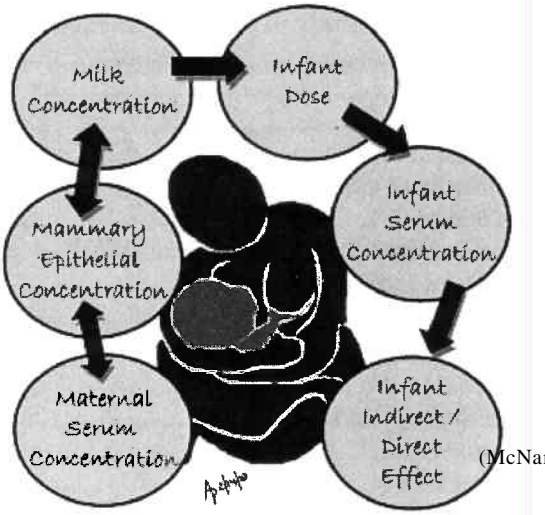
Influence of alcohol consumption on breastfeeding initiation and duration in Australia



(McNamara 2003)

Project report of the
Influence of alcohol consumption on breastfeeding initiation and duration in Australia (2003 — 2005)
for the Alcohol Education Research Foundation

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Contents

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PIFS II

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Executive Summary

Alcohol is an important part of Australian society, enjoyed by most of the population. But at the same time inappropriate alcohol use is a major cause of morbidity and mortality. The 2001 National Health Survey (NHS) showed that 57% of women in the 18-44 year age group had consumed alcohol in the past week and 8% of women over 18 years consumed alcohol at a level that created a health risk for them. Similar levels (64%) were found in the pre-pregnancy levels of the Perth Infant Feeding Study (PIFS) II mothers.

Reports in the literature show that health professionals rarely give mothers advice on alcohol and lactation and this was confirmed by the focus groups in this study. In a US study women were asked about the advice they were given on alcohol intake from health professionals. Almost one half (42%) were advised to drink alcohol during lactation by a health professional to facilitate lactation and/or help their babies sleep better, 17% were discouraged from drinking and the remaining were not given any advice at all about drinking. As there have been no published studies of alcohol consumption and lactation in Australia the present project, funded by the AERF, was undertaken to determine the levels of alcohol by mothers who are breastfeeding. Further objectives included attitudes towards alcohol consumption and the relationship of alcohol to infant feeding patterns and infant behaviour.

Several different methods were used to achieve the objectives of this project. An analysis was undertaken of data from the 1995 and 2001 National Health Surveys and the Perth Aboriginal Breastfeeding Study (PABS). Additional questions related to alcohol consumption and specific infant behavioural outcome variables were added to the Perth Infant Feeding Study (PIFSII). Finally a series of focus groups were organised to explore qualitative aspects of alcohol consumption and lactation.

In the 1995 NHS approximately 40% of pregnant women drank alcohol compared to 28% in the 2001 NHS. In the PIFSII 35% of mothers drank alcohol, the differences reflecting time differences and the samples used. In the analysis of the National Health Surveys mothers were not specifically identified and several different definitions were used for Lactating Mothers. In the NHS 2001 analyses 45% of the Lactating Mothers had consumed alcohol in the previous week. In the PIFSII, mothers were interviewed while in hospital and at regular intervals until their infants were 12 months old. Hence more detailed statistics are available on alcohol consumption, but instead of a national sample, the mothers all came from metropolitan Perth. In the first few weeks after birth 40% of mothers drank some alcohol, increasing to 50% at 12 months after the birth. For those

drinking, the quantities were usually small. Fewer Aboriginal mothers drank during lactation, about 25% of the mothers in the PABS. Of the Aboriginal mothers who drank alcohol, the average intake was 0.75 standard drinks per day while lactating. The maximum reported was 4 standard drinks per day.

However far more Aboriginal mothers smoked cigarettes. More than two thirds (68.6%) of mothers reported smoking post partum, a figure that remained constant during lactation. Most of the Aboriginal mothers reported smoking while breastfeeding. Smoking by Aboriginal mothers was not related to breastfeeding rates, probably because such a high proportion of them smoked.

In the PIFS II, which used a sample biased towards lower socio-economic groups, 39% of the women smoked before pregnancy, dropping to 26% during pregnancy and remaining at about the same level during lactation. Mothers who smoked in the PIFSII study were less likely to breastfeed at all time periods; they had a shorter duration of breastfeeding. This applied to the three categories of breastfeeding used in the study, 'exclusive', 'full' and 'any'. Mothers who smoked were more likely to introduce solids earlier than other mothers.

In the PIFSII the IOWA scale of infant feeding perceptions was a significant predictor of alcohol intake. Mothers who were more committed to breastfeeding consumed less alcohol. In this study no association was found between rates of breastfeeding initiation and drinking alcohol. However the high rate of breastfeeding initiation in Perth (95%) would make it very difficult to detect any differences without a much larger sample size.

There was however a weak association between alcohol consumption and duration of breastfeeding. This particularly applied to the duration of 'exclusive' and 'full breastfeeding', rather than to 'any breastfeeding'.

Previous experimental studies had suggested an association between maternal alcohol consumption and infant sleeping patterns and subsequent infant behaviour. Infants initially sleep longer, but later have more disturbed behaviour. In the PIFS II no association was found between infant behaviour (sleeping patterns), and drinking patterns. However the amount of alcohol consumed by the mothers was small and mothers often adjusted their drinking patterns to minimise the impact on infants, by drinking immediately after they had breastfed or by using previously expressed breastmilk.

No relationship was found between infant growth (weight and height) and alcohol consumption. A similar analysis found no association drinking patterns and the reported health of the infant.

Mothers from Asia drink significantly less alcohol than mothers born in Australia, New Zealand or Europe. This explains the strong association between country of birth and post natal drinking patterns.

After becoming pregnant and during lactation the types of alcoholic drink consumed by mothers changed. They were less likely to drink spirits and cocktails, changing to wine and beer. Overall alcohol consumption levels during lactation were low. This would indicate that to study these associations in Australia either a much larger sample is required or some way of identifying high consumers should be used. Obviously it would not be ethical to mount an intervention study where mothers were asked to consume larger quantities of alcohol.

Detailed consumption patterns of the mothers in the 1995 and 2001 NHS are described. The way in which mothers are identified is described in detail in the body of the report. This was a difficult process and it would be helpful if pregnant and Lactating Mothers were directly identified in future National Health Surveys.

In the review of the literature alcohol has been reported to have a number of adverse effects of on lactation and on the behaviour of the infant who consumes breastmilk that contains alcohol. (see Appendix A). From the focus groups it is evident that little information is given to mothers about the consumption of alcohol during lactation. In view of the lack of significant effects found in this study the risk of consuming small quantities of alcohol during lactation are small. However in view of the small amount of evidence available and the possible link of alcohol consumption to breastfeeding duration, advice given to mothers should be conservative and suggest abstinence.

1.0 Introduction

Alcohol has a major role in Australian society. Breastfeeding is recommended for every infant in Australia, exclusively for six months and then on to 12 months and longer if desired (Binns 2001; Scott & Binns 1996). Women of an age to breastfeed commonly consume alcohol. It has been commonly recommended that alcohol should be avoided during pregnancy and during breastfeeding. Despite this a literature search has not revealed any published papers on alcohol consumption during breastfeeding in Australia.

The benefit of breastfeeding for the infant and the mother are well known and for the infant these include nutritional, immunological and psychological benefits. Health benefits for lactating women include lactation amenorrhea, maternal weight or fat loss, protection against premenopausal breast cancer and ovarian cancer, bone remineralisation to levels exceeding those present before lactation, and more optimal blood glucose profiles in women with gestational diabetes (Dobson & Murtaugh 2001). Exclusive breastfeeding will provide the greatest gains for infant development, protection against childhood obesity and the prevention of chronic disease later in adult life (Martorell, Stein & Schroeder 2001; Leon-Cava 2002).

The World Health Organization (World Health Organization 2001) Expert Consultation recommends exclusive breastfeeding for 6 months before the introduction of complementary foods. It is recognised that it may not be possible for all mothers to maintain breastfeeding for this period however consuming an optimal diet during pregnancy and lactation will help support the desired outcomes of this recommendation for both the mother and the infant. Alcohol consumption by Lactating Mothers is not considered to be optimum nutrition as some of the alcohol consumed by a lactating woman is transferred to her milk and then consumed by her infant (Mennella 200Ia). In addition alcohol also displaces valuable nutrients from the diet (National Health and Medical Research Council 2003).

In many countries and cultures there is the belief that alcohol can actually promote breastmilk production and aid in settling the infant. Contrary to these beliefs research shows that drinking alcohol during lactation can result in a decrease in breastmilk production (through its effect on oxytocin), disturbed sleep patterns and altered gross motor development (Mennella 2001a; Little et al. 1989; Mennella, Pepino & Teff 2005).

Alcoholic beverages are widely consumed in Australia. The 2001 National Health Survey (Australian Bureau of Statistics 2003) showed that 56.5% of women in the 18-44 year age group

had consumed alcohol in the past week. Over eight percent of women over 18 years consumed alcohol at a level that created a health risk for them and many of these women were in the age group for pregnancy or for breastfeeding.

Overall alcohol provides 7% of energy in the Australian diet and as such is an important contributor to energy intake. An increase in energy of 1-2% above requirements provides the basis for a gain in weight of 1-2kg per year.

There have only been a limited number of studies on breastfeeding and alcohol consumption and none reported from Australia. Epidemiological studies in the USA have shown that breastfeeding mothers were less likely to smoke cigarettes or marijuana, but regular alcohol consumption at one month and three months postpartum did not differ from women who had never breastfed (Little, Lambert & Worthington-Roberts 1990). Mennella reports that lactating women who were either encouraged to drink or received no advice regarding alcohol intake drank significantly more than women who were advised not to drink (Mennella 2001a). In a further study women were asked about the advice they were given on alcohol intake from health professionals. Almost one half (41.7%) were advised to drink alcohol during lactation by a health professional (doctor, lactation consultant, midwife, nurse) to facilitate lactation and/or help their babies sleep better, 16.6% were discouraged from drinking and the remaining were not given any advice at all about drinking (Mennella 2001b). This highlights the need for consistent health education information to be provided by health professionals to women during lactation.

The provision of information and support to promote breastfeeding initiation and duration is well documented in the literature (Pascoe et al. 2002; Meyers 2001).

However the parallel promotion of safe alcohol consumption has not previously been included in health promotion programs promoting breastfeeding.

The most recent Australian alcohol guidelines published by the National Health and Medical Research Council (National Health and Medical Research Council 2001) provide a guideline for alcohol consumption for pregnant, or soon to be pregnant women (Guideline 11). Added on to this guideline is some ‘prudent’ advice for lactating women not to exceed the levels of drinking recommended during pregnancy, and to consider not drinking at all. The National Alcohol Strategy (Commonwealth Department of Health and Ageing 2002) outlines pregnant women as being at higher risk from alcohol harm in Key Strategy 2.

Providing guidelines for safe drinking opportunities during lactation may prolong breastfeeding duration in some groups, however there is a dearth of information on safe levels of alcohol intake during breastfeeding and no consideration of lactating women in either of these national documents.

The 2001 National Health and Medical Research Council, Australian Alcohol Guidelines: Health Risks and Benefits (National Health and Medical Research Council 2001), recommends further research in the area of alcohol intake and breastfeeding to determine better measures of average intake (relevant to long-term health problems), and patterns of drinking, (relevant to short-term health problems). In addition the National Alcohol and Research Agenda (Commonwealth Department of Health and Ageing 2002), recommends research in the area of vulnerable groups and the social determinants of health.

There are some studies of alcohol intake and the effect on the infant, the infant's behaviour or on lactogenesis (Mennella & Garcia-Gomez 2001; Heil & Subramanian 1998; Liston J 1998; Mennella, Pepino & Teff 2005) (see Appendix A for a more comprehensive review). However there is a lack of information in the scientific literature on the relationship between alcohol intake throughout lactation and breastfeeding practices and outcomes.

