It is known that Aboriginal women with more traditional lifestyles are more likely to breastfeed than Aboriginal women in urban settings (Lund-Adams and Heywood 1995, NHMRC 1995). In the NSW CHS 2001, 23% of mothers of Aboriginal and Torres Strait Islander background lived in urban areas compared to 77% living in rural areas. This indicates that the sample was not biased towards the urban dwellers who breastfeed less.

#### 4.3 Indicator 2: Duration of any breastfeeding (percent breastfeeding (any) at each month of age to 12 months)

This indicator is measured by calculating the proportion of infants in the survey who were receiving any breastmilk at each completed month of age up to 12 months (among all 0-23 month olds in the survey). It provides an overall measure of the rates of breastfeeding over the first 12 months of life (see Table 4.3.1).

This indicator does not show the extent of exclusive breastfeeding. Rates of exclusive breastfeeding at four and six months would be considerably lower than the rates of any breastfeeding (see Indicator 5). Indicator 2 does reflect the extent to which women have adopted the NHMRC policy recommendations to breastfeed for at least 12 months.

The indicator can also be used to identify the developmental ages at which the greatest declines in breastfeeding rates occur; and this can, in turn, serve as a guide for targeted interventions to increase the duration of breastfeeding.

**Table 4.3.1 Duration of breastfeeding, children aged less than 2 years, NSW 2001**

Age in completed months	Percent breastfed to at least this age
Ever breastfed	90.2
1 month	76.6
2 months	68.3
3 months	61.1
4 months	54.2
5 months	50.0
6 months	42.5
7 months	40.0
8 months	35.8
9 months	32.5
10 months	28.7
11 months	26.4
12 months	18.1

Source: NSW Child Health Survey 2001 (HOIST).

Key points:

- There is an ongoing decline in breastfeeding over the first 12 months.
- The most notable declines in breastfeeding occurs during the first month after birth.

Sample sizes among Area Health Services did not permit the determination of prevalence of breastfeeding at each completed month until 12 months of age. However, the key times for which we need to know about breastfeeding are four, six and 12 months, as these relate to current and recent policy. Breastfeeding rates for each Area Health Service at each of these three key times are presented in Table 4.3.2.

**Table 4.3.2 Prevalence of any breastfeeding to 4 months, 6 months and 12 months, by Area Health Service of residence, children aged less than 2 years, NSW 2001**

Area Health Service of residence	Percentage breastfed to at least this age		
	4 months	6 months	12 months
Central Sydney	64.7	48.8	16.8
Northern Sydney	66.6	56.6	32.2
SE Sydney	57.1	41.7	8.3
SW Sydney	42.9	28.6	19.1
Western Sydney	47.0	38.8	17.5
Central Coast	42.0	26.7	5.9
Wentworth	46.6	40.9 <sup>1</sup>	13.8
Hunter	54.0	43.4	19.4
Illawarra	57.0	37.8	12.8
Northern Rivers	58.7	49.1	22.2
Mid North Coast	65.7	59.0	24.9
New England	55.0	44.2	17.3 <sup>2</sup>
Macquarie	62.8	51.7	14.5
Far West	46.6	40.1	13.3
Mid Western	52.3	41.8	16.6
Greater Murray	57.0	49.3	22.2
Southern	61.1	48.2	25.3
<b>Total NSW</b>	<b>54.2</b>	<b>42.5</b>	<b>18.1</b>

Source: NSW Child Health Survey 2001 (HOIST).

<sup>1</sup> Extrapolated from data (42.2% to five months) as data did not allow estimation at six months

<sup>2</sup> Extrapolated from data (22.8% to 11 months) as data did not allow estimation at 12 months

#### Key points:

- The prevalence of any breastfeeding in NSW was 54.2% at four months, 42.5% at six months and 18.1% at 12 months, indicating that a considerable portion of babies are not being fed optimally, according to current Australian (NHMRC) guidelines.
- There was substantial variation between Area Health Services in (any) breastfeeding rates at four, six and 12 months.
- A greater percentage of infants in Northern Sydney AHS were breastfed to each of the three key age milestones (four, six and 12 months) than in NSW overall.
- Low rates of any breastfeeding were apparent at each of the three age milestones in the Central Coast AHS, at four and six months in South West Sydney AHS and at 12 months in South East Sydney AHS.
- At the four month milestone, the Central Coast, South Western Sydney, Far West, Wentworth and Western Sydney Area Health Services all had rates about 10 percentage points lower than the total for NSW.
- All differences noted may be partly attributable to differences in population characteristics between the Areas (see Table 4.3.3).

**Table 4.3.3 Prevalence of any breastfeeding to 4 months, 6 months and 12 months, by population characteristics of mothers, children aged less than 2 years, NSW 2001**

Population characteristics of mothers	Percentage breastfed to at least this age		
	4 months	6 months	12 months
<b>Maternal age</b>			
< 25 yrs	34.9	27.1	8.4
≥ 25 yrs	56.5	44.5	20.9
<b>Maternal education</b>			
Primary/secondary	44.5	33.5	15.0
Tertiary	71.4	58.6	23.6
<b>SEIFA</b>			
1st quintile (least disadvantaged)	64.2	55.4	26.9
2nd quintile	57.2	45.6	17.8
3rd quintile	52.0	36.9	13.7
4th quintile	46.8	35.9	17.2
5th quintile (most disadvantaged)	50.0	37.2	14.3
<b>Maternal country of birth</b>			
Australia	53.3	41.8	16.2
Overseas	56.2	44.7	24.6
<b>Maternal background</b>			
English speaking	54.4	43.0	18.2
Non English speaking	53.4	40.6	17.8
<b>Indigenous status (maternal)</b>			
Aboriginal and Torres Strait Islander	31.3*	22.2	10.0
Non-Aboriginal and non-Torres Strait Islander	54.6	43.0	18.4
<b>Place of residence</b>			
Urban	53.1	40.7	17.3
Rural	58.4	48.9	21.5

\* Extrapolation from three months (37.1%) as data did not allow estimation at four months.

Source: NSW Child Health Survey 2001 (HOIST).

#### Key points:

- A lower percentage of infants of mothers aged less than 25 years were receiving breastmilk at all three of the age milestones (four, six and 12 months) than infants of mothers aged 25 years and over.
- A lower percentage of infants of mothers of Aboriginal and Torres Strait Islander background were breastfed at all three age milestones than infants of mothers not of Aboriginal and Torres Strait Islander background.
- A lower percentage of infants of mothers who had less than a tertiary education were breastfed at all three age milestones, compared to infants of mothers who had a tertiary education.
- Higher rates of any breastfeeding at each of the age milestones were evident in infants in the least disadvantaged quintile compared to the most disadvantaged quintile.

#### 4.4 Indicator 3: Percent regularly given solid food before four months and six months

The 2003 NHMRC recommendation is for infants to be exclusively breastfed for the first six months of life, followed by the gradual introduction of appropriate solid foods. Previously, the introduction of solid food was recommended between four and six months of age. As well as providing an indication of the adherence to existing (at the time of the NSW CHS 2001) policy guidelines, this indicator provides a baseline for comparison with future surveys regarding the extent to which the new policy guideline has been adopted (see Table 4.4.1)

**Table 4.4.1 Percent of infants regularly given solid food before 4 months and 6 months, by Area Health Service of residence, children aged less than 2 years, NSW 2001**

NSW Area Health Service of residence	Percent given solid foods	
	before 4 months <sup>1</sup>	before 6 months <sup>2</sup>
Central Sydney	4.1	63.0
Northern Sydney	10.3	68.7
SE Sydney	6.8	62.2
SW Sydney	15.5	76.7
Western Sydney	10.5	69.3
Central Coast	17.3	62.1
Wentworth	23.1	84.7
Hunter	12.0	63.5
Illawarra	12.9	77.8
Northern Rivers	9.2	59.9
Mid North Coast	15.3	78.4
New England	20.0	68.7
Macquarie	18.6	62.2
Far West	19.9	66.9
Mid Western	17.2	68.3
Greater Murray	16.4	74.2
Southern	11.9	74.6
<b>Total NSW</b>	<b>12.6</b>	<b>69.8</b>

Source: NSW Child Health Survey 2001 (HOIST).

<sup>1</sup> up to but not including infants 4 months of age.

<sup>2</sup> up to but not including infants 6 months of age.

Key points:

- Approximately 13% and 70% of infants were regularly given solid food before four months and before six months of age, respectively.
- Early introduction of solids was observed in all Area Health Services. The rate was particularly high in Wentworth AHS compared to NSW overall.

**Table 4.4.2 Percent of NSW infants regularly given solid food before 4 months and 6 months of age, by population characteristics of mothers, NSW Child Health Survey, 2001**

Population characteristics of mothers	Percent given solid foods regularly	
	before 4 months <sup>1</sup>	before 6 months <sup>2</sup>
<b>Maternal age</b>		
< 25 yrs	22.6	79.3
≥ 25 yrs	12.2	71.8
<b>Maternal education</b>		
Primary/secondary (less than tertiary)	16.3	71.2
Tertiary	5.9	67.4
<b>SEIFA</b>		
1st quintile (least disadvantaged)	8.6	73.3
2nd quintile	11.4	64.9
3rd quintile	13.8	72.3
4th quintile	10.5	66.7
5th quintile (most disadvantaged)	18.9	72.2
<b>Maternal country of birth</b>		
Australia	14.9	73.9
Overseas	5.8	57.7
<b>Background (maternal)</b>		
English speaking	14.0	72.5
Non English speaking	7.3	79.6
<b>Indigenous status (maternal)</b>		
Aboriginal and Torres Strait Islander	17.0	73.7
Non-Aboriginal and non-Torres Strait Islander	12.3	69.7
<b>Place of residence</b>		
Urban	11.9	69.7
Rural	15.3	70.0

Source: NSW Child Health Survey 2001 (HOIST).

<sup>1</sup> up to but not including infants 4 months of age.

<sup>2</sup> up to but not including infants 6 months of age.

The data presented in Table 4.4.2 are consistent with previous research findings that mothers in some population subgroups tend to introduce solid foods earlier than recommended.

Key points:

- A larger proportion of young mothers' (less than 25 years) give their infants solid foods regularly before four and six months of age, than do older mothers.
- Mothers who had less than a tertiary education were more likely to give solid foods early (prior to four months of age) than tertiary educated mothers.
- Mothers in the most disadvantaged SEIFA quintile were more likely to give solid foods early, than mothers in the least disadvantaged quintile.
- A larger proportion of mothers born in Australia give their infants solid foods regularly before four and six months of age, than do mothers born overseas.
- A larger proportion of mothers of English speaking background give their infants solid foods regularly before four months than mothers of non-English speaking background.
- Indigenous (versus non-indigenous) mothers and mothers in rural (versus urban) areas are more likely to introduce solid foods regularly before four months of age.

#### 4.5 Indicator 4: Percent regularly given breastmilk substitutes before four months and six months

This indicator provides information on the extent to which infants are receiving breastmilk substitutes (as distinct from solid food) on a regular basis before four months and six months of age (see Table 4.5.1).

**Table 4.5.1 Percent of infants given breastmilk substitutes regularly before 4 and 6 months by Area Health Service of residence, children aged less than 2 years, NSW 2001**

NSW Area Health Service of residence	Percent given breastmilk substitutes regularly	
	before 4 months <sup>1</sup>	before 6 months <sup>2</sup>
Central Sydney	35.7	56.6
Northern Sydney	36.8	45.9
SE Sydney	49.0	63.4
SW Sydney	49.3	73.6
Western Sydney	59.2	62.3
Central Coast	60.1	66.7
Wentworth	50.3	63.3
Hunter	44.7	57.3
Illawarra	40.4	60.2
Northern Rivers	44.6	52.3
Mid North Coast	35.3	40.4
New England	51.0	62.6
Macquarie	40.0	51.2
Far West	52.2	64.5
Mid Western	47.0	59.4
Greater Murray	40.0	51.4
Southern	38.9	49.2
<b>Total NSW</b>	<b>46.5</b>	<b>59.6</b>

Source: NSW Child Health Survey 2001 (HOIST).

<sup>1</sup> up to but not including infants 4 months of age.

<sup>2</sup> up to but not including infants 6 months of age.

Key points:

- Nearly half of all infants were receiving breastmilk substitutes on a regular basis before they were four months old.

- Approximately 60% of infants were receiving breastmilk substitutes on a regular basis before they were six months old.
- South East Sydney, South West Sydney, Western Sydney, Central Coast, Wentworth, New England and Far West Area Health Services had higher rates of introduction of breastmilk substitutes before four months and before six months than NSW overall.

**Table 4.5.2 Percentage of NSW infants given breastmilk substitutes regularly before 4 and 6 months, children aged less than 2 years, NSW 2001**

Population characteristics of mothers	Percent given breastmilk substitutes regularly	
	before 4 months <sup>1</sup>	before 6 months <sup>2</sup>
<b>Maternal age</b>		
< 25 yrs	61.1	69.1
≥ 25 yrs	43.9	58.3
<b>Maternal education</b>		
Primary/secondary (less than tertiary)	54.6	66.8
Tertiary	32.1	47.0
<b>SEIFA</b>		
1st quintile (least disadvantaged)	38.5	48.5
2nd quintile	44.1	55.7
3rd quintile	51.9	66.1
4th quintile	48.9	63.6
5th quintile (most disadvantaged)	48.7	64.8
<b>Maternal country of birth</b>		
Australia	46.3	58.8
Overseas	46.8	62.0
<b>Background (maternal)</b>		
English speaking	50.5	68.3
Non English speaking	45.4	57.2
<b>Indigenous status (maternal)</b>		
Aboriginal and Torres Strait Islander	61.8	73.9
Non-Aboriginal and non-Torres Strait Islander	45.9	59.1
<b>Place of residence</b>		
Urban	47.5	61.6
Rural	42.5	52.4
<b>Total NSW</b>	<b>46.5</b>	<b>59.6</b>

Source: NSW Child Health Survey 2001 (HOIST).

<sup>1</sup> up to but not including infants 4 months of age.

<sup>2</sup> up to but not including infants 6 months of age.

The data presented in Table 4.5.2 are consistent with previous research findings that mothers in some population subgroups tend to give their infants breastmilk substitutes early.

Key points:

- A larger proportion of young mothers (aged less than 25 years) give their infants breastmilk substitutes regularly before four and six months of age, than do older mothers.
- A larger proportion of mothers who had less than a tertiary education give breastmilk substitutes regularly before four and six months of age, than do more highly educated mothers.
- Indigenous mothers are more likely to give breastmilk substitutes regularly before four and six months of age, than non-indigenous mothers.
- A smaller proportion of mothers in the least disadvantaged SEIFA quintile compared to other quintiles of disadvantage give their infants breastmilk substitutes regularly before four and six months of age.

#### 4.6 Indicators 5A and 5B: Prevalence of 'full' breastfeeding to four months and six months

This indicator provides data on a combined category – full breastfeeding, including infants who were exclusively breastfed, and those who were predominantly breastfed.

The purpose of reporting to four months and to six months is to provide information relevant to the NHMRC policy goals (recent and current). The percentage of babies being exclusively breastfed will be lower at each age than the percentage fully breastfed at that age.

Also included in the tables for this indicator is the percentage of infants fully breastfed to at least three months. These data are included to show the sharp fall in the proportion of infants fully breastfed between three and four months of age.

The indicator is presented in two forms – with ‘all children 0-23 months’ as the denominator (Indicator 5A, Tables 4.6.1 and 4.6.2) and with ‘children 0-23 months ‘ever breastfed’ as the denominator (Indicator 5B, Tables 4.6.3 and 4.6.4). Indicator 5A refers to the population rates of full breastfeeding and Indicator 5B provides information on the proportion of babies being fully breastfed among those babies that ever receive breastmilk.

The latter form of this indicator is included because, once we know how many infants are being breastfed then it is beneficial to know the way in which babies

who are breastfed initially continue to be breastfed (Webb et al 2001).

Interventions to increase the number of infants being exclusively breastfed will be aimed primarily at mothers who initiate breastfeeding, thus this form of the indicator can be used to determine the effectiveness of such interventions. Obviously the proportion of infants fully breastfed is lower with ‘all children’ (Indicator 5A) than with ‘ever breastfed children’ (Indicator 5B) as the denominator.

### **Indicator 5A – Population rates of fully breastfed for all children 0-23 months**

**Table 4.6.1 Prevalence of full breastfeeding to 3 months, 4 months and 6 months, by Area Health Service of residence, children aged less than 2 years, NSW 2001**

NSW Area Health Service of residence	Percent fully breastfed to		
	3 months	4 months	6 months
Central Sydney	60.8	29.9	2.4
Northern Sydney	58.4	31.8	5.2
SE Sydney	49.9	26.4	6.0
SW Sydney	41.6	14.3	2.3
Western Sydney	37.4	18.6	5.0
Central Coast	34.9	18.7	6.2
Wentworth	50.2	12.7	3.2
Hunter	52.2	30.2	6.6
Illawarra	52.6	31.8	3.4
Northern Rivers	49.1	37.6	11.3
Mid North Coast	52.2	25.8	1.1
New England	45.1	25.8	2.2
Macquarie	53.0	34.5	8.1
Far West	43.3	20.9	1.8
Mid Western	48.1	26.5	3.3
Greater Murray	48.7	29.7	4.4
Southern	52.9	29.3	6.6
<b>Total NSW</b>	<b>48.4</b>	<b>24.6</b>	<b>4.6</b>

Source: NSW Child Health Survey 2001 (HOIST).

Key points:

- There was a sharp fall in the proportion of infants fully breastfed between three and four months for all Area Health Services.
- Only a quarter of NSW infants were fully breastfed to at least four months and very few were fully breastfed to at least six months.
- There was substantial variation in the rate of full breastfeeding to at least four and at least six months among Area Health Services. The prevalence of full breastfeeding to at least four months ranged from 12.7% in Wentworth AHS to 37.6% in Northern Rivers AHS.

**Table 4.6.2 Percent of infants fully breastfed to 4 and 6 months, by population characteristics of mothers, children aged less than 2 years, NSW 2001**

Population characteristics of mothers	Percent fully breastfed	
	to 4 months	to 6 months
<b>Maternal age</b>		
< 25 yrs	13.5	8.0
≥ 25 yrs	25.5	3.4
<b>Maternal education</b>		
Primary/secondary (less than tertiary)	20.2	4.0
Tertiary	32.3	5.5
<b>SEIFA</b>		
1st quintile (least disadvantaged)	26.4	6.1
2nd quintile	30.2	5.9
3rd quintile	23.5	3.9
4th quintile	20.0	2.7
5th quintile (most disadvantaged)	22.0	4.2
<b>Maternal country of birth</b>		
Australia	24.2	4.0
Overseas	25.6	6.4
<b>Background (maternal)</b>		
English speaking	24.4	4.1
Non English speaking	25.4	6.6
<b>Indigenous status (maternal)</b>		
Aboriginal and Torres Strait Islander	15.8	5.9
Non-Aboriginal and non-Torres Strait Islander	24.9	4.6
<b>Place of residence</b>		
Urban	23.3	4.4
Rural	29.6	5.2

Source: NSW Child Health Survey 2001 (HOIST).

Table 4.6.2 presents data on indicator 5A by population characteristics of mothers.

Key points:

- The percentage of infants who were fully breastfed to at least four months was lower for those with mothers aged less than 25 years than for those with older (aged 25 years and over) mothers.
- The percentage of infants who were fully breastfed to at least four months was lower for those with mothers without a tertiary education than for those with mothers with a tertiary education.
- The percentage of infants who were fully breastfed to at least four months was lower for those with Aboriginal and Torres Strait Islander mothers than for those with non-Aboriginal and non-Torres Strait Islander mothers.
- The percentage of children fully breastfed to at least six months was similar across all subgroups.

**Indicator 5B – Population rates of fully breastfed among those ‘ever breastfed’****Table 4.6.3 Prevalence of full breastfeeding to 3 months, 4 months and 6 months, by Area Health Service of residence, in children aged less than 2 years who were ‘ever breastfed’, NSW 2001**

NSW Area Health Service of residence	Percent fully breastfed to		
	3 months	4 months	6 months
Central Sydney	61.6	30.3	2.5
Northern Sydney	62.5	34.1	5.6
SE Sydney	53.0	27.3	5.0
SW Sydney	50.4	17.3	2.7
Western Sydney	43.1	21.4	5.8
Central Coast	39.4	21.2	7.0
Wentworth	57.7	14.6	3.6
Hunter	55.7	32.2	7.1
Illawarra	57.9	35.0	3.8
Northern Rivers	52.5	40.1	12.1
Mid North Coast	53.1	26.2	1.1
New England	48.3	27.6	2.4
Macquarie	61.9	40.3	9.5
Far West	52.7	25.5	2.2
Mid Western	56.9	31.3	3.9
Greater Murray	54.8	33.4	4.9
Southern	55.7	30.8	6.9
<b>Total NSW</b>	<b>53.5</b>	<b>27.1</b>	<b>4.9</b>

Source: NSW Child Health Survey 2001 (HOIST).

Table 4.6.3 presents data on indicator 5B by Area Health Service of residence.

Key points:

- There was a sharp fall in the proportion of ever breastfed infants fully breastfed between three and four months for all Area Health Services.
- Only 27% of NSW infants who were ever breastfed were fully breastfed to at least four months and very few were fully breastfed to at least six months.
- There was substantial variation in the rate of full breastfeeding in ever breastfed infants to at least four and at least six months among Area Health Services. The prevalence of full breastfeeding to at least four months ranged from 14.6% in Wentworth AHS to 40.3% in Macquarie AHS.

**Table 4.6.4 Percent of infants fully breastfed to 4 and 6 months, by population characteristics of mothers, children aged less than 2 years who were 'ever breastfed', NSW 2001**

Population characteristics of mothers	Percent fully breastfed	
	to 4 months	to 6 months
<b>Maternal age</b>		
< 25 yrs	16.0	9.4
≥ 25 yrs	28.3	3.8
<b>Maternal education</b>		
Primary/secondary (less than tertiary)	23.3	4.6
Tertiary	33.2	5.3
<b>SEIFA</b>		
1st quintile (least disadvantaged)	26.9	5.6
2nd quintile	33.6	6.6
3rd quintile	26.9	4.4
4th quintile	21.7	2.9
5th quintile (most disadvantaged)	25.5	4.8
<b>Maternal country of birth</b>		
Australia	26.6	4.4
Overseas	28.5	6.6
<b>Background (maternal)</b>		
English speaking	26.8	4.5
Non English speaking	28.4	6.7
<b>Indigenous status (maternal)</b>		
Aboriginal and Torres Strait Islander	21.8	8.1
Non-Aboriginal and non-Torres Strait Islander	27.3	4.9
<b>Place of residence</b>		
Urban	25.7	4.7
Rural	32.3	5.7

Source: NSW Child Health Survey 2001 (HOIST).

Table 4.6.4 presents data on indicator 5B by population characteristics of mothers.

Key points:

- The percentage of ever breastfed infants who were fully breastfed to at least four months was lower for those with mothers aged less than 25 years than for those with older (aged 25 years and over) mothers.
- The percentage of ever breastfed infants who were fully breastfed to at least four months was lower for those with mothers without a tertiary education than for those with mothers with a tertiary education.
- The percentage of ever breastfed infants who were fully breastfed to at least four months was lower for those with Aboriginal and Torres Strait Islander mothers than for those with non-Aboriginal and non-Torres Strait Islander mothers.
- The percentage of ever breastfed infants fully breastfed to at least six months was similar across all subgroups.

#### 4.7 Indicator 6: Median duration of breastfeeding among 'ever breastfed' children

This indicator is used to monitor changes (including the overall effectiveness of interventions) in duration of breastfeeding of infants. It is determined for only those infants who were 'ever breastfed' to provide an indication of the continued practice of any breastfeeding among ever breastfed infants. The median duration of breastfeeding is the age, in completed months, at which 50% of children who were 'ever breastfed' were still receiving at least some breastmilk (see Table 4.7.1).

**Table 4.7.1 Median duration of breastfeeding in children aged less than 2 years who were 'ever breastfed', by Area Health Service of residence, NSW 2001**

NSW Area Health Service of residence	Median duration of breastfeeding (age in completed months)
Central Sydney	6
Northern Sydney	10
SE Sydney	6
SW Sydney	6
Western Sydney	6
Central Coast	4
Wentworth	5
Hunter	6
Illawarra	6
Northern Rivers	7
Mid North Coast	10
New England	6
Macquarie	8
Far West	6
Mid Western	6
Greater Murray	7
Southern	7
<b>Total NSW</b>	<b>6</b>

Source: NSW Child Health Survey 2001 (HOIST).

Key points:

- The median duration of breastfeeding in NSW is six months, ie at least half of the infants that were 'ever breastfed' continued to be breastfed for at least six months.
- This duration is different to that reported for indicator 2 (Table 4.3.1) because it is calculated based only on those infants who were 'ever breastfed'. Also, as noted previously, it is not possible to estimate how many of these infants were exclusively breastfed, an indicator that requires additional information to that collected in this survey (rates of full breastfeeding are shown in section 4.6).
- Substantial variation in median duration of breastfeeding was observed across the Area Health Services.
- The median duration of breastfeeding was shorter in the Central Coast AHS (four months) and longer in Mid North Coast and Northern Sydney AHS (10 months) than for NSW as a whole.