Currently more than 90% of Australian mothers initiate breastfeeding, but breastfeeding declines steadily to around 50% at six months (Graham et al. 2005). There is a strong socio-economic gradient with higher initiation rates and a longer duration of breastfeeding in upper socio-economic classes (Scott & Binns 1996; Scott, Binns & Aroni 1995). The factors involved in breastfeeding initiation, and duration have been well documented for Australia (Scott & Binns 1998; Scott & Binns 1999; Scott, Binns & Aroni 1997; Scott et al. 2000; Scott et al. 1999; Scott et al. 2001; Binns & Scott 2002). However these studies did not include the use of alcohol, and this could be an important omission.

Currently Australian breastfeeding data is still limited and is often cross sectional in nature. While providing some information, the data obtained from longitudinal studies are more reliable and allow for a more in-depth study. There are many advantages in conducting a longitudinal study of breastfeeding. These include interviewing the mother close to the proximity of the event to reduce recall bias and the ability to obtain data related to different stages of breastfeeding. The problem of recall is demonstrated by comparing the results of the Donath analysis of the National Health Survey (Donath & Amir 2000) and the Perth Infant Feeding Study (Scott & Binns 1998). Donath reported the exclusive breastfeeding rate at 57% at 3 months, and Scott et al reported 47%, a difference of ten percentage points, while overall rates of breastfeeding were similar. It is likely

that the difference is due to the recall bias inherent in the National Health Survey (NHS) methodology, which is cross-sectional and based on recall over a significant period of time.

The study of risk factors for initiation and duration of breastfeeding requires longitudinal studies. While recent Australian studies have documented the societal factors involved in breastfeeding there have been no studies of the role of alcohol in the initiation and duration of breastfeeding. Reported alcohol consumption is more likely to be accurate if done as a consumption record, rather than as recall at a later date. This study investigated the consumption of alcohol during breastfeeding and the attitudes of the mothers towards alcohol.

1.1 Objectives of the study

To determine levels of alcohol consumption and attitudes towards the consumption of alcohol of mothers who are breastfeeding.

To compare levels of alcohol consumption and attitudes towards the consumption of alcohol of mothers who are feeding infants using an infant formula.

• Research Questions

1. What is the level of alcohol consumption during the period of breastfeeding?
2. Is there a difference in alcohol consumption between mothers who are breastfeeding and those who are using infant formula?
3. Does the consumption of alcoholic beverages effect the initiation of breastfeeding?
4. Does the consumption of alcoholic beverages effect the duration of breastfeeding?
5. What is the relationship between the time of drinking and breastfeeding?
6. Is there a relationship between a history of alcohol consumption and the initiation of breastfeeding?
7. Is there a relationship between maternal alcohol consumption and infant behaviour or illness?

Alcohol consumption and cigarette smoking are often associated. As an additional objective for this report the smoking patterns of mothers in the PABS and PIFS II were also analysed.

2.0 Methods

This project used a number of different methods to achieve its objectives. Data from the recent National Health Surveys were analysed to document the alcohol consumption patterns of mothers. As the Perth Infant Feeding Study II was about to commence it was possible to add additional quesitons to that study. The Perth Aboriginal Breastfeeding Study contains a limited number of questions on alcohol and they are analysed here. Finally a number of focus groups were conducted to provide qualitative information on alcohol consumption. The details of the methodology employed are now described.

2.1 Analysis of the National Health Surveys.

Considerable detail of alcohol consumption had been collected in the national Health Survey's undertaken in 1995 and 2001 (Australian Bureau of Statistics 2002; Australian Bureau of Statistics 1998). This project undertook further analysis of the 1995 and 2001 National Health Survey data to determine levels of alcohol consumption of alcohol by mothers who were breastfeeding at the time of the surveys.

A number of assumptions had to be made to determine which subjects interviewed in the NHS were mothers and who were lactating. Detailed information is provided in section 3.1.1.

2.2 The Perth Infant Feeding Study

The first Perth Infant Feeding Study (PIFS) was undertaken in 1993-5 to document factors that determine initiation and duration (Scott, Binns & Aroni 1995). A decade later the second Perth Infant Feeding Study (PIFS II) was undertaken with similar objectives to the first and to document any secular trends. One major addition to the PIFS II, was the ability to add additional quesitons on the consumption of alcohol by the mothers in the study. The alcohol consumption quesitons were based on those used in the National Nutrition Survey of 1994 to allow for comparison (see Appendix B for the alcohol questions included in PIFS II).

A longitudinal study was conducted on a cohort of consecutive unselected mothers who delivered babies in two Perth hospitals; the same two hospitals that were used in the Perth Infant Feeding Study Mark I in 1993. The catchment areas for the hospitals have remained the same, as has the socio-economic category of the areas. The partners of mothers recruited to the study were also invited to participate.

All mothers were followed for 12 months postpartum regardless of the infant feeding method chosen in hospital and whether or not they had stopped breastfeeding before 12 months.

2.2.1. Mothers

Each eligible mother in both hospitals contacted by the research officer was invited to participate. The purpose and the methodology of the study were explained to each mother and they were asked to sign a consent form. Mothers who declined to participate in the 12 month cohort study were asked to provide some basic demographic details to allow for an assessment of how representative the final sample was. Some baseline data were collected at initial contact from all mothers and provided consent was given, an 'in-hospital' questionnaire was left for mothers to complete. The completed mother's questionnaire was collected either from the mother prior to her discharge from hospital or alternatively from a sealed box on the ward or posted back directly to the university within a week. Attempts were made to follow-up all recruited mothers by telephone seven times during the 12 month period post discharge: at four weeks, 10 weeks, 16 weeks, 22 weeks, 32 weeks, 40 weeks and 52 weeks. All 'in-hospital' questionnaires were checked soon after collection for missing or unclear responses. This information was then clarified during the first follow-up call.

2.2.2 Fathers

Mothers who were recruited by the research officer were left a self-administered questionnaire for the baby's father to complete and return either while the mother was in hospital or shortly afterwards by post. Some basic socio-demographic information was also sought from all fathers or alternatively through the baby's mothers.

2.2.3 Exclusion criteria

All mothers that delivered at either of the two Perth hospitals were eligible to participate in the study excluding: mothers with poor levels of English language literacy; mothers that delivered babies needing to be transferred to another hospital for neonatal intensive care; and those deemed unfit, for medical or other reasons, by nursing staff on the ward. Recruitment of mothers was to continue until around 600 mothers were enrolled in the study. All partners of participating mothers were eligible to participate if the participating mother was in contact with them and they were able to return a completed questionnaire shortly after the birth of their infant.

2.2.4 Sample size

It was estimated that it would take six months to recruit enough mothers from the same hospitals as previously used in PIFS I. The sample size required was estimated to be 600, similar to that of the earlier study. After allowing for loss to follow-up of up to 20% over the duration of the study, a sample of 600 would enable differences in the breastfeeding rates between PIFS I and PIFS II to be estimated within five percentage points with 95% confidence.

2.2.5 Data collection tools

The questionnaires used in PIFS II were based on those that were developed for PIFS I. Since the original study modifications of the questionnaires have been used in the Perth Aboriginal Breastfeeding Study and other studies undertaken in multicultural situations (Li et al. 2004{Binns, 2004 #140; Duong, Binns & Lee 2004). The longitudinal design of the study enables trends of alcohol consumption during breastfeeding to be documented. Additional questions on alcohol were added to the follow-up interviews undertaken at 6, 10, 16, 22, 32, 40 and 52 weeks. These interviews were undertaken by telephone and when necessary personal interviews were arranged.

Alcohol consumption questions were based on the National Nutrition and National Health Surveys conducted previously (see Appendix B for 'add on' questions). In addition, the questionnaire contained information on infant behaviour, including the mothers' perceptions of restlessness and feeding patterns. This information in combination with the alcohol consumption data provided information about mother's alcohol intake and infant behaviour.

2.2.5.1 Focus Groups.

A series of six focus groups were also conducted to explore the understanding of alcohol use during breastfeeding by mothers. The groups included mothers from differing socio-economic strata and of different age. During focus groups, the perceived effect of alcohol on breastmilk production and effect on the infant were discussed.

2.2.6 Data management

All data was coded, computer entered and analysed using the Statistical Package for Social Sciences (SPSS for Windows version 11.5). Data was checked for out of range and inconsistent responses. The original questionnaires were then consulted to enable the values to be corrected.

2.2.7 Statistical analysis

Initial analysis involved the frequency of all variables of interest and their univariate association with initiation and duration. Variables of interest were then incorporated into appropriate multivariate models. Multivariate logistic regression was used to estimate the effects of independent variables on the risk of cessation of breastfeeding. Kaplan-Meier survival analysis was utilised to examine the duration of exclusive, full and any breastfeeding.

2.2.8 Ethical issues

The study was approved by the Curtin University Human Research Ethics Committee, and by the ethics committees of each hospital participating in the study. The purpose of the study was explained to each participant, they were given an information sheet and asked to sign a consent form if they agreed to participate. In addition, study participants were offered the opportunity to receive a summary copy of the study findings. Informed consent was obtained from all participants after the study was fully explained by the research officer. A duplicate copy of the signed consent form incorporating information on the study was also provided to study participants. The wishes of those who initially provided consent but then later withdrew were respected.

All information obtained in the study has been kept confidential. Questionnaires remain kept in locked storage facilities (and will continue to be for the required time period) and were accessed by study personnel only when necessary for working on the study. No identifiable data or information has been released to anyone and no information was obtained from medical records.

2.3 Alcohol Risk Level

To determine the alcohol risk level from the 1995 and 2001 NHS each adult was classified into risk levels determined by their estimated average daily alcohol consumption in the 7 days prior to interview. Average daily consumption in the previous 7 days was estimated using two components:

- the number of days on which the respondent reported consuming alcohol in the previous week
- the quantity consumed on the three most recent days on which they consumed alcohol.

For people who drank on no more than 3 days in the last week, their daily average was simply the total consumed divided by 7. Risk levels are based on the NHMRC risk levels for harm in the long

term, and assumes the level of alcohol consumption is typical. The average daily consumption of alcohol associated with the risk levels is as follows:

ALCOHOL RISK LEVEL		
	Males	**Females**
Low risk	50 ml or less	25 ml or less
Risky	More than 50, up to 75 ml	More than 25, up to 50 ml
High risk	More than 75 ml	More than 50 ml

Drinking status information was also collected for those who did not consume any alcohol in the 7 days prior to interview:

- Last consumed more than one week to less than 12 months ago
- Last consumed 2 months or more ago
- Never consumed.

To determine the alcohol risk level for the 1995 NHS population the estimated total daily consumption of alcohol for the reference week and period since last drank alcohol (including never drank alcohol) was determined using the above method that was applied to the 2001 NHS.

3.0 Results

3.1 National Health Survey 2001

The 2001 NHS (general population and not including the supplementary sample of Indigenous Australians) was conducted during the ten month period from February to November 2001. The 2001 NHS was conducted in 17,918 private dwellings selected throughout non-sparsely settled areas of Australia. The sample design ensured that within each State or Territory each person had an equal chance of selection. Information was obtained about one adult, all children aged 0 to 6 years, and one child aged 7 to 17 years in each selected household. A total of 26,863 persons fully responded to the survey.

Trained interviewers personally interviewed the selected adult member of the household. A parent or guardian was asked to answer questions in respect of their children aged less than 18 years - this person was referred to as the child proxy.

The relationship of the child proxy and the children for which they were reporting was as below:

Relationship	**% of children selected**
Mother / stepmother	78.8
Father /stepfather	18.6
Other relative	2.0
Other	0.6

In addition to the interview questionnaire, adult female respondents were invited to complete a small additional questionnaire relating to specific aspects of women's health. It contained questions relating to specific women's health issues and was completed by the respondent in writing and returned to the interviewer in a sealed envelope. This approach was adopted in recognition of the potential sensitivity of the topics covered.