**Table 4.7.2 Median duration of breastfeeding in children aged less than 2 years who were 'ever breastfed', by population characteristics of mothers, NSW 2001**

Population characteristics of mothers	Median duration of breastfeeding (age in completed months)
<b>Maternal age</b>	
< 25 yrs	3
≥ 25 yrs	6
<b>Maternal education</b>	
Primary/secondary (less than tertiary)	5
Tertiary	9
<b>SEIFA</b>	
1st quintile (least disadvantaged)	9
2nd quintile	7
3rd quintile	6
4th quintile	5
5th quintile (most disadvantaged)	6
<b>Maternal country of birth</b>	
Australia	6
Overseas	7
<b>Background (maternal)</b>	
English speaking	6
Non English speaking	6
<b>Indigenous status (maternal)</b>	
Aboriginal and Torres Strait Islander	5
Non-Aboriginal and non-Torres Strait Islander	6
<b>Place of residence</b>	
Urban	6
Rural	7

Source: NSW Child Health Survey 2001 (HOIST).

Table 4.7.2 presents data on indicator 6 by population characteristics of mothers.

Key points:

- Of the various population subgroups examined, the shortest median duration of breastfeeding was three months, in infants of mothers who were aged less than 25 years.
- Infants of mothers with a tertiary education were breastfed for a longer time (nine months) than children of mothers with less than a tertiary education (five months).
- The median duration of breastfeeding of infants of mothers in the most disadvantaged quintile was shorter (six months) than that of infants of mothers in the least disadvantaged quintile (nine months).

#### 4.8 Comparison of NSW Child Health Survey, 2001 with the National Health Survey, 1995

The data from the 1995 National Health Survey (1995 NHS) have been chosen for comparison with the 2001 NSW CHS data as they are the only data available (for NSW and Australia) that have been collected from a sufficiently large and valid survey. Also, the questions used in the 1995 NHS were similar to those used in the 2001 NSW CHS. The data from the 1995 NHS have been published in two papers (Donath & Amir 2000, 2002).

Although there is a gap of six years between surveys, and the questions were asked to mothers (or carers) of children under four years in the 1995 survey, as compared to carers of children aged less than two years in the 2001 survey (thus less recall bias in the latter survey, Webb et al 2001), the similarity of questions enables a comparison of data.

The 1995 NHS was conducted by the Australian Bureau of Statistics (ABS) in all states and territories of Australia. The sample size was 21,878 households. For each child under the age of four years, a number of questions relating to feeding in the first year were asked (shown in Appendix D). The questions were answered on behalf of the child by an adult, generally a parent (the mother in approximately 80% of cases). Data were obtained by personal interview. There were 3,252 children under four years of age in the sample. Of these, 782 were under one year old (378 under six months), 818 were one year old, 856 were two years old and 796 were three years old.

Initial findings of initiation and duration of breastfeeding in Australia, by state, were published by Donath and Amir (2000) and more recently a 'clean dataset' was used to indicate the extent and timing of introduction of breastmilk substitutes and solid foods in Australia (not by state) (Donath & Amir 2002). The authors indicate that 'exclusive breastfeeding' in the 1995 NHS corresponds to the WHO definition of 'predominant' breastfeeding. Thus, the rates of 'exclusive' breastfeeding reported by Donath & Amir (2000, 2002) are comparable to the rates of 'full breastfeeding' reported for the NSW CHS 2001, with 'all children' as the denominator (Table 4.6.1). Some of the age milestones cannot be reported against for the 1995 NHS – notably breastfeeding practices at four months.

However, breastfeeding practices at three months were reported hence these data are compared to the 2001 NSW CHS (Table 4.8).

Table 4.8 is a summary of the findings of the two surveys compared for the NSW interim indicators. Where possible the data are reported for the NSW sub-sample of the 1995 NHS, otherwise the data are for Australia (in brackets).

**Table 4.8 Breastfeeding indicators from the NSW Child Health Survey, 2001, compared to the National Health Survey, 1995**

Indicator	NSW Child Health Survey 2001	NHS 1995 NSW (Australia in brackets)
<b>1. Percent children ever breastfed</b>	90.2 (86.5) <sup>1</sup>	78.4 <sup>2</sup>
<b>2. Percent children breastfed to at least</b>		
3 months	61.1	60.0
4 months	54.2	–
6 months	42.5	44.2
12 months	18.1	(21.2)
<b>5A. Percent children who were fully breastfed to at least</b>		
3 months	48.4	56.6
4 months	24.6	–
6 months	4.6	17.2
<b>3. Percent regularly given solid food</b>		
before 4 months	12.6	–
before 6 months	69.8	(61.5) <sup>3</sup>
<b>4. Percent regularly given breastmilk substitutes</b>		
before 4 months	46.5	–
before 6 months	59.6	(56.9)

Sources: New South Wales Child Health Survey 2001 (HOIST), Centre for Epidemiology and Research, NSW Department of Health, and Donath & Amir (2000, 2002)

<sup>1</sup> number in bracket is percentage of infants breastfed at hospital discharge (95% CI: 84.0-89.1).

<sup>2</sup> at hospital discharge.

<sup>3</sup> Donath & Amir (2002) reported percentage of infants receiving solid foods by 26 weeks (six months) varied significantly with age of child at time of interview – ranged from 60.8% to 79.5%.

Key points:

- A comparison of breastfeeding rates at hospital discharge indicate an increase in the rate in NSW between 1995 and 2001 from 78.4% to 86.5%. This indicator was compared instead of breastfeeding initiation rates because the publications from the 1995 NHS (Donath and Amir 1995, 2002) only report breastfeeding on discharge from hospital. The 2001 NSW CHS collected data on both rates of 'ever breastfed' and rates on discharge from hospital.
- Percentages of infants that were breastfed (any) to at least three months, six months and at least 12 months were similar between surveys.
- Population rates of full breastfeeding were similar at three months between surveys.
- Rates of full breastfeeding at six months were substantially lower in the 2001 NSW CHS (4.6%) than in the 1995 NHS (17.2%). Although these rates are not directly comparable due to differences between surveys, the difference is large enough to indicate a probable decline in rates of full breastfeeding to six months in NSW between 1995 and 2001.
- A larger percentage of infants regularly received solid foods before six months in the NSW CHS 2001 (69.8%) than in the 1995 NHS (Australia). However, the difference is likely to be explained, in part, by the differences in the age of the children sampled at the time of interview in the two surveys; up to two years of age in the NSW CHS and up to four years of age in the national survey. Thus, mothers surveyed in the NHS had to recall their infant feeding behaviour by up to four years compared with a recall of only up to two years in the CHS. Donath & Amir (2002) showed that the proportion of children in the NHS apparently receiving solid foods by six months, increased as the age of the child at the time of the survey decreased. The response of those with younger children is presumably more accurate because of the reduced recall period.
- Similar proportions of infants received breastmilk substitutes regularly before they were six months old in the 1995 NHS (Australia) and the NSW CHS 2001.

## 5.1 Health burden associated with poor breastfeeding practices

Many of the illnesses and diseases that breastfeeding protects against are major health problems in NSW. In this section we provide an introduction to the burden of disease for a number of key conditions associated with not breastfeeding. Lack of definitive quantification of the relative risks precludes the ability to determine exactly what proportions of the following illnesses are attributable to not breastfeeding, breastfeeding for a short duration or not breastfeeding exclusively.

Nevertheless, since breastfeeding rates and duration are well below recommended levels in NSW (see Section 4), any increase in breastfeeding would go some way towards reducing the health burden due to these illnesses.

A more detailed summary of the evidence linking health conditions to poor breastfeeding practices can be found in Appendix B, complete with references.

### 5.1.1 Infants

This section notes the extent of the health burden associated with those conditions for which there is evidence of reduced risk or protective effect from breastfeeding. For infants, the greatest health burden derives from: gastrointestinal illness, otitis media (ear infection), lower respiratory tract infection, eczema and necrotising enterocolitis. Breastfeeding may also be protective against bacteraemia, meningitis, botulism, urinary tract infection and possibly asthma, as well as other chronic conditions including obesity and diabetes.

#### Mortality

The *NSW Chief Health Officer's Report 2000* indicated SIDS to be the single most common cause of death outside the perinatal period, causing about 10% of all deaths in infants less than 12 months in NSW (in 1998). This figure remained relatively stable in 1999 (54 out of 485) and 2000 (45 out of 436). Evidence indicates that breastfeeding may reduce the risk of SIDS by a factor of about two.

#### Morbidity

The major conditions associated with morbidity in infants and children for which breastfeeding is known to be protective are:

- gastroenteritis and diarrhoea
- otitis media (and ear infection generally)
- respiratory infection (including pneumonia, bronchiolitis, bronchitis, respiratory syncytial virus).

All of these conditions are primary causes of hospitalisation in infants less than 12 months and in children aged one to four years in NSW. They are also among the major problems managed by general practitioners. Also of note is the higher prevalence (10 times) of otitis media in Aboriginal children than non-Aboriginal children (Coates et al 2002).

Acute and chronic respiratory disease was the largest cause of burden of disease in children aged 0-14 years in 1996 in Australia, contributing 23.7% to the total burden.

A majority of studies show that there is a protective effect of breastfeeding against asthma and atopy (eg eczema, allergic dermatitis, allergic rhinitis); although two recent studies have provided contrary evidence. In Australia in 1996, asthma was one of the leading causes of the total disease burden in children aged 0 to 14 years, estimated to account for 18.2%. The 2001 NSW CHS indicated that of parents with a child aged 0-12 years, 26.4% reported ever being told by a doctor or at a hospital that their child has asthma. Nearly 16% of children were reported to have current asthma.

There is increasing evidence that not being breastfed is linked to overweight and obesity in children and adults. One study has indicated that the population attributable risk of obesity due to formula feeding is about 15-20% (Dietz 2001). Details of the burden of obesity in children and adults in NSW is included in another report in this series *Report on the weight status of NSW 2003* (NSW Department of Health 2003). This report indicates that obesity accounts for over 4% of the total burden of ill health in NSW. The report highlights the special risks of childhood obesity and the burden of obesity-related conditions later in life.

Breastfeeding also reduces the risk of other chronic conditions including type 1 diabetes, coeliac disease, childhood cancer, high cholesterol, hypertension and cardiovascular disease.

The morbidities associated with chronic disease in later life are difficult to quantify. A majority of the total burden of disease in Australia and NSW is attributable to chronic diseases such as diabetes and cardiovascular disease (Mathers et al 1999).

### 5.1.2 Mothers

#### *Breast and ovarian cancer*

Women who do not breastfeed are more likely to suffer from breast cancer, particularly pre-menopausal breast cancer, and ovarian cancer. They are also more likely to suffer from endometrial cancer but this is not a prevalent cancer, hence is not considered here.

Whilst the evidence for the protective effect of breastfeeding is stronger for pre-menopausal women, the incidence of breast cancer is much higher in post-menopausal women than pre-menopausal women. Thus incidence data for both pre- and post-menopausal women are presented in Table 5.1.2.

**Table 5.1.2 Incidence of breast cancer and ovarian cancer in pre- and post-menopausal women in NSW 2000**

	Breast cancer		Ovarian cancer	
	15-44 years	45+ years	15-44 years	45+ years
All NSW	531	3297	40	334

Source: NSW Inpatients Statistics Collection (HOIST).

The number of deaths due to breast cancer in pre-menopausal women in NSW was 71 and 63 in 1999 and 2000 respectively. This approximates to 27% of all deaths due to cancer and 9% of all deaths in this group of women. Population estimates were used to determine standardised mortality ratios (number of deaths/100,000) and these were calculated to be 5.0 and 4.4 in 1999 and 2000 respectively.

#### *Hip fracture*

Some studies have shown that after weaning their infants, women who breastfeed have a higher bone mineral density than those who do not breastfeed. This effect increases with

each child. Reduction in osteoporosis is related to fewer hip fractures, particularly in older women. In the year 1999-2000, over 5,000 women in NSW suffered hip fractures.

### 5.2 Economic costs of poor breastfeeding practices

In Australia, the total value of breastfeeding to the community makes it one of the most cost-effective primary prevention measures available and well worth the support of the whole community (NHMRC 2001).

Ideally, quantifiable data on the health benefits of breastfeeding would be available which could be translated into economic benefits. However, many of the benefits of breastfeeding are difficult (eg savings to employers and the environment) or impossible (eg the emotional benefits) to quantify. Thus most studies of the economics of breastfeeding have centred on the reduction in health care costs.

Breastfeeding, particularly exclusive breastfeeding for six months and then ongoing breastfeeding to 12 months or more, reduces the incidence, duration and severity of illness in infants. Thus not breastfeeding, and breastfeeding for a limited duration (particularly non-exclusively), is associated with increased rates of hospitalisation, increased duration of infant hospitalisation, increased health service utilisation, increased medication requirements, and increased rates of relapse from illnesses (see Table 5.2).

Most studies that have tried to put a dollar value on health care costs have concentrated on direct health care costs for a limited number of illnesses or diseases related to not breastfeeding, and usually only those costs for the infant period. They exclude numerous other chronic or common illnesses and out-of-hospital health care costs. Only one of the economic studies found took into account the reduction in maternal illness related to breastfeeding (Tolstoplatov et al 1996).

The previous section showed that there is particularly strong evidence of the protective effect of breastfeeding for some illnesses, such as otitis media; these can have ongoing health implications (eg otitis media can lead to long-term language and cognitive impairment). Where poor breastfeeding practices are associated with chronic illnesses, the costs and savings will accrue over many years and sometimes, a lifetime.

**Table 5.2 Costs associated with not breastfeeding and breastfeeding for short duration**

<p><b>Families:</b></p> <ul style="list-style-type: none"> <li>• cost of infant formula and complementary food</li> <li>• equipment, fuel and time for preparation of artificial food</li> <li>• additional contraceptives and menstruation supplies</li> <li>• medical care (fewer trips to the doctor or hospital)</li> <li>• medications and time (including lost work days) caring for a sick child.</li> </ul>
<p><b>Governments and nations:</b></p> <ul style="list-style-type: none"> <li>• health care services (for preventable acute and chronic illnesses)</li> <li>• welfare medicines</li> <li>• ecological damage due to infant formula and complementary food production</li> <li>• purchase and distribution of imported artificial breastmilk substitutes</li> <li>• remedial or special education.</li> </ul>
<p><b>Health care institutions:</b></p> <ul style="list-style-type: none"> <li>• costs for purchase, storage, and preparation of various feeds for babies</li> <li>• staff costs, with rooming in</li> <li>• medicine and staff time for treating sick babies.</li> </ul>
<p><b>Employers:</b></p> <ul style="list-style-type: none"> <li>• higher staff turnover</li> <li>• absenteeism.</li> </ul>
<p>Of course, breastfeeding is not completely cost-free. <b>Costs of breastfeeding include:</b></p> <ul style="list-style-type: none"> <li>• a small amount of extra food for the mother (although some mothers eat no more but instead lose fat gained during pregnancy)</li> <li>• breastfeeding education and support</li> <li>• costs associated with working mothers access to breastfeeding (includes costs of expressing milk and costs to employers for time out to express)</li> <li>• maternity leave.</li> </ul>

*Adapted from information on the websites of the International Baby Food Action Network (IBFAN) and the World Alliance for Breastfeeding Action (WABA)*

### 5.2.1 Australian estimates

A study conducted in the ACT estimated that hospitalisation costs of early weaning in that state are about \$1-2 million per year based on five illnesses alone (gastrointestinal illness, lower respiratory infection, otitis media, eczema and necrotizing enterocolitis (NEC)) (Smith et al 2002).

This type of analysis has not been conducted for NSW. However, assuming that the incidence of illness, associated costs and breastfeeding rates, are similar among the ACT and NSW, then a straight multiplication by the number of zero to four year olds in these two states (22,165 children aged zero to four in ACT in 1996 and 432,457 children aged zero to four in NSW in 1999) indicates major potential health care cost savings in NSW (see box below).

The costs of not breastfeeding or short duration of exclusive breastfeeding in NSW are estimated as \$20-40 million a year for five illnesses alone (gastrointestinal illness, lower respiratory infection, otitis media, eczema and NEC).

These costs are minimum estimates of the actual health care costs of early weaning as they exclude numerous other chronic or common illnesses and out-of-hospital health care costs. They also exclude cost savings from reduced maternal illness or reduced environmental costs.

Drane (1997) estimated that \$11.5 million could be saved each year in Australia if the prevalence of exclusive breastfeeding at three months was increased from 60% to 80%. This assessment was based on costs of hospitalisation for four illnesses only (gastrointestinal illness, NEC, eczema and type 1 diabetes), as well as educational costs associated with neuro-developmental impairment. Not included were: cost savings due to reductions in long term morbidity due to NEC and type 1 diabetes, GP visits for gastrointestinal illness, health service utilisation, social welfare costs due to neuro-developmental impairment, maternal absenteeism, and costs associated with the many other illnesses that breastfeeding prevents or reduces the severity of, eg otitis media.

### 5.2.2 Overseas estimates

A number of overseas studies have singled out certain illnesses and attributed health care costs to poor breastfeeding practices (see Appendix G for details of these studies).

IBFAN (1998) determined that the total cost for hospital treatment of bottle-fed infants during the first four months is 15.4 times the cost of treating breastfed infants.

As indicated in the study reported by Wiemer (2001), the vast savings in terms of health care costs for most of the studies are for only a few illnesses and often do not include the complete range of areas of savings. Consequently they are an underestimate of the total costs attributable to not breastfeeding.

### 5.3 Breastmilk as part of the food supply

Recent research in Australia incorporates breastmilk in national food supply statistics.

*'Quantifying breastmilk as a valuable economic resource in terms of food supply to a nation is one method of demonstrating its importance to responsible policy makers.'* (Smith and Ingham 2001)

Smith and Ingham (1997) determined the net economic value of breastfeeding (after adjustment for increased maternal food consumption) in Australia in 1992 to be a minimum of \$2.2 billion. They considered the capital stock value of Australia's breastmilk production capacity and determined the value of the asset at its biological maximum to be around \$100 billion, in comparison to its current value of around \$37 billion.

Smith and Ingham noted that the exclusion of human milk production and consumption (whilst including the manufacture and sale of artificial formula) in gross domestic product (GDP) measurement by the Australian Bureau of Statistics severely undermines the public credibility of GDP estimates and other economic data. They consider that lactating mothers are producers, as well as consumers, of goods, and indicate the tax anomaly whereby some mothers' milk is effectively 'input taxed' through imposition of GST on lactation aids such as breast pumps. This is in stark contrast to the GST free on-farm milking machinery, or infant food manufacturing equipment. GDP currently also includes expenditures on health which are needed to treat infant illnesses attributable to artificial feeding, and thus overstates the gain in economic welfare from higher spending on breastmilk substitutes and medical services.

Thus present practice currently indicates that increased breastfeeding reduces national food output and GDP (lowers formula and baby food sales and reduces private and public health expenditures). This is in spite of the substantial economic gains from using a virtually cost-free

and environmentally-friendly food resource, and despite the huge economic resources savings from maintaining good health and reducing illness without the need for use of medical services or products.

Oshuag and Botten (1994) had earlier indicated that, if the WHO breastfeeding targets were achieved in Australia, the economic value of breastfeeding would increase by \$3.4 billion per annum, representing 3.1% of the GDP – equivalent to 40% of public expenditure on health.

### 5.4 Environmental costs of not breastfeeding

Radford (1992) considers that 'breastmilk is a natural, renewable resource which is intended to be fed to babies: artificial baby milks are processed, non-renewable substitutes for this resource'.

Breastmilk production does not pollute, is free, is ready to use, does not have to be shipped across the world and does not require the huge amounts of packaging and promotional material required to sell infant formula. Stuart-Macadam and Dettwyler (1995) indicated that 'for every three million babies bottle-fed each year, 450 million metal cans are discarded'.

Some of the environmental costs are as follows (adapted from Radford, 1992):

- Direct waste and pollution:
  - tin cans
  - glossy paper used to promote the products
  - rubber, plastic, rubber and silicon used in bottles and teats
  - sterilising fluids
  - sanitary products – cotton (and associated pesticide use), bleaching, packaging and disposal (most lactating women do not menstruate).
- Related to the dairy industry (most artificial baby milk is heat-treated cows' milk converted into powder):
  - deforestation (cows need pasture)
  - methane from cows
  - eutrophication – algal blooms in rivers and streams from fertiliser use (to grow feed for cows)
  - impact on land use
  - high temperatures and mechanical processes impact upon air quality and energy use.

## 6 Factors associated with breastfeeding practices

An understanding of the determinants of infant feeding behaviour is important for at least two reasons. First, an understanding of why babies are weaned before six months of age enables modification of those contributing factors (where they are modifiable) and evaluation of interventions aimed at these factors. Second, knowledge of the important contributors to poor infant feeding practices allows monitoring of how these contributors are changing over time.

However, designing and testing interventions, and developing sound methods to measure and monitor particular determinants over time are expensive propositions, and thus, require good evidence that these factors are in fact contributors to breastfeeding initiation and/or duration.

Many complex factors influence a woman's infant feeding practices. Although considerable research has been conducted on selected factors, the full range of factors which make a significant impact on and/or predict infant feeding behaviours are not fully identified, nor well understood. The determinants considered are usually limited to the sociodemographic and other common descriptors of subjects participating in studies. Although many factors have been investigated, no two studies investigate the same factors using comparable

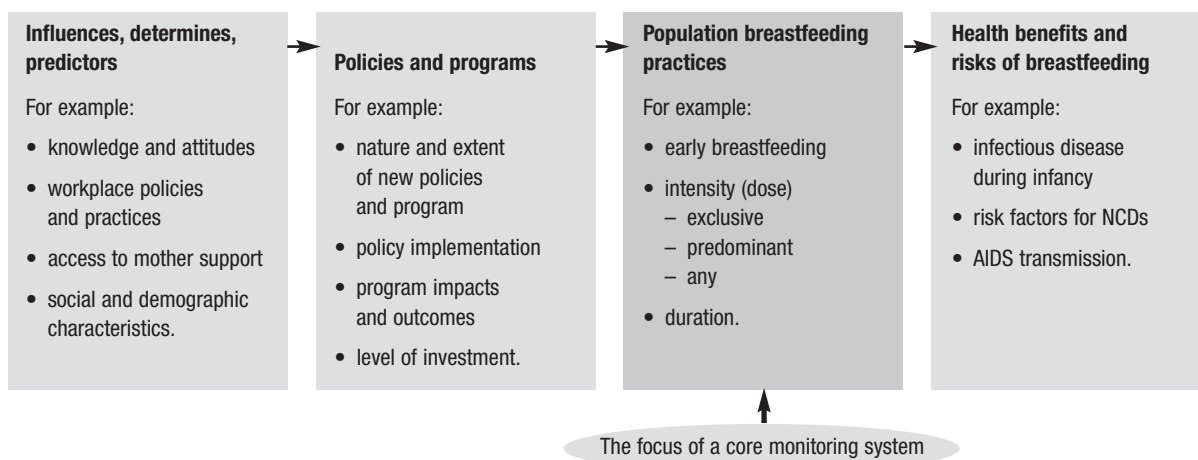
methods, thus making it impossible to identify common factors across studies that may be worthy of more inquiry (Scott and Binns 1998).

There has not been a systematic attempt to develop and test a solid conceptual framework for classifying factors and studying the relationships between these factors and infant feeding practices.

In addition, appropriate research designs are not often used to answer questions about the predictors of breastfeeding or other infant feeding habits in the population at large. Large-scale, random population samples and prospective designs are needed to ensure generalisability of results, and to establish the causal relationship or 'predictive' capacity of various factors on breastfeeding practices.

Hence, whilst factors affecting (influences, determinants and predictors of) breastfeeding are of considerable interest, the uncertainty surrounding the direction and magnitude of the effect of these factors on breastfeeding practices and the incompleteness of the research indicates that the focus of monitoring should not be in these areas. As highlighted by Webb et al (2001), the focus of a core monitoring system should be on population breastfeeding practices (see Figure 6.1).

**Figure 6.1 Conceptual framework of aspects of breastfeeding of potential interest and the focus for a core monitoring system (taken from Webb et al 2001, Figure 1, page 4, reproduced with permission)**



A possible scheme for classifying these factors, with the aim of integrating and understanding the research concerning the complex array of factors affecting mothers' choice to breastfeed, breastfeeding duration and breastfeeding exclusivity, has been developed by the authors; it is adapted from work by Sackett and Haynes (1979) and Haynes et al (1980) and is presented in Table 6.2 of this report.

The headings are not definitive nor is the list exhaustive – the factors listed include those frequently referred to in the literature, as well as some factors often overlooked. The reader is referred to the studies of Scott et al 2001, Higginson 2001, Arora 2000, Fairbank et al 2000, Vogel et al 1999, Scott and Binns 1998, Piper & Parks 1996, and to the current guidelines for infant feeding (NHMRC 2003, pages 7-11), for further reading in this area.