In the 2001 NHS, information about alcohol consumption was recorded against seven general categories of alcoholic drinks: low alcohol beer, medium strength beer, full-strength beer, wine, spirits, fortified wine and other alcoholic beverages. Details of the quantity of each of these drinks consumed on (up to) the last three days in the week prior to the day of interview were recorded.

Quantities were recorded in terms of standard measures where possible; otherwise a description of the quantity consumed was recorded by interviewers.

A system was developed to calculate in millilitres the amount of pure alcohol contained in the drinks which respondents reported they had consumed. This system used information about the type of alcoholic drinks consumed (including brand name for common drinks), and the size and number of drinks consumed; a conversion factor was applied to this information to obtain the amount of pure alcohol consumed. Conversion factors tailored to specific drinks/drink types were included in the system, and default factors for each of the seven broad types of alcoholic drinks used in the survey were included for cases where more detailed information had not been recorded at the interview.

3.1.1 Data Assumptions

There is a total of 26 862 respondents in the 2001 Australian Bureau of Statistics National Health Survey (NHS 2001). Of this population there is information on the alcohol consumption of 4 965 women of child bearing age (18 — 44 years). The survey design does not allow for women or men to identify their children in the dataset therefore the following assumptions were made to define mothers of breastfeeding children in the NHS 2001 dataset.

- **Mothers**

Lactating Mothers 1: assumes all the cases selected out are the mother of any child under four in the same household.

Lactating Mothers 2: assumes that a woman who has stated that she has breastfed is the mother for any child under four in the same household.

Lactating mothers 3: assumes that a woman who has stated that she has had babies is the mother of any child aged under four in the same household.

Women who do not have any children are those women aged between 18 — 44 years and report not having children (e.g. couple without children). They are referred to as Non-mothers. Pregnant women are those women who report that they are ‘currently pregnant’ in response to question W31 b.

- **Fathers**

Fathers are selected using the household variable (ie husband, lone parent) together with gender (male). The father definition assumes all the cases selected out are the father of any child under four in the same household.

- **Not applicable**

It is assumed that a not applicable response is nil consumption of alcohol.

3.1.2 Estimation Procedure

In the unit record data, the Australian Bureau of Statistics (ABS) provides a weighting for each person to be used when estimating parameters for the Australian population. All proportions in this report were calculated using the weighted estimates and are presented together with the sample population.

3.1.3 Cohort Characteristics

A total of 137 pregnant mothers and 2764 Non-mothers were determined from the 2001 NHS. The age groupings for the proxy mothers are different to the Pregnant women and Non-mothers as presented here. Lactating Mothersl contains 1382 women, slightly more women than the 1263 and 1264 women in Lactating Mothers2 and 3, respectively. The small difference in numbers between the three samples gives strength to the method used to extract these women from the dataset and when missing values are included all three samples contain 2365 women.

There are a greater number of pregnant women in the 18 – 34 age grouping than all other groupings (85.5%). The Non-mothers (68.8%) and Lactating Mothers all have a similar number of women within this age grouping.

Table 3.1.2.1 Age of Pregnant women and Non-mothers NHS 2001

Years	Pregnant Women		Non-mothers	
	n	%	n	%
18-19	3	2.2	65	4.2
20-24	13	9.2	181	7.2
25 - 29	49	35.2	336	11.4
30 - 34	52	38.4	618	22.4
35 - 39	18	13.8	818	28.3
40 - 44	2	1.2	746	26.5
Total	137	100.0	2764	100.0

Table 3.1.2.2 Age of Lactating Mothers NHS 2001

Age (yrs)	Lactating Mothers 1		Lactating Mothers 2		Lactating Mothers 3	
	n	%	n	%	n	%
15 - 17	5	.2				
18 - 19	12	.8	11	.8	1526*	69.8*
20 - 24	154	10.7	144	10.6		
25 - 29	336	24.1	304	23.7		
30 - 34	444	33.2	405	33.2		
35 - 39	305	20.6	283	21.1	566	21.3
40 - 44	100	7.2	87	6.9	199	7.0
45 - 49	14	1.1	14	1.3	53	1.0
50 - 54	7	1.2	9	1.5	15	.9
55 - 59	2	.5	3	.8	6*	-
60 - 64	1	.2	3	.3		
65 - 69	2	.3	1263			
Total	1382	100.0	11	100.0	2365	100.0

* Proxy ages are recorded in different age groupings ie 18-34 years; 55 and over.

3.1.4 Alcohol consumption

Table 3.1.4.1 Alcohol consumed in reference week NHS 2001

Standard Drinks	Pregnant Women		Non-mothers	
	n	%	n	%
Nil	98	73.4	1254	46.3
One	8	4.2	150	5.8
Two	14	10.1	279	10.7
Three	5	3.1	180	6.0
Four	5	4.4	112	3.9
Five	2	1.6	103	3.7
Six	3	1.9	88	3.1
Seven	-	-	66	2.3
Eight	-	-	66	2.2
Nine	-	-	66	2.4
Ten - Fifteen	2	1.3	217	7.2
> Fifteen	-	-	183	6.3
Total	137	100.0	2764	100.00

Table 3.1.4.2 Alcohol consumed in reference week NHS 2001

Standard Drinks	Lactating Mothers 1		Lactating Mothers 2		Lactating Mothers 3	
	n	%	n	%	n	%
Nil	728	54.5	648	52.8	648	52.8
One	78	5.3	72	5.4	72	5.4
Two	137	10.7	132	11.4	132	11.4
Three	80	5.1	74	5.1	74	5.1
Four	51	3.1	49	3.1	49	3.1
Five	44	2.7	40	2.6	41	2.7
Six	36	2.7	36	3.2	36	3.2
Seven	27	1.8	25	1.8	25	1.8
Eight	28	2.3	28	2.6	28	2.6
Nine	25	1.9	24	2.1	24	2.1
Ten - Fifteen	85	5.6	86	5.6	76	5.6
> Fifteen	63	4.3	59	4.4	59	4.3
Total	1382	100.0	1263	100.0	1264	100.0

Figure 3.1.4.1 Alcohol consumed in reference week NHS 2001

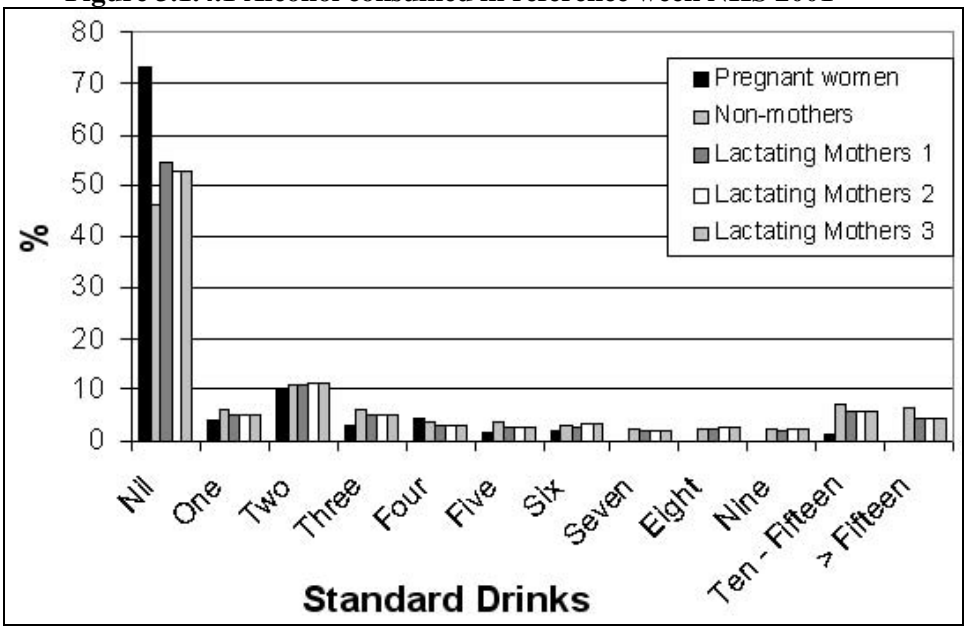


Figure 3.1.4.1 together with Tables 3.1.4.1 and 3.1.4.2 show that over a week a greater proportion of pregnant women did not consume alcohol compared with all other groups. At all levels of intake a small proportion of mothers (all Lactating Mothers) continued to consume alcohol during the week at a level not dissimilar to Non-mothers. Most women from all categories consume two drinks during the . reference week.

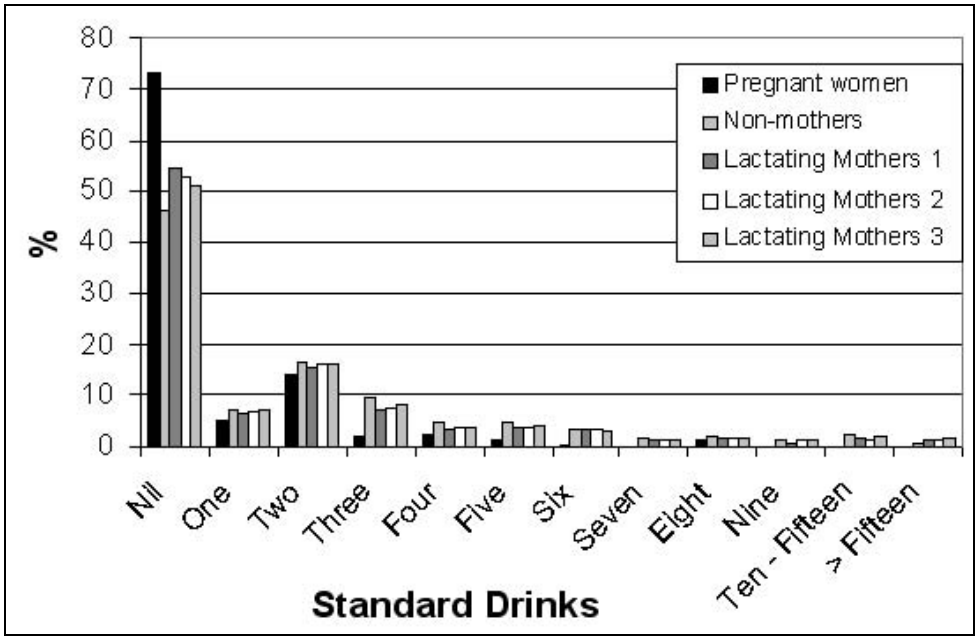
Table 3.1.4.3 Number of standard drinks consumed on heaviest day of alcohol consumption NHS 2001

Standard Drinks	Pregnant Women		Non-mothers	
	n	%	n	%
Nil	98	73.4	1254	46.3
One	10	5.3	150	7.2
Two	19	14.2	279	16.6
Three	4	1.9	180	9.8
Four	2	2.2	112	4.7
Five	1	1.1	103	4.8
Six	I	.5	88	3.3
Seven	-	-	66	1.5
Eight	2	1.3	66	1.9
Nine	-	-	66	1.0
Ten - Fifteen	-	-	217	2.1
> Fifteen	-	-	183	0.8
Total	137	100.0	2764	100.0

Table 3.1.4.4 Number of standard drinks consumed on heaviest day of alcohol consumption NHS 2001

Standard Drinks	Lactating Mothers 1		Lactating Mothers 2		Lactating Mothers 3	
	n	%	n	%	n	%
Nil	728	54.5	648	52.8	648	51.3
One	96	6.4	90	6.8	90	7.1
Two	212	15.5	201	16.2	201	15.9
Three	109	7.1	102	7.3	102	8.1
Four	51	3.5	48	3.6	48	3.8
Five	53	3.8	51	3.9	52	4.0
Six	42	3.2	39	3.4	39	3.1
Seven	15	1.0	15	1.2	15	1.2
Eight	20	1.6	18	1.6	18	1.4
Nine	15	.9	14	1.0	14	1.1
Ten - Fifteen	25	1.5	21	1.3	21	1.7
> Fifteen	16	1.0	16	1.0	16	1.4
Total	1382	100.0	1263	100.0	1264	100.0

Figure 3.1.4.2 Number of standard drinks consumed on heaviest day of consumption during reference week NHS 2001



The majority of mothers, approximately 16%, have two standard drinks on their heaviest day of consumption during the reference week. This is followed by three standard drinks (–7%) and one standard drink (–7%). Pregnant women (73.4%) are most likely not to drink at all followed by mothers (-50%).