**Table 6.2 Schema of factors associated with suboptimal breastfeeding practices**

<p><b>Sociodemographic characteristics of the mother and family:</b></p> <ul style="list-style-type: none"> <li>• younger age of mother</li> <li>• mother not married</li> <li>• lower level of maternal education</li> <li>• early return to employment</li> <li>• more socioeconomically disadvantaged</li> <li>• country of birth/background (varies)</li> <li>• indigenous status</li> <li>• rural residence</li> <li>• greater parity (number of children born to a mother)</li> <li>• male infant.</li> </ul>	<p><b>Aspects of the feeding regime/practices:</b></p> <ul style="list-style-type: none"> <li>• incorrect positioning and attachment technique</li> <li>• daily dummy use</li> <li>• use of formula in the first month</li> <li>• use of a bottle</li> <li>• uncertainty regarding the quantity of breastmilk, and demand feeding</li> <li>• not sharing the mother's bedroom.</li> </ul>
<p><b>Structural and social support:</b></p> <ul style="list-style-type: none"> <li>• negative attitude and poor support by father</li> <li>• lack of family and community support</li> <li>• lack of maternity leave</li> <li>• lack of peer support</li> <li>• lack of time</li> <li>• lack of workplace policies and facilities.</li> </ul>	<p><b>Health services' organisation policies (including hospital and health facilities):</b></p> <ul style="list-style-type: none"> <li>• not rooming-in</li> <li>• supplementary and complementary feeds in the maternity ward</li> <li>• use of pacifiers in the neonatal period</li> <li>• short length of stay in hospital post-partum</li> <li>• infant not put to breast within one hour of birth</li> <li>• commercial discharge packs provided by hospitals</li> <li>• lack of positive staff practices and breastfeeding guidance.</li> </ul>
<p><b>Health status of mothers and infants:</b></p> <ul style="list-style-type: none"> <li>• maternal obesity</li> <li>• postnatal depression</li> <li>• experiencing mastitis</li> <li>• sore nipples.</li> </ul>	<p><b>Socio-cultural, economic and environmental factors:</b></p> <ul style="list-style-type: none"> <li>• cultural norm to not breastfeed</li> <li>• changing role of women in society</li> <li>• desire to re-establish identity as separate individual and as non-mother</li> <li>• portrayal of women's breasts as symbols of sexuality</li> <li>• men's attitudes towards breasts</li> <li>• embarrassment relating to breastfeeding in public</li> <li>• lack of public facilities for breastfeeding</li> <li>• loss of knowledge and experience of breastfeeding in the community</li> <li>• lack of intention to breastfeed at all</li> <li>• lack of intention to breastfeed for the recommended period</li> <li>• inaccurate information from the mass media</li> <li>• marketing of breastmilk substitutes</li> <li>• lack of maternity leave.</li> </ul>
<p><b>Birth and neonatal experiences of mothers and babies:</b></p> <ul style="list-style-type: none"> <li>• obstetric experience eg caesarian delivery</li> <li>• complications of delivery and perinatal period eg admission of baby to ICU or special care nursery.</li> </ul>	
<p><b>Health behaviours of mothers:</b></p> <ul style="list-style-type: none"> <li>• maternal smoking</li> <li>• alcohol use/abuse.</li> </ul>	
<p><b>Mothers' knowledge, attitudes, skills</b></p>	

Source: Adapted from Sackett and Haynes (1979) and Haynes et al (1980).

# 7 Conclusions and recommendations

## 7.1 Monitoring breastfeeding practices

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### **Recommendation 1**

#### ***Use of nationally consistent indicators for monitoring breastfeeding***

In order to enhance comparability of results across programs and populations, it is recommended that the survey questions indicated in Appendix E are included in future NSW Health surveys as these meet the data requirements to report on all of the national breastfeeding indicators as recommended in the report of the Australian Food and Nutrition Monitoring Unit (Webb et al 2001). Consideration needs to be given to optimal sample size (depending on resources) as several of the recommended indicators rely on 24-hour recall of breastfeeding practices in children less than six months old.

### **Recommendation 2**

#### ***Monitor trends in breastfeeding practices in NSW***

It would be desirable to retain the questions used in the 2001 survey in future surveys of breastfeeding (as part of the NSW Health Survey program) in addition to the national indicators, at least for the next few years, to enable monitoring of trends in breastfeeding practices from 2001.

Also, some of the sample size limitations would be overcome by combining data from rolling surveys. A larger, combined data set will provide more power to determine differences in breastfeeding practices among health areas of residence and among population subgroups. Inclusion of previous and nationally recommended questions in the survey may also provide the opportunity to examine if these recommended questions and indicators are indeed optimal.

### **Recommendation 3**

#### ***Extend methods of analysis***

Future analyses should further explore the estimation of confidence intervals for survival analysis when using survey data. Currently the only statistical software that does survival analysis, whilst weighting the survey data appropriately to calculate confidence intervals, is Sudaan.

However, this software only does cox regression whilst most of the indicators in this report are based on the Kaplan-Meier method. Alternatives to address this are to determine the mathematical links between cox regression and the Kaplan-Meier method in estimation of standard errors and to use Sudaan for estimation, or to write programs in SAS that do Kaplan-Meier survival analysis whilst using the weights appropriately to calculate standard errors. In addition, there should be investigation of the application of the new analytical methods based on Empirical Bayes techniques to this type of data. These methods have been used to overcome estimate instability and lack of precision due to large sampling errors in population subgroups with small sample sizes.

### **Recommendation 4**

#### ***NSW Health professionals adopt WHO standardised breastfeeding terms and definitions***

The NSW Department of Health and Area Health Services should adopt the WHO standardised breastfeeding terms and definitions. It should be noted, however, that these are for use by health professionals who report and/or use information about breastfeeding rates in the population; the terms are not necessarily for use in promoting breastfeeding, or in communicating about breastfeeding to the public.

## 7.2 Promoting breastfeeding

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### **Recommendation 5**

#### ***Promotional efforts address the decline in breastfeeding that occurs in the early months (zero to three)***

While breastfeeding initiation rates are relatively high (about 90% of infants received some breastmilk), only about 78% of all infants are receiving any breastmilk by the end of the first month postpartum and 54.2% by four months.

It is recommended that additional initiatives in breastfeeding promotion be aimed at reducing the decline in rates in the first months postpartum, while (at least) maintaining current initiation levels.

**Recommendation 6*****Promotion of continued breastfeeding for at least 12 months***

The Australian recommendation is that children be breastfed to at least 12 months and thereafter as long as is mutually desired. In the 2001 survey, only 18% of infants were breastfed until 12 months.

Breastfeeding promotion should encourage continued breastfeeding to at least 12 months.

**Recommendation 7*****Promote exclusive breastfeeding to six months***

Current policy recommendations highlight that infants be exclusively breastfed for the first six months. In NSW, although 50% of infants ever breastfed continued to be breastfed (any) for at least six months, only a very small proportion of these infants (4.9%) were fully breastfed (the closest approximation to exclusively breastfed from the NSW CHS 2001) to six months. This figure equates to 4.6% when expressed as a population rate of infants fully breastfed and compares unfavourably with the NSW population rate derived from the 1995 National Health Survey (17.2%). Although these rates are not directly comparable due to differences between surveys, the difference is large enough to indicate a probable decline in rates of full breastfeeding to six months in NSW between 1995 and 2001.

The health benefits to infants and mothers of exclusive breastfeeding to six months are now established, hence the extremely low rate of full breastfeeding to this age in NSW is cause for concern and should be targeted in breastfeeding promotion.

Breastfeeding promotion should communicate the advantages of exclusive breastfeeding to six months.

**Recommendation 8*****Promotional efforts should target high-risk groups and address short duration and low intensity of breastfeeding***

The statistical methods used to report on the indicators did not permit statistically significant differences in breastfeeding practices to be identified between Area Health Services and between population subgroups, except for rates of breastfeeding initiation (see Recommendation 3 above). Nevertheless, some apparent differences in breastfeeding practices were identified and these should be borne in mind when targeting breastfeeding promotion in the NSW population.

Approaches that target high-risk groups in the population should be used to address short duration and low intensity of breastfeeding. These groups are very young mothers (particularly less than 25 years), and mothers that are not tertiary educated. Also, there was some indication that Aboriginal and Torres Strait Islander mothers should be targeted, for breastfeeding initiation and intensity.

**Recommendation 9*****Investigate determinants of breastfeeding, and report on current evidence on the effectiveness of a range of interventions to promote breastfeeding, in order to support evidence-based practice in NSW***

While the full range of factors that make a significant impact on and/or predict infant feeding behaviours have not been fully identified, the importance of linking breastfeeding interventions to the influences (determinants) on breastfeeding is often highlighted in the literature (eg Higginson 2001).

Further research into the factors associated with breastfeeding practices and a hierarchy of significance is a priority.

It is also recommended that a systematic review of interventions to promote breastfeeding be conducted with the aim of identifying the most effective interventions and thus recommendations for breastfeeding promotion in NSW. This review should highlight current interventions in NSW and include further consideration of the factors affecting breastfeeding practices.

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## Differences between human milk and formula

### ***Immunoglobulins***

All types of immunoglobulins are found in human milk. The highest concentration is found in colostrum, the pre-milk that is only available from the breast during the first three to five days of the baby's life. Secretory IGA, a type of immunoglobulin that protects the ears, nose, throat, and the GI tract, is found in high amounts in breastmilk throughout the first year. Secretory IGA does its work before it is digested in the stomach. Secretory IGA attaches to the lining of the nose, mouth, and throat and fights the attachment of specific infecting agents. Breastmilk levels of IGA protect against specific viruses and bacteria increase in response to a maternal exposure to these organisms. Human milk has been called environmentally specific milk — the mother provides it for her infant to protect specifically against the organisms that her infant is most likely to be exposed to.

### ***Lactoferrin***

Lactoferrin is an iron-binding protein that is found in human milk, but is not available in formulas. It limits the availability of iron to bacteria in the intestines, and alters which healthy bacteria will thrive in the gut. Again, it is found in the highest concentrations in colostrum, but persists throughout the entire first year. It has a direct antibiotic effect on bacteria such as staphylococci and E. coli.

### ***Lysozyme***

Human breastmilk contains lysozyme (a potent digestive ingredient) at a level 30 times higher than in any formula. Interestingly, while other contents of breastmilk vary widely between well nourished and poorly-nourished mothers, the amount of lysozyme is conserved, suggesting that it is very important. It has a strong influence on the type of bacteria that inhabit the intestinal tract.

### ***Growth factors***

Human breastmilk specifically encourages the growth of lactobacillaceae, which are helpful bacteria that can inhibit many of the disease-causing gram-negative bacteria and parasites. In fact, there is a striking difference between the bacteria found in the guts of breast- and formula-fed infants. Breast-fed infants have a level of lactobacillus that is typically 10 times greater than that of formula-fed infants. Both the presence of the lactobacilli and the action of the lactoferrins and lysosomes help protect the infant.

### ***Allergic factors***

The cow's milk protein used in most formulas is a foreign protein. When babies are exposed to non-human milk, they actually develop antibodies to the foreign protein. Research has shown that without exception the important food allergens found in milk and soybean formulas are stable to digestion in the stomach for as long as 60 minutes (as compared to human milk protein which is digested in the stomach within 15 minutes). The foreign proteins pass through the stomach and reach the intestines intact, where they gain access and can produce sensitisation. While research in this area is still relatively new, this early exposure to foreign proteins may be the predisposing factor in such illnesses as eczema and asthma.

### ***Carnitine***

While carnitine is present in both breastmilk and formula, the carnitine in breastmilk has higher bioavailability. Breast-fed babies have significantly higher carnitine levels than their counterparts. Carnitine is necessary to make use of fatty acids as an energy source. Other functions of carnitine have been hypothesized, but have not yet been proven.

### ***DHA & ARA***

The main long-chain fatty acids found in human milk are still not present in many formulas in the United States. These lipids are important structural components, particularly in the substance of the brain and the retina. Significantly different amounts of these ingredients have been found in the brains and retinas of breast-fed versus formula-fed infants. This difference may have other subtle effects on the cell membrane integrity in other parts of the body as well.

Apart from the specific properties that have been mentioned, it is important to emphasise that breastmilk is a dynamic fluid that changes in composition throughout the day and throughout the course of lactation. It provides for the baby the specific nutrients that are needed at each age and in each situation.

*Source: Khanh-Van Le-Buklin, April 2001  
[www.drgreene.com/21\\_552.html](http://www.drgreene.com/21_552.html)*

## Summary of major health conditions associated with poor breastfeeding practices

### Infants

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#### **Gastroenteritis and diarrhoea**

Gastroenteritis refers to vomiting or diarrhoea as a discrete illness for a 24-hour period. It predisposes the infant to dehydration and malnutrition, resulting in a weakened immune system and susceptibility to further infection. Under adverse conditions (primarily in developing countries but also likely under low socioeconomic conditions and in Aboriginal and Torres Strait Islander' communities) where gastrointestinal illness is recurrent and frequent, the infants grow poorly, develop slowly, and may die.

- The evidence that breastfeeding is protective against infectious disease is greatest for diarrhoeal illnesses (Heinig & Dewey 1996). The reduction in risk of diarrhoeal illness is undisputed for less-developed countries. Further, most methodologically-sound studies conducted in industrialised countries have shown a protective effect of breastfeeding on diarrhoeal disease, even where exposure to pathogens is low (Heinig 2001).
- Also notable was the fact that the protective effect extended beyond the period of breastfeeding, at least until 12 months.
- Dewey et al (1995) found the incidence of diarrhoeal illness among formula fed infants was almost twice that of breastfed infants during the first year of life.
- A longitudinal study by Scariati et al (1997) in the USA showed that a dose-response association was found between breastfeeding and the development of diarrhoea and ear infections. As the amount of breastmilk an infant received decreased, the risks for infection increased. When compared with exclusively breastfed infants, those fed only formula showed an 80% increase in the risk of developing diarrhoea and a 70% increased risk of developing an ear infection.

#### **Necrotising enterocolitis (NEC)**

Necrotising enterocolitis is a gastrointestinal tract disease and the leading cause of emergency surgical treatment in newborns. It is an important cause of neonatal death, particularly among premature infants. Even when infants survive NEC, the disease can lead to life-long problems – short-gut syndrome and chronic malabsorption syndromes. No single causative agent has been identified and little is known about the aetiology of the disease.

- A methodologically-sound (as determined by Bick 1999) multi-centre study in British neonatal units showed breastfeeding to be the single most effective method of preventing NEC in preterm infants (Lucas & Cole 1990). Infants born at more than 30 weeks duration whose diet contained any breastmilk rarely experienced NEC. Amongst babies fed only formula, NEC was 20 times more common than amongst infants receiving any breastmilk. The results thus suggest that there are considerable protective benefits from breastmilk for pre-term neonates.

#### **Otitis media (OM) – ‘ear infection’**

Otitis media covers a range of conditions – acute otitis media, otitis media with effusion, and chronic otitis media with effusion – relating to inflammation of the ear. OM is a common childhood infection that affects the middle ear. Because of the infection, the eustachian tube gets blocked and stops the airflow that keeps the middle ear healthy. If infection persists, fluid builds up in the middle ear and can become thick like glue. If not treated it may lead to hearing loss, tinnitus, and brain abscess.

- Heinig (2001) indicates seven prospective studies that have shown a significant protective effect of breastfeeding against otitis media and three studies that have not.
- Both Duncan et al (1993) and Duffy et al (1997) reported a two-fold increase in the incidence of OM in formula-fed children compared to exclusively breastfed (for four and six months respectively) children. Dewey et al (1995) found a lower incidence of OM in the infants first year and a shorter duration of OM among breastfed infants during the first two years of life. Scariati et al (1997) reported that breastfeeding was protective against OM in a dose-response manner.

### **Respiratory illness**

Most studies examining the effect of breastfeeding on respiratory disease or illness have examined one or more of the following diseases: pneumonia (*Streptococcus pneumoniae*), bronchitis, bronchiolitis, *Haemophilus influenzae* (meningitis). Others have included a greater range, for example the Canadian study by Beaudry et al (1995) included OM, cold, influenza, pneumonia, bronchopneumonia, chest cold, bronchitis, throat infection, pharyngitis, tonsillitis, whooping cough, or any illness accompanied by wheezing. Some specify upper respiratory tract infections, whilst others include lower respiratory tract infections. Wheezing is included here and also in studies specific to asthma in the following sub-section. Respiratory syncytial virus (RSV) is the most important cause of lower respiratory tract disease in infants and children throughout the world. It is estimated to cause up to 80% of hospital admissions for bronchiolitis in infants under one year of age. It is also associated with pneumonia, croup, bronchitis, otitis media and upper respiratory tract infections.

- Studies have assessed breastfeeding protection against a range of respiratory symptoms (Bick 1999). Results are mixed, not surprisingly as studies of respiratory illness are complicated by many factors, including subjectivity of parental report, variety of pathogens and atopic conditions that may result in respiratory symptoms, and the number of known risk factors unrelated to feeding.
- In eight studies reviewed by Heinig (2001) that met their selection criteria, four showed a significant protective effect. Several of the studies showing no protective effect had definitions of breastfeeding that were particularly poor – especially the inclusion of mixed feeding groups in analyses – limiting the ability of the researchers to draw definite conclusions (Heinig 2001).
- More recently Chantry et al (2002) showed that infants fully breastfed for six months had a significantly lower risk for respiratory infections in the first two years, when compared with babies who were fully breastfed for four months.

### **Asthma and allergy (atopy)**

The link between breastfeeding and asthma and atopic illness (eg eczema, allergic dermatitis, allergic rhinitis) has been explored in a number of studies and at least one systematic review. Most of the early evidence suggested that breastfeeding has a protective effect against the development of asthma and other allergic disorders (Lucas et al 1990, Saarinen & Kajosaari 1995, Marini et al 1996, Chandra 1997, Oddy et al 1999). A number of recent meta-analyses (Gdalevich et al 2001a,b, Mimouni et al 2002) have indicated that incidence of bronchial asthma, atopic dermatitis and allergic rhinitis is much reduced during childhood in children with a family history of atopy that have been exclusively breastfed for the first months of life. Peat et al (submitted) state that '*until recently, the role of breastfeeding in preventing asthma and allergy was undisputed with consistent evidence from many cross-sectional and cohort studies*'.

Some studies have failed to show a relationship between breastfeeding and the development of asthma or allergy. Indeed, two of these studies indicated that *breastfeeding might be a risk factor* for asthma and allergy (Wright et al 1999, 2001, Sears et al 2002). The study by Sears et al provided evidence that children who were breastfed for more than four weeks were more likely to have asthma as young adults.

Peat et al (submitted) advise caution when interpreting these and other studies. They concluded that each of the two studies was flawed in a number of ways. Their summary was that '*until some of the methodological issues inherent in the... studies are resolved and the results corroborated, mothers should be encouraged to breastfeed because of the multiple health benefits conferred*'. Similarly, Unilever Australasia (2003) highlighted the controversy in this area and concluded that the issue may remain uncertain for some time to come.

In summary, whilst two recent studies have provided contrary evidence, the majority of studies still show a protective effect of breastfeeding against asthma and atopy.

### ***Sudden infant death syndrome***

Sudden infant death syndrome (SIDS), first formally defined in 1969, is the sudden and unexpected death of an apparently healthy infant whose death remains unexplained after autopsy, examination of the death scene, and review of the case history (Valdes-Dapena 1991, in Heinig & Dewey 1996).

- Most of the larger and better studies in the literature (eg Ford et al 1993, Alm et al 2002) indicate that formula feeding is a risk factor for SIDS, possibly increasing the risk by as much as a factor of three. A meta-analysis of the literature regarding the protection against SIDS offered by breastfeeding was conducted by McVea et al 2000. Crude odds ratios (significant) from 19 out of 24 studies favoured breastfeeding as protective against SIDS. The combined analysis indicated that bottle-fed infants were twice as likely to die from SIDS (pooled OR = 2.11, 95% CI 1.66-2.68). However, they did state that there may be confounding variables not accounted for in some of these studies.

### ***Chronic disease in childhood and adolescence and later in life***

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#### ***Type 1 Diabetes***

Insulin-dependent diabetes mellitus (IDDM) is an autoimmune disease determined by a combination of genetic and environmental factors (Davis 2001). The current etiologic model suggests that environmental factors are triggers for onset of IDDM in genetically susceptible children. Providing early exposure to foreign proteins (non-breastmilk) or other offensive agents or depriving children of adequate exposure to the complex immune activity of human milk may protect them from the exposure and processes that result in chronic disease. The credibility of the infant feeding hypothesis has been enhanced by a plausible theory that early exposure to cow's milk produces autoimmunity (Davis 2001). Although, Labbock (1999) considered that there was a 'lack of support' of the cow's milk protein theory leading some to reject the association between infant feeding and IDDM.

- As much is known about IDDM in childhood and it is relatively common, there is more literature for this chronic disease than any of the others indicated, with respect to breastfeeding benefits.
- Davis (2001) reports on two major meta-analyses (Gerstein 1994, Norris & Scott 1996) of case-control studies examining the association between infant feeding and IDDM. Gerstein's meta-analysis included the four most rigorously conducted studies that looked at children with a history of exposure to cow's milk in the first three months compared to those not exposed and determined an odds ratio of 1.63 (95% CI = 1.22-1.77). In those children breastfed less than three months, the odds ratio was 1.43 (95% CI = 1.15-1.77). However, Norris & Scott (1996) indicated that most of the positive findings were attributable to methodological flaws – although Davis (2001) refutes this conclusion.
- The mechanisms of the effects of infant feeding on development of IDDM need to be elucidated before firm claims can be made of a protective effect of breastfeeding and/or increased risk from early introduction of cow's milk.

- The American Academy of Pediatrics strongly endorses breastfeeding for infants and non-introduction of cow's milk protein in infants in families with a strong history of IDDM.

### **Coeliac disease**

Coeliac disease is a digestive disease that damages the small intestine and interferes with absorption of nutrients from food. People who have coeliac disease cannot tolerate a protein called gluten, which is found in wheat, rye, barley, and possibly oats, and consumption of these over a period of time can lead to malnutrition. It is an autoimmune disorder resulting from two necessary but apparently insufficient conditions: (1) genetic susceptibility, and (2) dietary exposure to gluten.

- The few controlled studies finding an association between infant feeding and coeliac disease show an approximate four-fold increase in risk, and an earlier onset among artificially fed children (Davis 2001). The most recent view indicates that children should be breastfed while, and for a few months after, gluten is introduced. However, the overall conclusion was that the duration of breastfeeding, and the types, quantities, and timing of the introduction of supplementary and weaning foods appear to influence risk, but the accumulated evidence is inconclusive (Davis 2001).

### **Childhood cancer**

Childhood cancer is made up of many different diseases (eg leukaemia, lymphomas, Hodgkin's disease), of which the causes are poorly understood.

- At least six studies have shown a protective effect of breastfeeding against different cancers (Davis 1998). Significant results range from odds ratios of 1.75 (1.08-2.83) to 7.0 (3.6-13.5). Duration of breastfeeding was an important determinant in these studies. Some studies examine cancers in aggregate, and this may obscure significant associations of infant feeding and single cancers.
- The link between breastfeeding and reduction in risk of some cancers, particularly Hodgkin's disease and leukaemia, has some biological plausibility. Both cancers are thought to be associated with infection. Infant immune systems that experience infection without immunomodulatory protection

(from anti-microbial and anti-inflammatory activity present in human milk) may be less able to handle carcinogenic insults after infancy.

### **Obesity**

Obesity is a condition of excessive fat stores but it is difficult to measure body fat directly hence surrogate measures such as the body mass index (BMI) are used. A person over 18 years is classified as 'obese' if their BMI is greater than or equal to 30kg/m<sup>2</sup>. Booth et al (2001) recommend using BMI percentile charts produced in the US by the CDC for clinical assessments and the international BMI age cut-points proposed by Cole et al for use in population and clinical research (cf. *Report on Healthy Weight in NSW 2003*, NSW Department of Health).

There has been increasing interest in the possible protective effect of breastfeeding against obesity, probably due to the condition reaching pandemic proportions. Childhood obesity is of particular concern (NSW Department of Health 2002, Childhood Obesity Summit), partly because of the follow-on link to obesity (and related illness) in later life.

- Several very recent studies have shown a protective effect of breastfeeding. Due to its contemporary nature, there have been no reviews of the literature relating breastfeeding to reduced incidence of overweight and obesity.
- Bergmann et al (2003) found that bottle-feeding was a risk factor for overweight and adiposity at six years of age. Early bottle-feeding brings forward the 'adiposity rebound', predictive of obesity in later life.
- Another recent study (Armstrong & Reilly 2002) showed that prevalence of obesity in children aged 39-42 months was lower in children that had been breastfed. The odds ratio was 0.70 (95% CI 0.61-0.80).
- Gillman et al (2001) used a large sample size of children aged 9-14 years, and reported a dose-dependent effect – those children that had been breastfed for at least seven months had a lower risk of becoming overweight or obese than those who reported breastfeeding for three months or less. The timing of introduction of solids was not found to be related to becoming overweight.