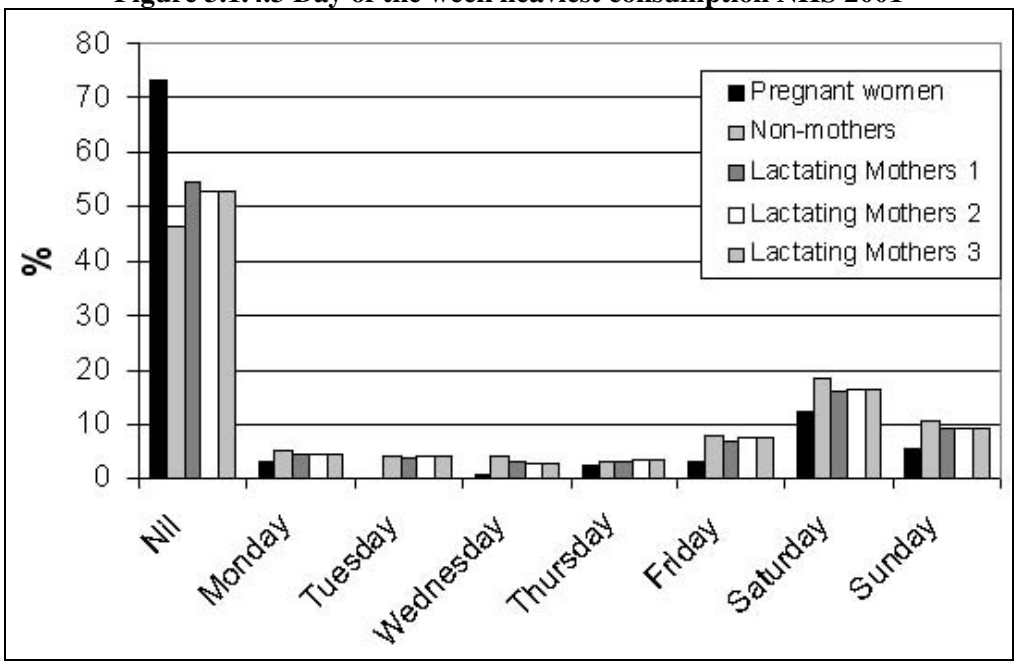
Table 3.1.4.5 Day of the week heaviest consumption NHS 2001

	Pregnant Women		Non-mothers	
	n	%	n	%
Not Applicable	98	73.4	1254	46.3
Monday	5	3.0	131	5.3
Tuesday	-	-	112	4.1
Wednesday	1	.9	114	4.1
Thursday	3	2.1	98	3.1
Friday	5	2.8	235	7.7
Saturday	18	12.3	532	18.6
Sunday	7	5.5	288	10.7
Total	137	100.0	2764	100.0

Table 3.1.4.6 Day of the week heaviest consumption NHS 2001

	Lactating Mothers 1		Lactating Mothers 2		Lactating Mothers 3	
	n	%	n	%	n	%
Nil	728	54.5	648	52.8	648	52.8
Monday	59	4.6	51	4.5	51	4.5
Tuesday	53	3.6	50	3.9	50	3.9
Wednesday	44	2.9	36	2.6	37	2.7
Thursday	45	2.8	46	3.2	46	3.2
Friday	102	6.6	100	7.2	100	7.2
Saturday	230	15.8	218	16.3	218	16.3
Sunday	121	9.1	114	9.4	114	9.4
Total	1382	54.5	1263	100.0	1264	100.0

Figure 3.1.4.3 Day of the week heaviest consumption NHS 2001



Friday, Saturday and Sunday are the days of heaviest consumption for all women who consume alcohol in the reference week.

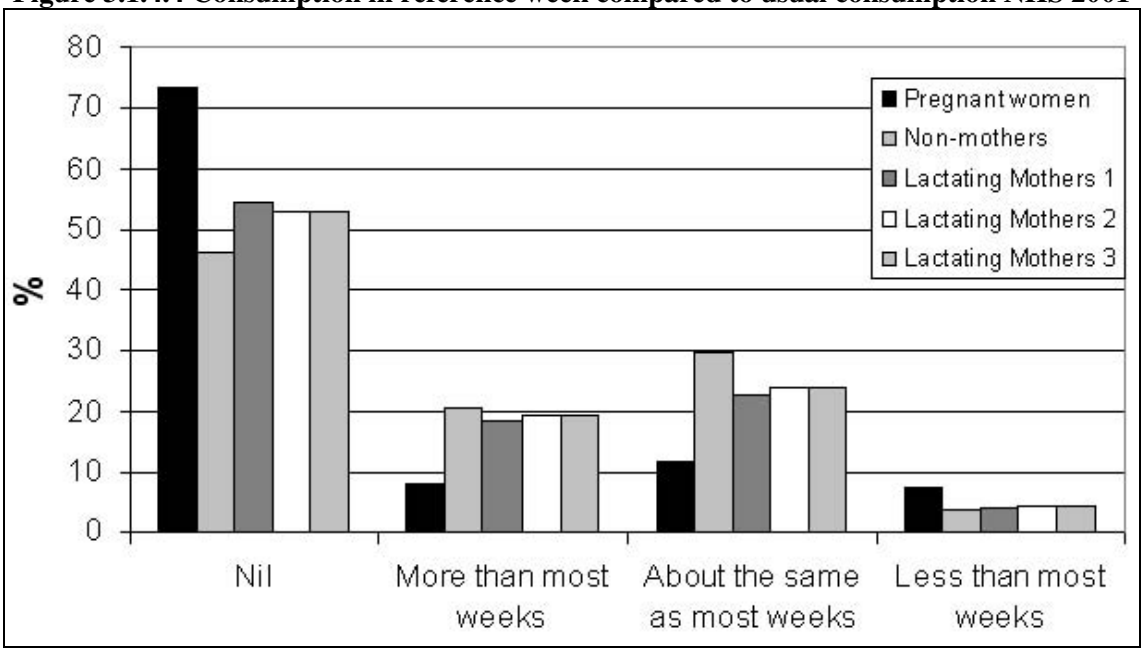
Table 3.1.4.7 Consumption in reference week compared to usual consumption NHS 2001

	Pregnant Women		Non-mothers	
	n	%	n	%
NA/Nil	1254	73.4	443	46.3
More than most weeks	567	7.8	289	20.5
About the same as most weeks	835	11.6	404	29.7
Less than most weeks	108	7.2	73	3.6
Total	2764	100.0	1209	100.0

Table 3.1.4.8 Consumption in reference week compared to usual consumption NHS 2001

	Lactating Mothers 1		Lactating Mothers 2		Lactating Mothers 3	
	n	%	n	%	n	%
Nil/NA	728	54.5	648	52.8	648	52.8
More than most weeks	263	18.6	248	19.2	249	19.3
About the same as most weeks	334	22.9	314	23.7	314	23.7
Less than most weeks	57	4.0	53	4.2	53	4.2
Total	1382	100.0	1263	100.0	1264	100.0

Figure 3.1.4.4 Consumption in reference week compared to usual consumption NHS 2001



Approximately a quarter of the Lactating Mothers reported that this level of alcohol intake (ie that amount consumed in the reference week) was 'about the same as most weeks', whereas approximately 30% of non-mothers reported this. The response for 'more than most weeks' is not dissimilar between Non-mothers and Lactating Mothers.

Following 'nil consumption' the majority of mothers (~10%) report drinking two standard drinks during the reference week. Given that approximately 20% of Lactating Mothers report that this level of consumption is 'more than most weeks' or 'about the same as most weeks' (~25%), Lactating Mothers are consuming alcohol in small amounts and within NHMRC recommendations

for women in general (National Health and Medical Research Council, 2001 #46).

However a further 5.6% of mothers are drinking between 10 to 15 standard drinks and approximately 4.5% are drinking more than 15 standard drinks during the reference week. Despite the fact that this intake is just within and/or above the NHMRC daily recommendations for all women it is alarming given that approximately 25% of Lactating Mothers report this level of consumption is 'about the same as most weeks'.

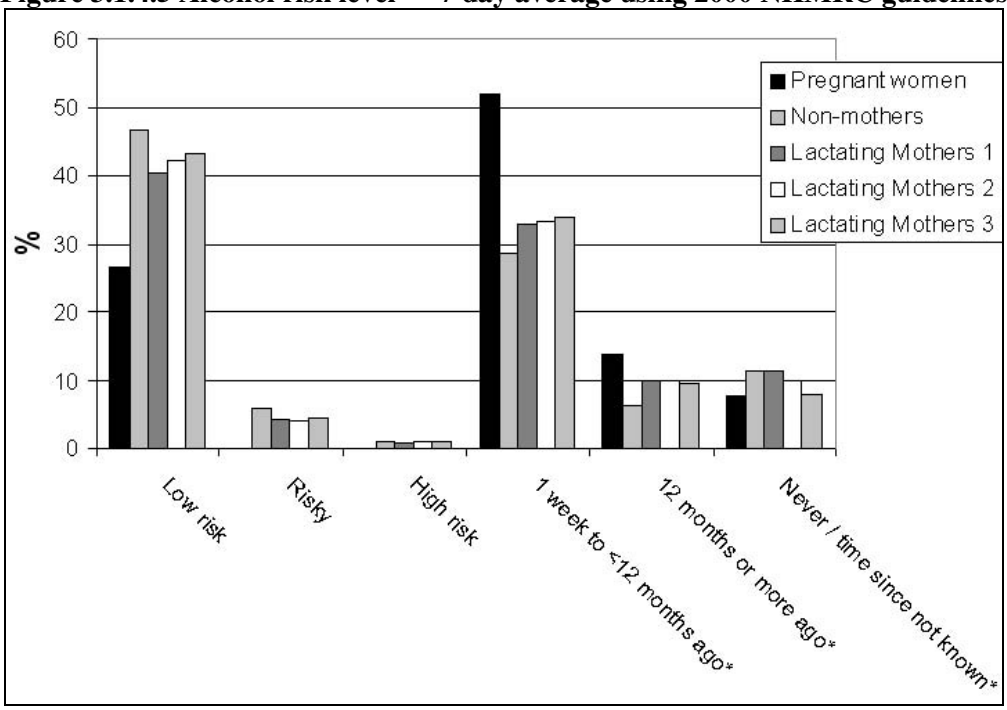
Table 3.1.4.9 Alcohol risk level — 7 day average using 2000 NHMRC guidelines NHS 2001

Risk Level	Pregnant Women		Non-mothers	
	n	%	n	%
Low risk	39	26.6	1299	46.5
Risky	-	-	174	6.0
High risk	-	-	37	1.2
Last consumed alcohol 1 week to less than 12 months ago	71	51.9	814	28.6
Last consumed alcohol 12 months or more ago	17	13.8	178	6.3
Never consumed alcohol or time since last consumed not known	10	7.6	262	11.4
Total	137	100.0	2764	100.0

Table 3.1.4.10 Alcohol risk level — 7 day average using 2000 NHMRC guidelines NHS 2001

	Lactating Mothers 1		Lactating Mothers 2		Lactating Mothers 3	
	n	%	n	%	n	%
Not applicable	5	0.2	-	-	-	-
Low risk	581	40.5	548	42.2	549	43.4
Risky	61	4.1	55	3.9	55	4.4
High risk	12	.9	12	1.0	12	1.0
Last consumed alcohol 1 week to less than 12 months ago	466	33.0	428	33.1	429	33.9
Last consumed alcohol12 months or more ago	128	9.9	118	9.9	118	9.4
Never consumed alcohol or time since last consumed not known	129	11.4	102	9.8	101	8.0
Total	1382	100.0	1263	100.0	1264	100.0

Figure 3.1.4.5 Alcohol risk level — 7 day average using 2000 NHMRC guidelines



* Time since last consumed alcohol

Without reporting those values not applicable (0.2% Lactating Mothers 1), Non-mothers are the highest risk drinkers with 1.2% and 6.0% being 'high risk' and 'risky', respectively. Interestingly, approximately 4% of mothers were in the 'risky' category.