- Another study (Hediger et al 2001), using a much smaller sample size, examined the effect of breastfeeding on childhood obesity in children aged three to five years and found no significant reduction in risk. However, it has been suggested that the association may remain latent in early childhood, and only appear at a later point in development. This view is supported by a study in New Zealand (Poulton & Williams 2001) which produced results indicating that the preventive influence of breastfeeding on the development of overweight was largely confined to late childhood and adolescence.
- Von Kries et al (1999) indicated a dose-response relationship in their study of obesity of school children (aged five to six years) in Bavaria. Prevalence of obesity was 4.5% in those never breastfed compared to 2.8% for those exclusively breastfed. Also, prevalence was 3.8% for those breastfed for two months, 2.3% for three to five months, 1.7% 6-12 months, and 0.8% for those breastfed longer than 12 months. Similarly a dose-response relationship was observed for the prevalence of being overweight.
- The Dundee Infant Feeding Study (Wilson et al 1998) had earlier found that children who had been given solids before the age of 15 weeks were considerably heavier.

Bergmann et al (2003) discuss the possible theories for how breastfeeding reduces obesity. (Also see the Australian Breastfeeding Association, [www.breastfeeding.asn.au/advocacy/obesity.html](http://www.breastfeeding.asn.au/advocacy/obesity.html))

### ***IQ / intelligence / cognitive ability***

Bick (1999) identified several studies that have found evidence to suggest that breastfed infants have an intellectual advantage over their bottle-fed contemporaries. Some studies have only included pre-term infants (eg Lucas et al 1992) who may well gain a greater health and developmental advantage from receiving breastmilk.

Since the review by Bick (1999), more studies have been published showing an intellectual advantage in children conferred by breastfeeding, particularly exclusive breastfeeding. The most recent study (*Journal of American Medical Association* 2002) found a significant positive relationship between the duration of breastfeeding and intelligence, with a dose-response effect.

A significant dose-response effect was also identified in a recent study by Quinn (2001). After adjusting for confounders, the adjusted mean Peabody Picture Vocabulary Test Revised was 8.2 points higher for females and 5.8 points for males who were breastfed when compared with those never breastfed. Scores increased with increased duration of breastfeeding.

In a New Zealand longitudinal study (Horwood & Fergusson 1998), the beneficial effects of breastfeeding were shown to be long-lived, extending throughout childhood into young adulthood.

### ***Cholesterol, hypertension and cardiovascular disease in later life***

In adults, cholesterol levels appear to be lower in those who had been breast-fed compared to those who were formula fed (Owen et al 2002). Increasing evidence has suggested that nutritional programming (nutrition during the neonatal period) may influence the development of cardiovascular risk in humans (Owen et al 2002).

Ravelli et al (2000) showed that exclusive breastfeeding protects against some risk factors for cardiovascular disease in later life including lipoprotein and glucose levels.

Singhal et al (2001) indicated that breastmilk consumption in children born prematurely was associated with lower blood pressure in later life. These authors also concluded that the data were applicable to populations born to term. Roberts (2001) discusses the important implications of this research finding – that it adds to the body of evidence ‘reporting the widespread effects of early diet on later body composition, physiology and cognition’ – and blood pressure is one of the risk factors for heart disease and premature mortality.

## Mothers

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### **Breast cancer**

Sakai (2001) reviewed the literature and indicated that studies consistently demonstrate a mild to moderate protective effect from breast cancer, particularly pre-menopausal breast cancer. The first cohort study to show a significant negative association between breastfeeding and breast cancer was Tryggvadottir et al (2001).

Labbok (2001) indicated that 11 of 20 studies reviewed showed a significant effect of breastfeeding against pre-menopausal breast cancer. The level of relative risk reported varied from approximately 0.54 to 0.85 for the first three to six months of breastfeeding, from 0.39 to 0.71 at 12 months of breastfeeding, 0.4 to 0.72 for more than two years, and 0.35 for more than six years. Most of those studies that did not show a statistically significant effect produced findings in the direction of protectiveness. Indeed, Labbok (2001) concludes that:

*'The issue of breastfeeding as a variable associated with decreased prevalence of pre-menopausal breast cancer no longer is controversial; rather a clear and consistent protective effect is reflected in nearly all of the analyses of extant data sets.'*

A dose-response effect has been shown in several studies, with significant reductions in pre-menopausal breast cancer associated with increasing duration of lifetime breastfeeding (Keun-Young et al 1992, Romieu et al 1996, Zhen 2000). A recent study (Zheng et al 2000) showed that women who breastfed their infants for two years or longer reduced their risk of breast cancer by 50% compared to those who breastfed for only one to six months. This held true for both pre-menopausal and post-menopausal cancers. A reduced, but significant effect, was shown for shorter durations of breastfeeding.

These studies, and many others, were most recently reviewed in a collaborative reanalysis of individual data for 47 epidemiological studies in 30 countries, including 50,302 women with breast cancer and 96,973 women without the disease (Beral 2002). The relative risk of breast cancer decreased by 4.3% (95% CI 2.9-5.8;  $p < 0.0001$ ) for every 12 months of breastfeeding in addition to a decrease of 7.0% (5.0-9.0;  $p < 0.0001$ ) for each birth. Their conclusion was that:

*'The longer women breastfeed the more they are protected against breast cancer. The lack of or short lifetime duration of breastfeeding typical of women in developed countries makes a major contribution to the high incidence of breast cancer in these countries.'*

### **Ovarian cancer**

There have been fewer studies on the association between breastfeeding and ovarian cancer, possibly because it affects fewer women. Labbok (2001) concludes, from her review of the literature, that the findings clearly support the protective effect of breastfeeding against the occurrence of ovarian cancer (eg Rosenblatt & Thomas 1993 found a 20% to 25% decrease in risk among women who breastfed for at least two months). However, there is no consistent evidence of a dose-response relationship.

### **Endometrial cancer**

A WHO collaborative study (Rosenblatt 1995) found the relative risk of endometrial cancer decreased significantly with increased duration of breastfeeding, if lifetime lactation is greater than 12 months.

### ***Osteoporosis and hip fracture***

There are difficulties involved in studies on the relationship between breastfeeding and osteoporosis, especially the problem of studying a group of women over a long period of time in prospective studies.

Nevertheless, some studies have shown that, although bone mineral density decreases during lactation; after weaning, women who breastfeed have a higher bone mineral density than those who do not breastfeed. This effect increases with each child. The end result is a decrease in risk of fracture of the hip, vertebrae, and humerus (Kalwart and Specker 1995, Cumming & Klineberg 1993). The biological plausibility explained by Davis (2001) in her review, lends weight to the likelihood of a positive effect of breastfeeding in reduction in incidence of osteoporosis.

### ***Rheumatoid arthritis***

A recent study of 80,000 women followed for 25 years, indicated that those women who spent a cumulative two or more years breastfeeding were 50% less likely to develop rheumatoid arthritis than those who breastfed for three months or less (Karson et al 2002). The risk was lowest for women who breastfed for at least 24 months.

The only other major study in the literature on the association between breastfeeding and rheumatoid arthritis also indicated a positive, dose-response effect of breastfeeding (Brun 1995).

### ***Mental health and bonding***

Oxytocin, a hormone released every time a mother breastfeeds, decreases blood pressure, stress hormone levels and calms the mother; thus there is some biological plausibility to the mental health benefits of breastfeeding (Uvnas-Moberg 1996).

However, Davis' (2001) review of this topic found the literature on mental health and mother-infant bonding 'sparse and unconvincing'. She does acknowledge one study that highlighted the sense of empowerment associated with successful breastfeeding.

### ***Weight loss***

One study (Dewey et al 1993) has indicated that lactating women lose an average of 2kg more than not breastfeeding women during the first year postpartum and that there is no return of weight after weaning. This has possible implications concerning obesity and thus obesity-related disease.



## Questions on breastfeeding used in the NSW Child Health Survey 2001

*Respondent is mother or father*

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Questions were asked if the child was 0-23 months.

The questions used in the survey did not allow measurement of exclusive breastfeeding as defined by the World Health Organisation since they did not determine the babies consuming only breastmilk without water.

- Q36 Has [child] ever been breastfed?
- Yes
  - No (*go to Q41*)
  - Don't know (*go to Q41*)
  - Refused (*go to Q41*)
- Q37 Is [child] currently being breastfed?
- Yes
  - No
  - Don't know
  - Refused
- Q38 Was [child] breastfed when [he/she] first came home from hospital?
- Yes
  - No
  - Not born in hospital
  - Don't know
  - Refused
- Q39 Including times of weaning, what is the total time [child] was breastfed?
- \_\_\_ weeks (1-12 weeks only)
  - \_\_\_ months (1-23 months only)
  - Less than one week
  - Don't know
  - Refused
- Q40 IF MOTHER, ASK: What were the main reasons you decided to breastfeed [child]?  
ELSE *go to Q41* (read options 1-8 multiple response)
- Breastmilk is better for baby
  - Breastfeeding is more convenient
  - Breastfeeding is cheaper
  - Breastfeeding prevents allergies
  - Breastfeeding helps weight loss
  - Breastfeeding is the right thing to do
  - [Child]'s father wanted you to breastfeed
  - Other people advised you to breastfeed
  - Any other reason (*specify*) \_\_\_\_\_
  - Don't know
  - Refused
- Q41 Has [child] ever been given infant formula regularly? (PROMPT IF NECESSARY: regularly means at least once a day)
- Yes
  - No (*go to Q43*)
  - Don't know (*go to Q43*)
  - Refused (*go to Q43*)
- Q42 At what age was [child] first given infant formula regularly?
- \_\_\_ weeks (1-12 weeks only)
  - \_\_\_ months (1-23 months only)
  - Less than one week
  - Don't know
  - Refused
- Q43 Has [child] ever been given cow's milk regularly?
- Yes
  - No (*go to Q45*)
  - Don't know (*go to Q45*)
  - Refused (*go to Q45*)

- Q44 At what age was [child] first given cow's milk regularly?
1. \_\_\_ weeks (1-12 weeks only)
  2. \_\_\_ months (1-23 months only)
  3.  Less than one week
  4.  Don't know
  5.  Refused
- Q45 Has [child] ever been given any other type of milk substitute on a regular basis?  
(PROMPT: Apart from breastmilk / infant formula / cow's milk)
1.  Yes
  2.  No (*go to Q48*)
  3.  Don't know (*go to Q48*)
  4.  Refused (*go to Q48*)
- Q46 What type of milk substitutes did [child] have?  
(MULTIPLE RESPONSE)
1.  Soya bean milk
  2.  Goat's milk
  3.  Evaporated milk
  4.  Other (*specify*) \_\_\_\_\_
  5.  Don't know
  6.  Refused
- Q47 At what age was [child] first given [this / any of these] milk substitute (s) regularly?
1. \_\_\_ weeks (1-12 weeks only)
  2. \_\_\_ months (1-23 months only)
  3.  Less than one week
  4.  Don't know
  5.  Refused
- Q48 Has [child] ever been given solid food?
1.  Yes
  2.  No (*go to Q57*)
  3.  Don't know (*go to Q57*)
  4.  Refused (*go to Q57*)
- Q49 At what age was [child] first given solid food regularly?
1. \_\_\_ weeks (0-12 weeks only)
  2. \_\_\_ months (1-23 only)
  3.  Never given solids / not yet started solids
  4.  Don't know
  5.  Refused

# Appendix D

## Breastfeeding questions from the 1995 National Health Survey (1995 NHS)

There were 14 breastfeeding questions included in the 1995 NHS. Information was collected for all children aged less than 4 years (n=3,252), at the time of the survey. For most children, questions were answered on their behalf by a parent, usually the mother (approximately 80%). The aim of the module on breastfeeding was to assess the length of time an infant was breastfed and when substances other than breastmilk were introduced. 'Introduced' was defined as when first started taking food or breastmilk substitutes on a regular basis, not when first offered or one-off occasions when the food was taken (ABS 1998).