More pregnant women than any other group reported both recent alcohol intake (1 week to less than 12 months ago) and remote alcohol intake (12 months or more ago).

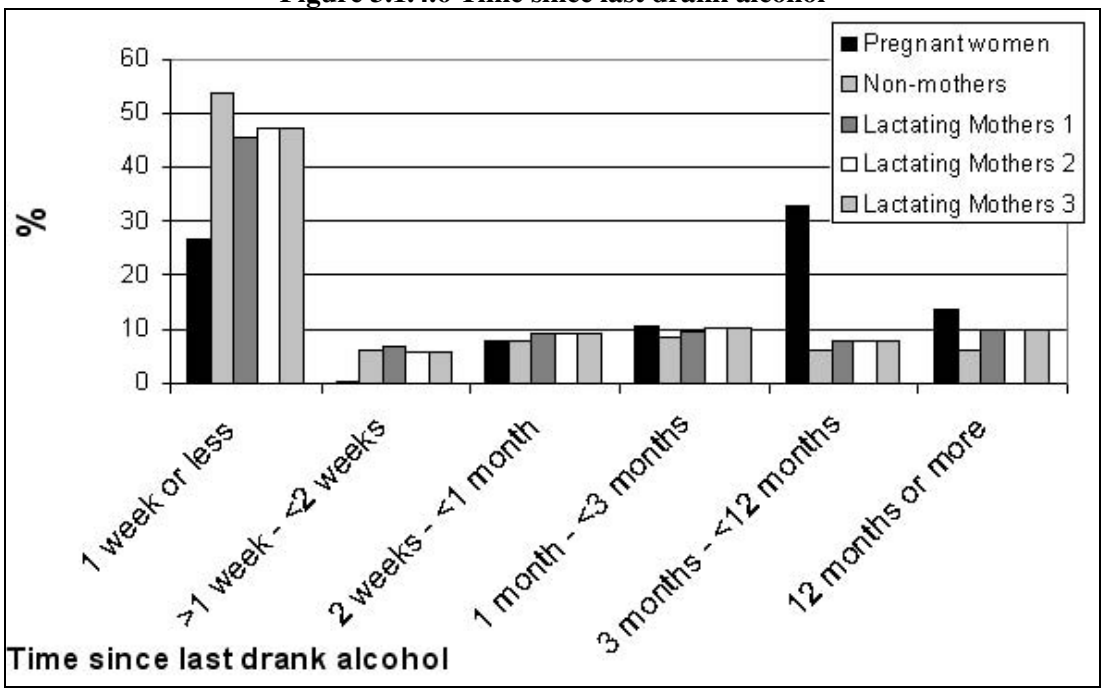
Table 3.1.4.11 Time since last drank alcohol NHS 2001

	Pregnant Women		Non-mothers	
	n	%	n	%
1 week or less	39	26.6	1510	53.7
More than 1 week to less than 2 weeks	2	.4	188	6.2
2 weeks to less than 1 month	12	7.8	224	7.6
1 month to less than 3 months	14	10.7	235	8.4
3 months to less than 12 months	43	33.1	167	6.3
12 months or more	17	13.8	178	6.3
Never	8	6.2	239	10.6
Not known	2	1.4	23	.8
Total	137	100.0	2764	100.0

Table 3.1.4.12 Time since last drank alcohol NHS 2001

	Lactating Mothers 1		Lactating Mothers 2		Lactating Mothers 3	
	n	%	n	%	n	%
Not applicable	5	.2	-			
1 week or less	654	45.5	615	47.2	616	47.2
More than 1 week to less than 2 weeks	101	6.5	89	6.1	90	6.1
2 weeks to less than 1 month	125	9.3	114	9.2	114	9.2
1 month to less than 3 months	137	9.7	129	10.2	129	10.2
3 months to less than 12 months	103	7.6	96	7.6	96	7.6
12 months or more	128	9.9	118	9.9	118	9.9
Never	117	10.5	92	9.1	91	9.0
Not known	12	.9	10	.7	10	.7
Total	1382	100.0	1263	100.0	1264	100.0

Figure 3.1.4.6 Time since last drank alcohol



Almost 50% of mothers had consumed alcohol in the previous week (or less) whereas just over 50% of Non-mothers were also within this time category. Approximately 30% of pregnant women had abstained from alcohol from 3 – 12 months and just less than 30% had consumed alcohol in the last week or less. Mothers' alcohol intake patterns are not dissimilar to non-mothers.

Table 3.1.4.13 Main drink type consumed NHS 2001

	Pregnant Women		Non-mothers	
	n	%	n	%
Not applicable	98	73.4	1254	46.3
Low alcohol beer	1	.4	41	1.7
Mid strength beer	1	.1	32	1.1
Full strength beer	2	1.6	137	4.6
Wine/champagne	22	17.3	794	28.2
Spirits/liquor	11	6.3	445	16.2
Fortified wine	1	.7	23	.8
Other	1	.3	38	1.2
Total	137	100.0	2764	100.0

Table 3.1.4.14 Main drink type consumed NHS 2001

	Lactating Mothers 1		Lactating Mothers 2		Lactating Mothers 3	
	n	%	n	%	N	%
Not applicable	728	54.5	648	52.8	648	52.8
Low alcohol beer	17	1.5	15	1.3	15	1.3
Mid strength beer	14	.9	13	.9	13	.9
Full strength beer	73	4.9	66	5.1	67	5.2
Wine/champagne	325	23.4	308	24.4	308	24.4
Spirits/liquor	199	13.2	189	13.7	189	13.7
Fortified wine	9	.6	9	.7	9	.7
Other	17	1.1	15	1.0	15	1.0
Total	1382	100.0	1263	100.0	1264	100.0

Wine and champagne are the main drink types consumed by all women followed by spirits/liquor.

3.2 National Health Survey 1995

The 1995 National Health Survey (1995 NHS) was conducted on a multistage area sample of private dwellings and a list sample of non-private dwellings in all States and Territories of Australia. The final sample size was 21 77 households. Information was obtained by personal interview with each adult member of the selected household. Children aged 0-14 years were not interviewed and responses were provided on behalf of the child by an adult, generally a parent, and the mother in approximately 80% of cases.

Four questionnaires were used in the 1995 NHS; household form (demographic information), personal interview questionnaire (health related), general health and well-being form (given to adults in selected households to self complete) and the women's health supplementary form (women's health issues).

In the 1995 NHS, information about alcohol consumption was recorded for seven general categories of alcoholic drinks: extra/special light beer, low alcohol beer, full-strength beer, wine, spirits, fortified wine and other alcoholic beverages. Respondents were asked if in the last seven days they had consumed any alcoholic drinks and those who answered yes were then asked on which days of the preceding week they consumed those drinks. Details of the quantity of each of these drinks consumed on (up to) the last three days in the week prior to the day of interview were recorded. Quantities were recorded in terms of standard measures where possible; otherwise a description of the quantity consumed was recorded by interviewers.

A system was developed to calculate in millilitres the amount of pure alcohol contained in the drinks, which respondents reported they had consumed. This system used information about the type of alcoholic drinks consumed (including brand name for common drinks), and the size and number of drinks consumed; a conversion factor was applied to this information to obtain the amount of pure alcohol consumed. Conversion factors tailored to specific drinks/drink types were included in the system.

3.2.1 Data Assumptions

National Health Survey 1995

Once again it is not possible to identify mothers of children in the 1995 NHS therefore the following data assumptions have been made.

- Mothers

Lactating Mothers 1: contains any mother of a child less than four years in the same household.

Lactating Mothers 2: contains a breastfeeding mother of any child less than four years in the same household.

- Fathers

Fathers are selected using the household variable (ie husband, lone parent) together with gender (male). The father definition assumes all the cases selected out are the father of any child under four in the same household.

- Not applicable

It is assumed that a not applicable response is nil consumption of alcohol. The high numbers of not applicable responses are recorded as a nil alcohol intake.

Women who do not have any children are those women aged between 18 — 44 years and report not having children (e.g. couple without children). They are referred to as Non-mothers. Pregnant women are those women who report that they are 'currently pregnant' in response to question 28, ie 'Why don't you or your partner use contraception?'.

3.2.2 Estimation Procedure

In the unit record data, the Australian Bureau of Statistics (ABS) provides a weighting for each person to be used when estimating parameters for the Australian population. All proportions in this report were calculated using the weighted estimates and are presented together with the sample population

3.2.3 Cohort Characteristics

Excluding missing values there are 1483 women within Lactating Mothers one and two. There are 983 and 1102 missing values from 'Lactating Mothers 1' and 2, respectively. The similarity between the sample population gives strength to the method used to extract these women from the dataset. There are 137 pregnant women and 2764 Non-mothers.

Table 3.2.3.1 Age of women NHS 1995

Age (years)	Pregnant Women		Non-mothers	
	n	%	n	%
18 – 19	-	-	81	5.6
20 – 24	14	13.2	379	26.6
25 – 29	27	35.7	335	21.9
30 – 34	22	29.1	259	17.0
35 – 39	12	15.1	215	14.1
40 – 44	8	6.7	220	14.8
45 – 49	1	.2	-	-
Total	84	100.0	1489	100.0

Table 3.2.3.2 Age of Mothers as defined NHS 1995

Age (years)	Lactating Mothers 1		Lactating Mothers 2	
	n	%	n	%
10 - 14	1	.1		
16	3	1		
17	5	.2		
18 - 19	31	1.1	15	1.2
20 – 24	354	12.4	166	11.3
25 – 29	819	26.7	385	25.7
30 – 34	1062	34.6	528	35.6
35 - 39	544	17.8	251	16.4
40 - 44	191	5.8	94	6.0
45 - 49	22	.9	22	2.0
50 - 54	5	.1	9	.6
55 - 59	3	.2	8	.8
60 - 64	1	.1	5	.3
Total	3041	100	1483	100.0

The majority of pregnant mothers are aged between 25 and 34 years. Most of the Non-mothers are between 20 and 29 years whereas the mothers are similar to the pregnant women with the majority being aged between 25 and 34 years.