- Q301. Has .....ever been breastfed?
- Yes
  - No (*go to Q304*)
- Q302. Is .... currently being breastfed?
- Yes
  - No
- Q303. Was .....breastfed when .....first came home from hospital?
- Yes
  - No
  - No hospital
- Q304. Has .....ever been given infant formula regularly?
- Yes
  - No (*go to Q306*)
- Q305. At what age was .... first given infant formula regularly?
- Weeks
  - Months
  - Less than one week
  - Don't know
- Q306. Has .....ever been given cow's milk regularly?
- Yes
  - No (*go to Q308*)
- Q307. At what age was .....first given cow's milk regularly?
- Weeks
  - Months
  - Less than one week
  - Don't know
- Q308. Apart from breastmilk/infant formula/cow's milk has .... ever been given any (other) type of milk substitute on a regular basis?
- Yes
  - No (*go to Q311*)
- Q309. What type of milk substitutes did .... have?
- Soya bean milk
  - Goat's milk
  - Evaporated milk
  - Other \_\_\_\_\_
- Q310. At what age was .... first given (this/any of these) milk substitute (s) milk regularly?
- Weeks
  - Months
  - Less than one week
  - Don't know
- Q311. Sequence guide
- If aged less than six months (*go to Q312*)
  - Otherwise (*go to Q313*)
- Q312. Has .... ever been given solid food?
- Yes
  - No (*go to Q314*)
- Q313. At what age was .... first given solid food regularly?
- Weeks
  - Months
  - Never/not
  - Don't know

Q314. Sequence guide

If code '2' (No) in Q302 (*go to Q315*)

Otherwise

*(NO further questions about breastfeeding)*

Q315. Including times of weaning, what is the total time  
.... was breastfed?

Weeks

Months

Less than one week

Don't know

Q316. What is the main reason you stopped  
breastfeeding ....?

Teething

Child bored

Felt it was time to stop

Resumed work

Pregnant

Not producing any /adequate milk

Other

## Nationally recommended survey questions (Webb et al 2001)

The following interim questions were suggested by Ingrid Rutishauser as meeting the data requirements to report on all of the national breastfeeding indicators as recommended in the report of the Australian Food and Nutrition Monitoring Unit (CDHAC 2001).

The first breastfeeding question would be asked of all children aged less than 48 months and then the question sequence followed as outlined below:

- Q1 [Would be Q301 from NHS 1995 plus a definition of 'ever breastfed' ie]  
Has X ever been breastfed?  
(‘Ever breastfed’ means ever given breastmilk, even just once. This includes putting the infant to the breast to feed or giving expressed breastmilk.)
- Yes (*go to Q2*)  
 No (*no further breastfeeding questions*)
- Q2 [Would be WHO Q2 without the second part ie]  
Since this time yesterday, has X been breastfed?  
(Breastfed includes giving expressed breastmilk)
- Yes – If YES and the child is aged six months or less *go to Q3* (24 hour recall)  
 No (*go to Q4*)

- Q3 [Would be WHO Q3 – for classifying exclusive/ predominant breastfeeding – possibly condensed to five parts rather than the present 10 parts if it is considered to be too long. But since all the items have to be read out anyway it might be more informative to keep them separate as in the WHO version. The part about oral rehydration salts could be omitted for Australia and covered under ‘others’.]

EITHER

Since this time yesterday did X receive any of the following?

1. Vitamins / mineral / medicines  
 Yes  
 No
2. Plain water / sweetened or flavoured water / fruit juice / tea or infusion  
 Yes  
 No
3. Infant formula / other milk  
 Yes  
 No
4. Solid or semi-solid food  
 Yes  
 No
5. Other (*specify*) \_\_\_\_\_

OR

(WHO question 3)

Since this time yesterday, did (name) receive any of the following?

1. Vitamins, mineral supplements, medicine  
 Yes  
 No
2. Plain water  
 Yes  
 No

3. Sweetened or flavoured water

Yes

No

4. Fruit juice

Yes

No

5. Tea or infusion

Yes

No

6. Infant formula

Yes

No

7. Tinned, powdered or fresh milk

Yes

No

8. Solid or semi-solid food

Yes

No

9. Oral rehydration salts

Yes

No

Q4. [Would be NHS 1995 Q315]

Including times of weaning, what is the total time that X was breastfed?

***Somewhere in the survey.... should also ask....***

For each child less than 48 months old ask the respondent

a) Can you tell me how old the child is today (in completed months)? \_\_\_\_\_

b) If possible, the exact date of birth is \_\_\_\_\_

## Calculation of breastfeeding indicators

Questions in the NSW Child Health Survey 2001 that were used to determine indicators:

### *Indicator 1*

Percent ever breastfed: Questions 2 or 3, and 36.

### *Indicator 2*

Percent breastfeeding (any) at each completed month of age to 12 months: Questions 2 or 3 and 36-39. Infants and children who are still breastfeeding at the time of the survey are included in the calculation of this indicator to avoid bias.

### *Indicator 3*

Percent of children regularly given solid foods before four months and six months: Questions 2 or 3, 48 and 49. The indicator is calculated including those who have and have not been regularly given solid food at the time of survey.

### *Indicator 4*

Percent regularly given breastmilk substitutes before four months and six months: Questions 2 or 3, 41, 42, 43, 44, 45, 47. The indicator is calculated including infants who have or have not received breastmilk substitutes at the time of the survey.

### *Indicator 5*

Percent fully breastfed to at least four months and six months: Questions 2 or 3, 36, 41, 42, 43, 44, 45, 47, 48, 49. The indicator is calculated including infants who were still fully breastfed as well as those who had ceased being fully breastfed at the time of the survey.

### *Indicator 6*

Percent fully breastfed to at least four months and six months among 'ever breastfed' children: Questions 2 or 3, 36, 41, 42, 43, 44, 45, 47, 48, 49. The indicator is calculated including infants who were still fully breastfed as well as those who had ceased being fully breastfed at the time of the survey.

### *Indicator 7*

Median duration of breastfeeding among 'ever breastfed' children: Questions 2 or 3, and 36-39, and excludes those infants who were 'never breastfed'.

**In all cases where a month is reported, it refers to 'completed' months, or infants who have attained the age in months, where one month refers to an infant who is one month post-delivery, a two-month-old infant is two months post delivery and so on.**

### *Survey details and statistical tests*

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The survey sample from the NSW Child Health Survey 2001 was weighted to adjust for differences in the probabilities of selection amongst subjects, according to the probabilities of eligible children in the household and the number of residential telephone connections for the household. Post-stratification weights were used to decrease the effect on survey estimates of differing rates of non-response amongst males and females and children of different ages.

The SURVEYMEANS procedure in SAS version 8.02 was used to calculate the percent ever breastfed and the 95% confidence intervals that account for the sample design. Taylor expansion is used in this procedure to calculate standard errors.

The denominator for the first five indicators was infants/children aged 0-23 months in the survey. For the last two indicators relating to breastfeeding duration and intensity, the denominator was children aged 0-23 months who were ever breastfed.

Survival analysis methods were used to calculate all indicators except 'percent ever breastfed'. The LIFETEST procedure in SAS version 8.02 was used to perform the survival analysis. Survival analysis models data that specifies a time between an initial event (such as commencing breastfeeding) and the terminating event (for example ceasing all breastfeeding). Where the terminating event

was the date of survey (for example the child was still being breastfed), these cases are called censored observations. The censored observations remain in the analysis until the time of censoring. The survival analysis determined the non-parametric estimates of the survival distribution function using the Kaplan-Meier method. The estimate of the percent breastfeeding at each month of age thus includes both those currently breastfeeding and those that have ceased, and increases the sample size for age specific estimates by taking account of the overall breastfeeding history for each child (Mackerras, unpublished). It is assumed that someone who stopped breastfeeding at a particular age was breastfeeding for all the time up until the age of cessation (eg a child who stopped breastfeeding at four months is assumed to have been breastfed at ages one, two and three months).

The procedure calculated proportions initially at weekly time intervals, allowing for the weighting of the dataset. All data were converted to 'completed months of age' for presentation of the indicators, to minimise false expectations regarding precision of the data.

The lifetest procedure in SAS version 8.02 does not allow for the calculation of confidence intervals that account appropriately for the weighting and stratification of the data collected. This type of calculation is not readily available in standard statistical software. Thus 95% confidence intervals have not been included for indicators 2-6.

### *Strength of evidence and sample size*

The power to detect differences is affected by the size of the sample available in each of the population subgroups and health areas. Tables A7.1 and A7.2 show the number of children, aged 0-23 months, available for each population subgroup and Area Health Service. The sample size for the Aboriginal and Torres Strait Islander population subgroup is extremely small (53 respondents) hence all indicators for this group should be interpreted with caution. Similar caution in interpretation is required of estimates for some of the Area Health Services, notably Illawarra, Northern Rivers, Mid North Coast and New England, where there was only between 60 and 70 respondents for each area.

**Table A7.1 Sample sizes for analysis for each Area Health Service of residence, NSW Child Health Survey 2001**

Area Health Service of residence	Sample size
Central Sydney	112
Northern Sydney	101
South East Sydney	93
South West Sydney	93
Western Sydney	103
Central Coast	110
Wentworth	74
Hunter	83
Illawarra	69
Northern Rivers	64
Mid North Coast	67
New England	67
Macquarie	72
Far West	102
Mid Western	73
Greater Murray	103
Southern	103
<b>Total NSW</b>	<b>1,489</b>

**Table A7.2 Sample sizes for analysis for each population subgroup, NSW Child Health Survey 2001**

Population subgroup	Sample size
<b>Maternal age</b>	
< 25	211
≥ 25	1,095
<b>Marital status</b>	NA
Married	
Single	
<b>Maternal education</b>	
Primary/secondary (less than tertiary)	999
Tertiary	488
<b>SEIFA</b>	
1st quintile	195
2nd quintile	320
3rd quintile	346
4th quintile	274
5th quintile	342
<b>Maternal country of birth</b>	
Australia	1,220
Overseas	269
<b>Background (maternal)</b>	
English speaking	1,273
Non English speaking	216
<b>Indigenous status (maternal)</b>	
Aboriginal and Torres Strait Islander	53
Non-Aboriginal and non-Torres Strait Islander	1,436
<b>Place of residence</b>	
Urban	838
Rural	651
<b>Total</b>	<b>1,489</b>

### *Data heaping and smoothing of data*

Data heaping may occur if mothers round their recalled reports of duration of breastfeeding (for example, mothers often report feeding events at three, four or six months of age rather than two or five, O'Gara et al 1995). If this has occurred, a method for data smoothing, such as calculation of a three month moving average, or estimation of a line of best fit (or trendline), should be used to more accurately determine prevalence rate at each month of age (Mackerras, unpublished).

Smoothing using a three month moving average was done for indicator 2: Percent of children receiving any type of breastfeeding at each completed month of age

to 12 months. The prevalence estimates using smoothed or unsmoothed data differed by no more than 3% except for the prevalence at 11 months where the difference was 7%. Thus, in these data there was no evidence of significant data heaping. Consequently all indicators were reported on unsmoothed data, as the smoothing of rates at each month of age did not improve the estimates of the median, and monthly percentages.

## International estimates of costs associated with poor breastfeeding practices

### *Weimer (2001)*

A minimum of US\$3.6 billion could be saved annually if the prevalence of exclusive breastfeeding increased from 'their current levels' to those recommended by the US Surgeon General. This amount was based on reduced incidences of only three childhood illnesses and reflects savings in terms of medical expenditures, wages lost by parents attending to an ill child, and the prevention of premature deaths. Hence it is an underestimate. It excluded the cost of purchasing over-the-counter medications for otitis media and gastrointestinal symptoms, physician charges, and savings due to reduced long-term morbidity.

### *Ball & Wright (1999)*

Additional health care services cost between US\$331 and \$475 for each never breastfed infant over the first year of life for three childhood illnesses: lower respiratory tract illnesses, otitis media, and gastrointestinal illness.

### *Niemela (1999)*

Total annual costs to society for otitis media alone were estimated as US\$138 million in the Finnish population of five million. The direct costs included physician visits, adenoidectomies, tube insertions and medications. Indirect costs were calculated from travel costs and productivity loss from parental work absence. This figure did not account for the long-term costs of language and cognitive impairment related to otitis media.

### *Riordan (1997)*

Additional annual health care costs, incurred for treatment of four medical conditions (infant diarrhoea, respiratory syncytial virus, Type 1 diabetes, otitis media) in infants who were not breastfed were estimated as US\$1.3 billion.

### *Tolstoplatov et al (1996)*

In the former Yugoslavia only 30% of babies are partially breastfed at four months. If this rate could be increased to 70%, it was calculated that US\$40 million could be saved while 99,000 respiratory infections, 33,000 ear infections, 123 cases of early diabetes, and 84 cases of childhood cancer could be averted. Also, mothers might be spared 249 cases of breast cancer and 152 of ovarian cancer.

### *Baby Friendly Initiative (1994)*

This study indicated that every 1% increase in the number of babies breastfed to three months would save the National Health Service more than UK£500,000 per year.

### *Kaiser Permanente (1997)*

One of the United States' largest and most successful health maintenance organisations conducted internal research to determine the value of providing a lactation support program for their members in the North Carolina region. They concluded that an increase in breastfeeding could have a significant impact on a national health care budget. Infants who were breastfed for a minimum of six months experienced \$1,435 less health care claims than formula fed infants.