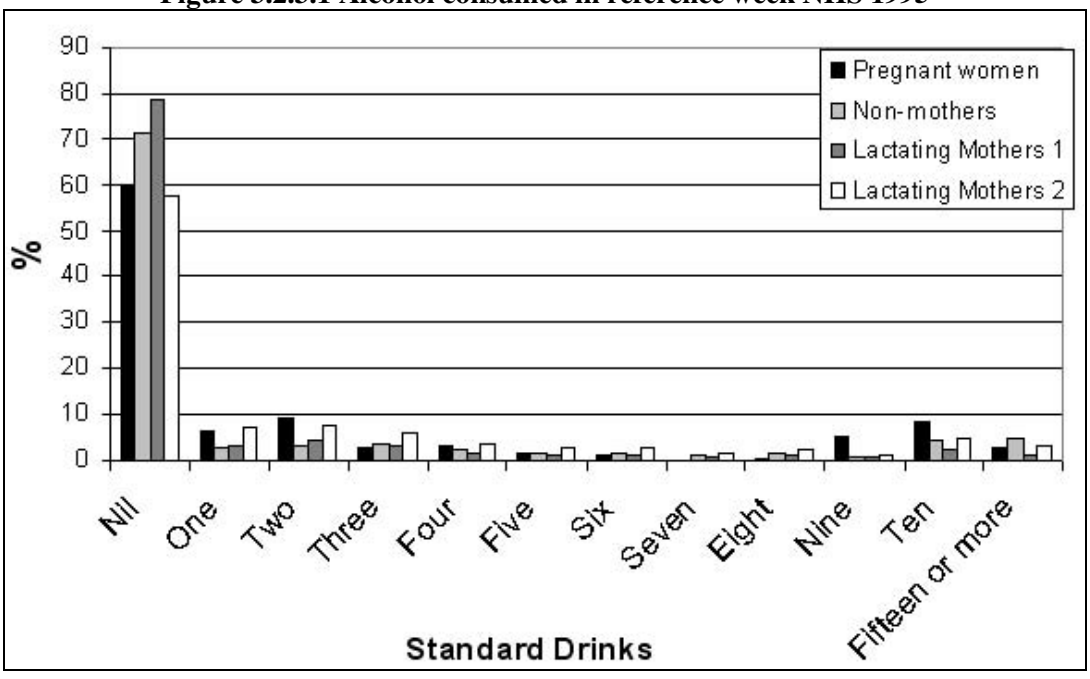
Table 3.2.3.3 Alcohol consumed in reference week NHS 1995

Standard Drinks	Pregnant Women		Non-mothers	
	n	%	n	%
Nil	46	59.7	1052	71.2
One	6	6.5	36	2.8
Two	8	9.1	49	3.2
Three	3	2.6	61	3.5
Four	3	3.0	35	2.2
Five	2	1.8	26	1.6
Six	1	1.1	32	1.9
Seven	-	-	22	1.5
Eight	1	.6	26	1.7
Nine	5	5.1	10	.8
Ten - Fifteen	1	8.2	17	4.5
>Fifteen	8	2.5	123	5.0
Total	84	100.0	1489	100.0

Table 3.2.3.4 Alcohol consumed in reference week NHS 1995

Standard Drinks	Lactating Mothers 1		Lactating Mothers 2	
	n	%	n	%
Nil	2368	78.8	834	57.5
One	88	3.1	93	7.2
Two	132	4.3	118	7.6
Three	104	3.0	100	5.9
Four	52	1.6	52	3.4
Five	40	1.3	38	2.6
Six	47	1.4	43	2.6
Seven	29	.9	27	1.6
Eight	39	1.1	36	2.2
Nine	19	.7	19	1.5
Ten - Fifteen	72	2.4	71	4.6
> Fifteen	50	1.5	51	3.1
Total	3040	100.0	1482	100.0

Figure 3.2.3.1 Alcohol consumed in reference week NHS 1995



The majority of all women did not consume alcohol in the reference week. Interestingly pregnant women most often consumed one and two drinks and were the group consuming alcohol at the higher levels (nine, ten and >15 standard drinks). 'Lactating Mothers 2' were higher consumers than any other groups at two to eight standard drinks.

Table 3.2.3.5 Amount consumed (ml)[a] on day of heaviest alcohol consumption from last 3 days in reference week NHS 1995

mls of alcohol	Pregnant Women		Non-mothers	
	n	%	n	%
Not applicable	46	59.7	1052	71.2
1 to 19 mls	16	16.9	107	7.3
20 to 39 mls	5	4.4	99	6.1
40 to 59 mls	8	7.8	88	5.8
60 to 79 mls	2	.7	51	3.1
80 to 99 mls	2	3.8	36	2.5
100 to 199 mls	5	6.7	49	3.5
200 to 299 mls	-	-	5	.4
Over 300 mls	-	-	2	.2
Total	84	100.0	1489	100.0

[a] One standard drink contains 12.5m1 of alcohol.

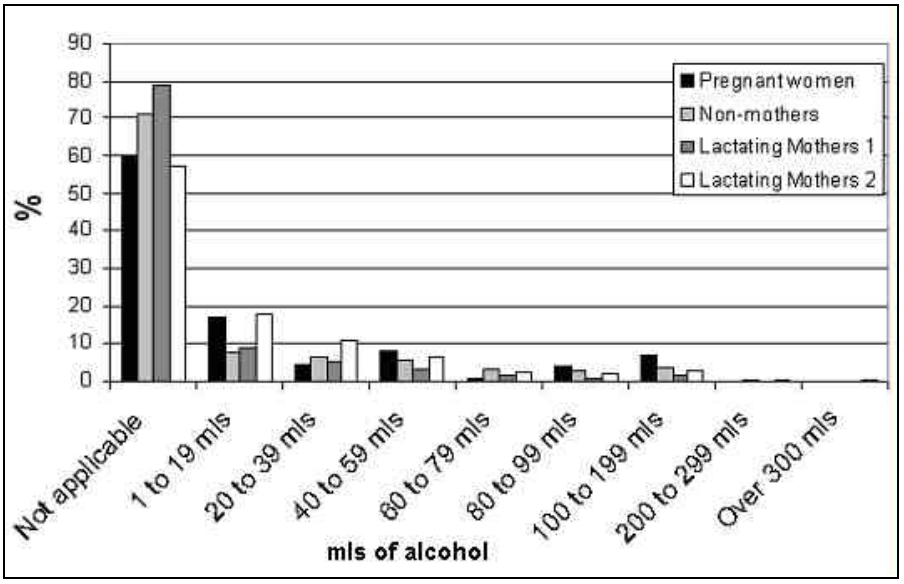
Table 3.2.3.6 Amount consumed (ml)[a] on day of heaviest alcohol consumption from last 3 days in reference week NHS 1995

mls of alcohol	Lactating Mothers 1		Lactating Mothers 2	
	n	%	n	%
Not applicable	2368	78.8	834	57.5
1 to 19 mls	267	8.7	257	17.7
20 to 39 mls	181	5.5	177	11.0
40 to 59 mls	101	3.2	96	6.2
60 to 79 mls	38	1.2	36	2.3
80 to 99 mls	29	.9	27	1.7
100 to 199 mls	43	1.3	41	2.5
200 to 299 mls	8	.2	9	.6
Over 300 mls	6	.2	6	.5
Total	3041	100.0	1483	100.0

[a] One standard drink contains 12.5m1 of alcohol.

Amount of alcohol consumed on the heaviest day of consumption for the last three days in the reference week from the 1995 NHS is grouped in the categories as shown in Tables 3.2.3.2 and 3.2.3.3 and is not provided in total millilitres of alcohol consumption and is therefore unable to be presented as standard drinks.

Figure 3.2.3.2 Amount of alcohol consumed on heaviest day of consumption during reference week NHS 1995



The majority of women consumed between one to 19mls of alcohol (approximately 1.5 standard drinks) on their heaviest day of alcohol consumption. 'Lactating Mothers 2' were higher consumers of alcohol than 'Lactating Mothers l'and consumed alcohol at levels not dissimilar to Non-mothers.

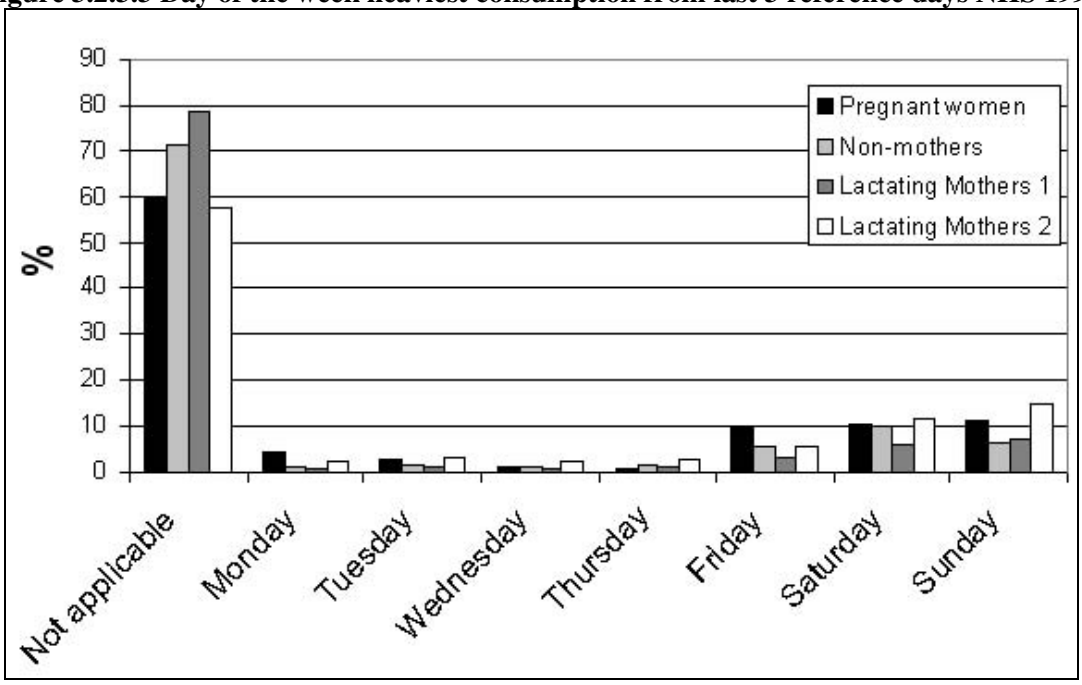
Table 3.2.3.7 Day of the week heaviest consumption from last 3 reference days NHS 1995

	Pregnant Women		Non-mothers	
	n	%	n	%
Not applicable	46	59.7	1052	71.2
Monday	3	4.3	20	1.4
Tuesday	2	2.7	27	1.8
Wednesday	1	1.1	26	1.5
Thursday	1	.7	30	1.8
Friday	7	9.5	91	5.8
Saturday	10	10.6	143	10.0
Sunday	14	11.4	100	6.6
Total	84	100.0	1489	100.0

Table 3.2.3.8 Day of the week heaviest consumption from last 3 reference days NHS 1995

Day	Lactating Mothers 1		Lactating Mothers 2	
	n	%	n	%
Not applicable	2368	78.8	834	57.5
Monday	33	1.0	32	2.2
Tuesday	44	1.5	43	3.2
Wednesday	36	1.0	36	2.3
Thursday	37	1.3	35	2.5
Friday	103	3.1	95	5.8
Saturday	199	6.1	191	11.9
Sunday	221	7.1	217	14.7
Total	3041	100.0	1483	100.0

Figure 3.2.3.3 Day of the week heaviest consumption from last 3 reference days NHS 1995



Friday, Saturday and Sunday were the heaviest days of alcohol consumption for all groups.

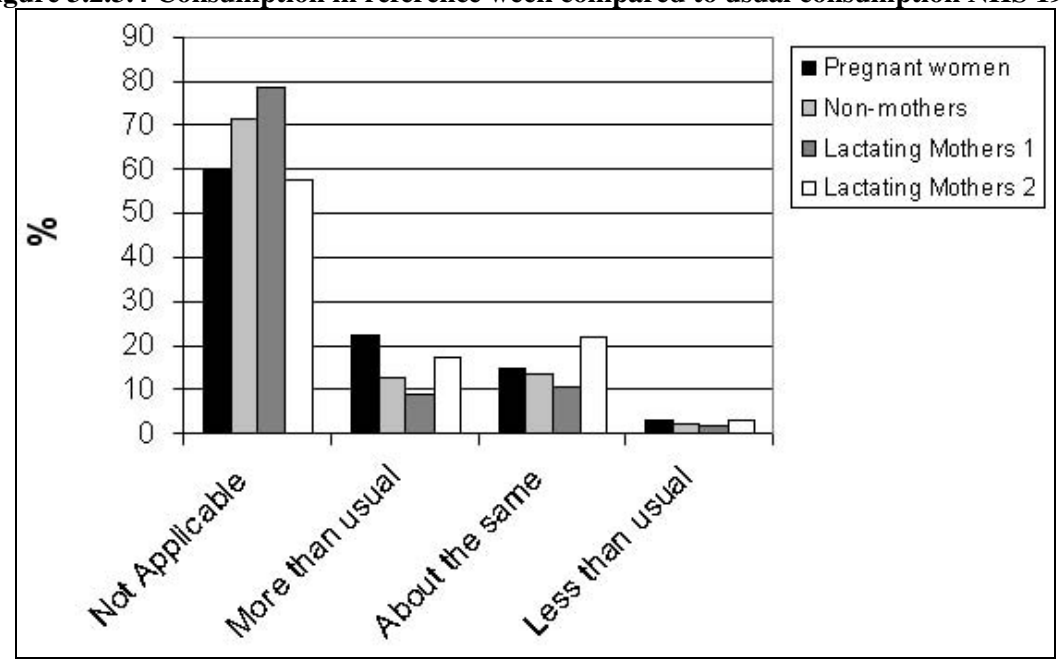
Table 3.2.3.9 Consumption in reference week compared to usual consumption NHS 1995

	Pregnant Women		Non-mothers	
	n	**%**	**n**	**%**
Not Applicable	46	59.7	1052	71.2
More than usual	19	22.1	182	12.9
About the same	16	15.2	219	13.7
Less than usual	3	3.0	36	2.3
Total	84	100.0	1489	100.0

Table 3.2.3.10 Consumption in reference week compared to usual consumption NHS 1995

	Lactating Mothers 1		Lactating Mothers 2	
	n	%	n	%
Not Applicable	2368	78.8	834	57.5
More than usual	289	9.0	272	17.4
About the same	335	10.5	329	21.70
Less than usual	49	1.7	48	3.4
Total	3041	100.0	1483	100.0

Figure 3.2.3.4 Consumption in reference week compared to usual consumption NHS 1995



Over 20% of pregnant women reported that their intake during the reference week was more than usual, possibly accounting for the higher alcohol intakes (10 to >15 standard drinks) of approximately 10% of pregnant women. It is interesting that 27% of 'Lactating Mothers 2' mothers report their alcohol intake during the reference week was 'about the same' given that 'Lactating Mothers 2'mothers have a higher intake at three, four, five, six, seven and eight standard drinks than all other groups of women. Approximately 22% and 15% of pregnant women report that this level of intake is 'higher than usual' and 'about the same' as usual, respectively and may account in part for the high level of pregnant women consuming alcohol at the higher levels (nine, 10 and >15 standard drinks).

Alcohol risk was not calculated in the 1995 NHS, however it has been calculated using the 'estimated total daily consumption of alcohol (in millilitres) for the reference week' and 'period since last drank alcohol' (including never drank) and applying this information to develop NHMRC risk levels (National Health and Medical Research Council 2001).

Table 3.2.3.11 Alcohol risk level — 7 day average using 2000 NHMRC guidelines (using 2000 guidelines) NHS 1995

Risk Level	Pregnant women		Non-mothers	
	n	%	n	%
Low risk	74	87.3	566	81.1
Risky	3	2.8	55	8.5
High risk	1	1.2	21	2.7
Last consumed alcohol 1 week to less than 12 months ago	-	-	-	-
Last consumed alcohol 12 months or more ago	6	8.7	28	4.1
Never consumed alcohol or time since last consumed not known	-	-	27	3.5
Total	84	100.0	697*	100.0

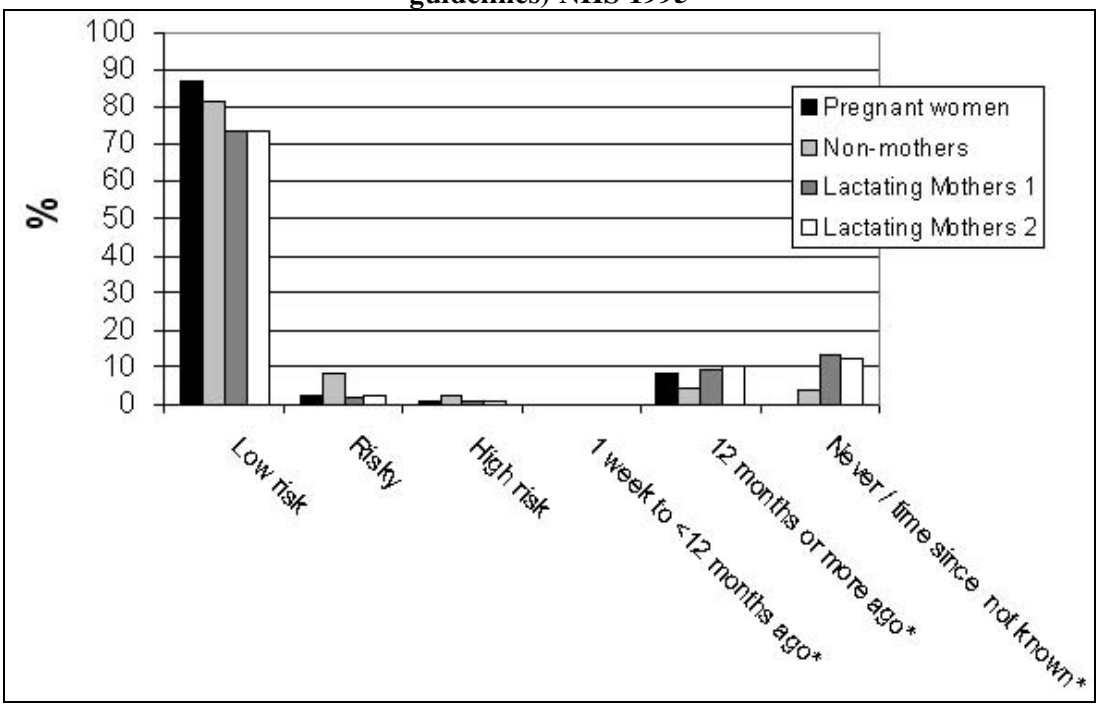
*A total of 792 missing values occurs when calculating to the NHMRC risk levels.

Table 3.2.3.12 Alcohol risk level – 7 day average using 2000 NHMRC guidelines (using 2000 guidelines) NHS 1995

Risk Level	Lactating Mothers 1		Lactating Mothers 2	
	n	%	n	%
Low risk	1141	73.5	1090	73.4
Risky	43	2.4	44	2.5
High risk	14	.9	15	1.1
Last consumed alcohol 1 week to less than 12 months ago	-	-	-	-
Last consumed alcohol 12 months or more ago	154	9.8	152	10.1
Never consumed alcohol or time since last consumed not known	184	13.3	166	12.6
Total	1536[a]	100.0	1467[a]	100.0

[a] A total of 1550 missing values for 'Lactating Mothers 1'and 1619 missing values for 'Lactating Mothers 2'occur when calculating to the NHMRC risk levels.

Figure 3.2.3.5 Alcohol risk level — 7 day average using 2000 NHMRC guideline (using 2000 guidelines) NHS 1995



The majority of all women consume alcohol at low risk levels, with higher proportions of the Non-mothers consuming alcohol at 'Risky' (8.5%) and 'High risk' (2.7%) levels. Lactating Mothers were most likely not to have consumed alcohol in the last 12 months or did not drink at all.

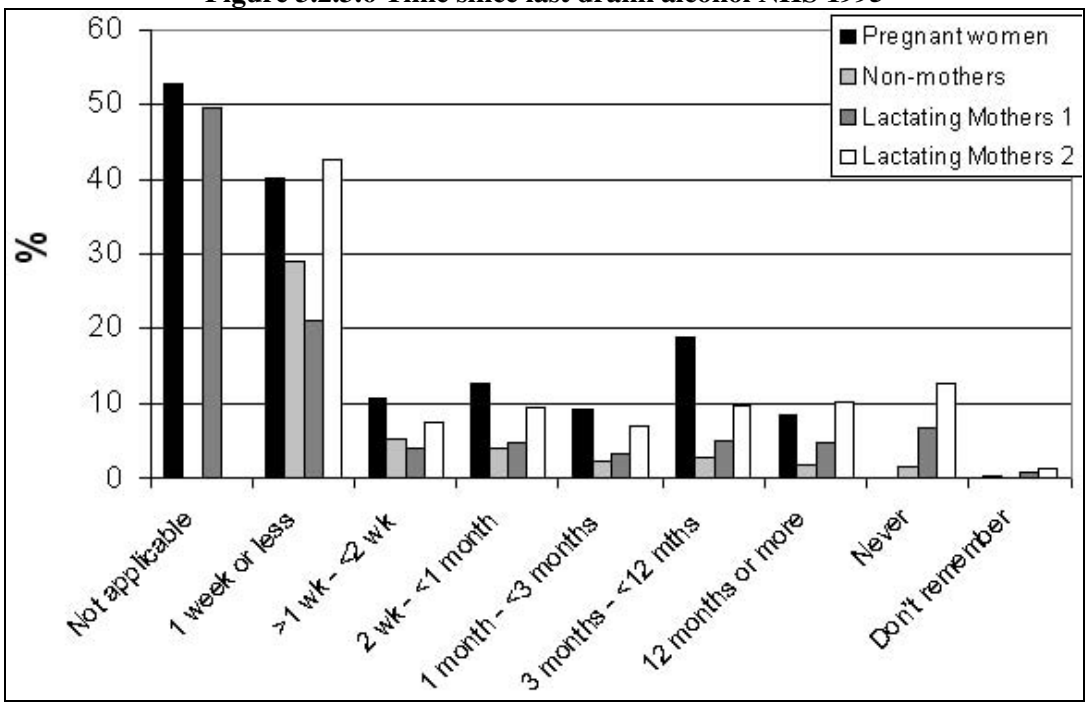
Table 3.2.3.13 Time since last drank alcohol NHS 1995

	Pregnant Women		Non-mothers	
	n	%	n	%
Not applicable	788	52.7		
1 week or less	38	40.3	437	28.8
> 1 wk -<2 wk	7	10.6	66	5.3
2 wk - <1 month	9	12.6	60	4.1
1 month - <3 months	7	9.0	39	2.5
3 months - <12 mths	17	18.8	40	2.6
12 months or more	6	8.7	28	1.9
Never	-	-	27	1.6
Don't remember	4	.4		
Total	84	100.0	1489	100.0

Table 3.2.3.14 Time since last drank alcohol NHS 1995

	Lactating Mothers 1		Lactating Mothers 2	
	n	%	n	%
Not applicable	1486	49.5	-	-
1 week or less	673	21.2	649	42.5
> 1 wk -<2 wk	130	3.9	120	7.4
2 wk - <1 month	137	4.9	130	9.5
1 month - <3 months	109	3.3	110	7.0
3 months - <12 mths	149	5.0	140	9.6
12 months or more	154	4.9	152	10.1
Never	184	6.6	166	12.6
Don't remember	19	.7	16	1.3
Total	3041	100.0	1483	100.0

Figure 3.2.3.6 Time since last drank alcohol NHS 1995



Approximately 40% of pregnant women and 'Lactating Mothers I 'had consumed alcohol in the previous week (or less) whereas just less than 30% of Non-mothers and 21.2% of 'Lactating Mothers 2'were also within this time category. Once again pregnant women and 'Lactating Mothers 2'were those women most likely to have consumed alcohol in the recent past ('>one week to < two weeks' and two weeks to less than one month').

Approximately 20% of pregnant women had abstained from alcohol from 3 – <12 months, which is not unlike the pattern for abstinence seen in the 2001 NHS.

Table 3.2.3.15 Main drink type consumed NHS 1995

	Pregnant Women		Non-mothers	
	n	%	N	%
Low alcohol beer	3	3.6	28	1.9
Mid strength beer	2	2.4	9	0.6
Full strength beer	9	10.7	118	7.9
Wine	25	29.8	273	18.3
Spirits	10	11.9	161	10.8
Fortified wine	2	2.4	14	0.9
Other	-	-	44	3

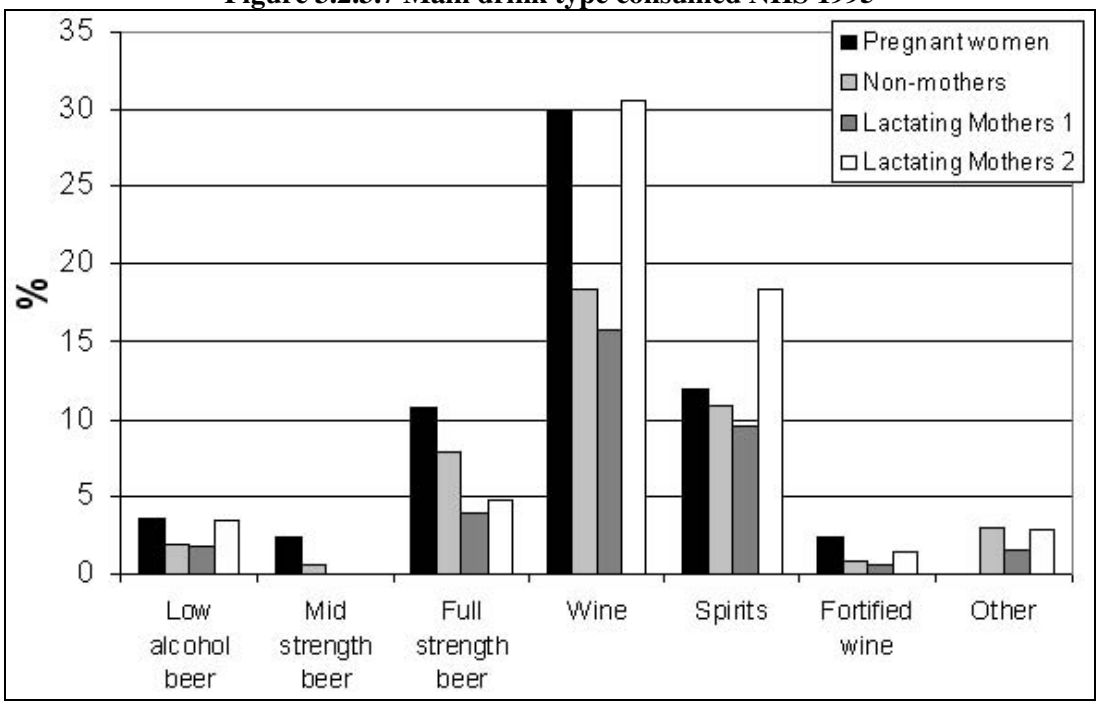
Multiple response question

Table 3.2.3.16 Main drink type consumed NHS 1995

	Lactating Mothers 1		Lactating Mothers 2	
	n	%	n	%
Low alcohol beer	45	1.8	44	3.5
Mid strength beer	22	-	21	
Full strength beer	118	4	117	4.8
Wine	401	15.7	388	30.5
Spirits	202	9.5	195	18.4
Fortified wine	20	0.7	19	1.4
Other	42	1.5	38	2.8

Multiple response question.

Figure 3.2.3.7 Main drink type consumed NHS 1995



Wine, followed by spirits then full strength beer were the most popular drink types for all women. This is reflected in the 2001 NHS.

3.3 Fathers from the 1995 and 2001 National Health Survey

3.3.1 Cohort characteristics

There are 2596 and 926 fathers in the 1995 and 2001 NHS, respectively. In the 1995 NHS sample there are 490 missing values and 1439 missing values in the 2001 NHS.

Table 3.3.1.1 Age of Fathers 1995 and 2001 NHS

Age (yrs)	Fathers 1995		Fathers 2001	
	n	%	n	%
17	1	.0	-	-
18 - 19	3	.2	4	.4
20 - 24	104	4.0	30	3.3
25 - 29	482	18.2	126	13.8
30 - 34	854	31.4	296	32.4
35 - 39	709	28.4	276	29.2
40 – 44	303	11.8	122	12.6
45 – 49	103	4.4	44	4.8
50 – 54	25	1.0	17	2.0
55 – 59	8	.3	6	.7
60 – 64	3	.2	2	.3
65 - 69	1	.1	3	.5
Total	2596	100.0	926	100.0

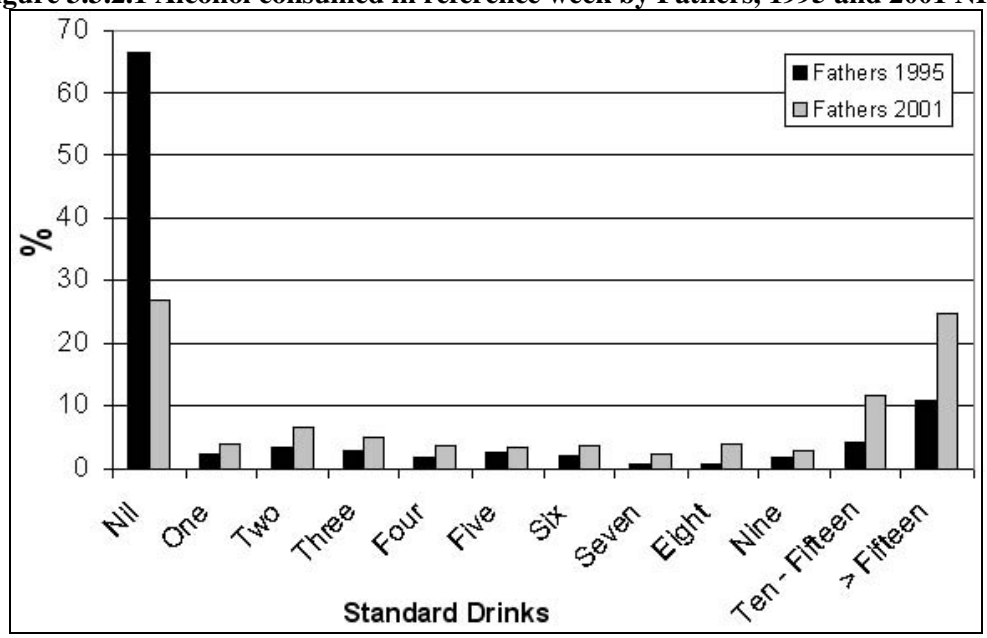
There are a slightly greater proportion of fathers in the older age groups in the 1995 NHS than the 2001 NHS. The majority of fathers in both surveys fall between the 30 – 34 and 35 – 39 age groups.

3.3.2 Alcohol intake

Table 3.3.2.1 Alcohol consumed in reference week by Fathers, 1995 and 2001 NHS

Standard Drinks	Fathers 1995		Fathers 2001	
	n	%	N	%
Nil	1690	66.4	237	26.8
One	61	2.4	36	4.1
Two	89	3.4	63	6.7
Three	76	3.0	46	5.0
Four	42	1.6	32	3.9
Five	65	2.6	39	3.6
Six	52	1.9	37	3.8
Seven	29	1.0	21	2.3
Eight	29	.9	37	4.1
Nine	41	1.6	28	3.0
Ten - Fifteen	115	4.2	1 11	11.7
> Fifteen	305	11.0	239	25.0
Total	2596	100.0	926	100.0

Figure 3.3.2.1 Alcohol consumed in reference week by Fathers, 1995 and 2001 NHS



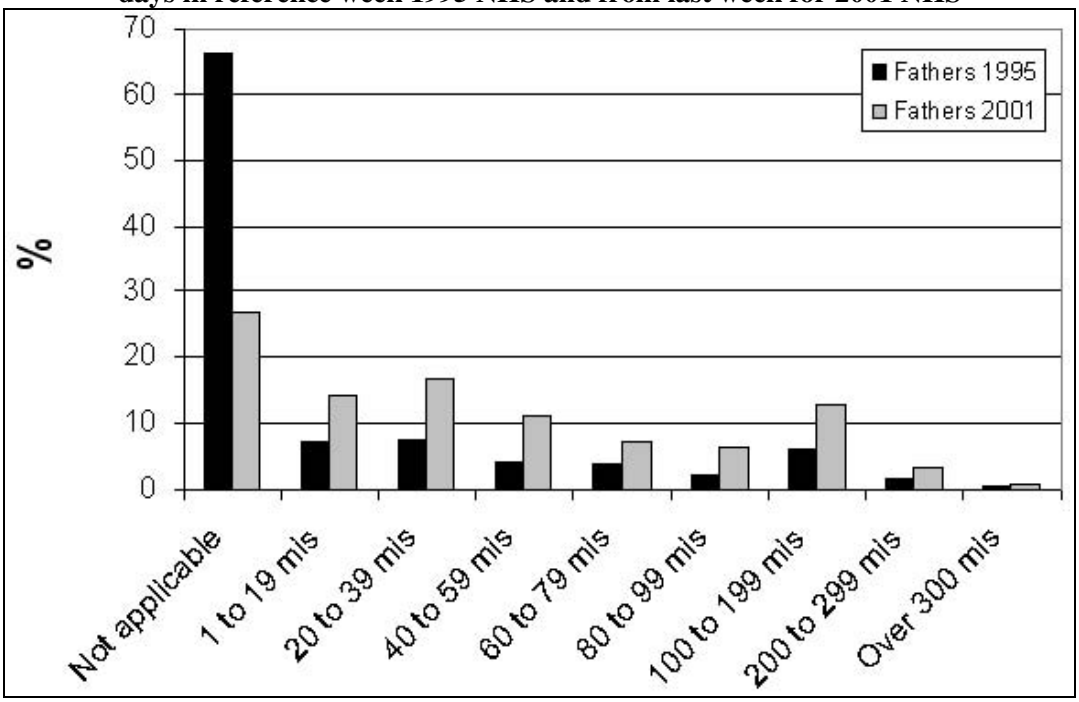
At all levels of alcohol intake, there are more fathers from the NHS 2001 consuming alcohol. More fathers from the NHS 1995 report not drinking alcohol during the reference week. There is almost twice the number of NHS 2001 fathers consuming alcohol at all levels of alcohol intake.

Table 3.3.2.2 Amount consumed (ml) on day of heaviest alcohol consumption from last 3 days in reference week 1995 NHS and from last week for 2001 NHS

	Fathers 1995		Fathers 2001	
	n	%	n	%
Not applicable	1690	66.4	237	26.8
1 to 19 mis	188	7.3	131	14.3
20 to 39 mis	200	7.5	162	16.8
40 to 59 mis	122	4.4	106	11.3
60 to 79 mis	103	4.0	68	7.3
80 to 99 mis	53	2.0	60	6.3
100 to 199 mis	174	6.2	121	12.8
200 to 299 mis	51	1.6	33	3.5
Over 300 mis	15	.7	8	.9
Total	2596	100.0	926	100.0

[a] for 1995 consumption from last 3 reference days
[b] 12.5m1 of alcohol is equivalent to one standard drink

Figure 3.3.2.2 Amount consumed (ml) on day of heaviest alcohol consumption from last 3 days in reference week 1995 NHS and from last week for 2001 NHS



On the heaviest day of alcohol consumption fathers from the NHS 2001 were consuming higher amounts than fathers from the NHS 1995. Only a small proportion of fathers from both populations were consuming alcohol at the higher levels of intake, however there were still over 10% of fathers NHS 2001 consuming 100 — 199m1s on their heaviest day of alcohol consumption which is equivalent to eight to 16 standard drinks. This is greater than the NHMRC recommendations (National Health and Medical Research Council 2001).

Table 3.3.2.3 Number of standard drinks consumed on heaviest day of alcohol 2001 NHS (converted from mis alcohol consumed from last week 2001 NHS)

Standard Drinks	Fathers 2001	
	n	%
Nil	237	26.8
One	51	5.9
Two	113	11.9
Three	118	12.0
Four	48	5.6
Five	76	7.7
Six	54	5.9
Seven	34	3.5
Eight	36	3.9
Nine	41	4.2
Ten - Fifteen	76	8.0
>Fifteen	42	4.5
Total	926	100.0

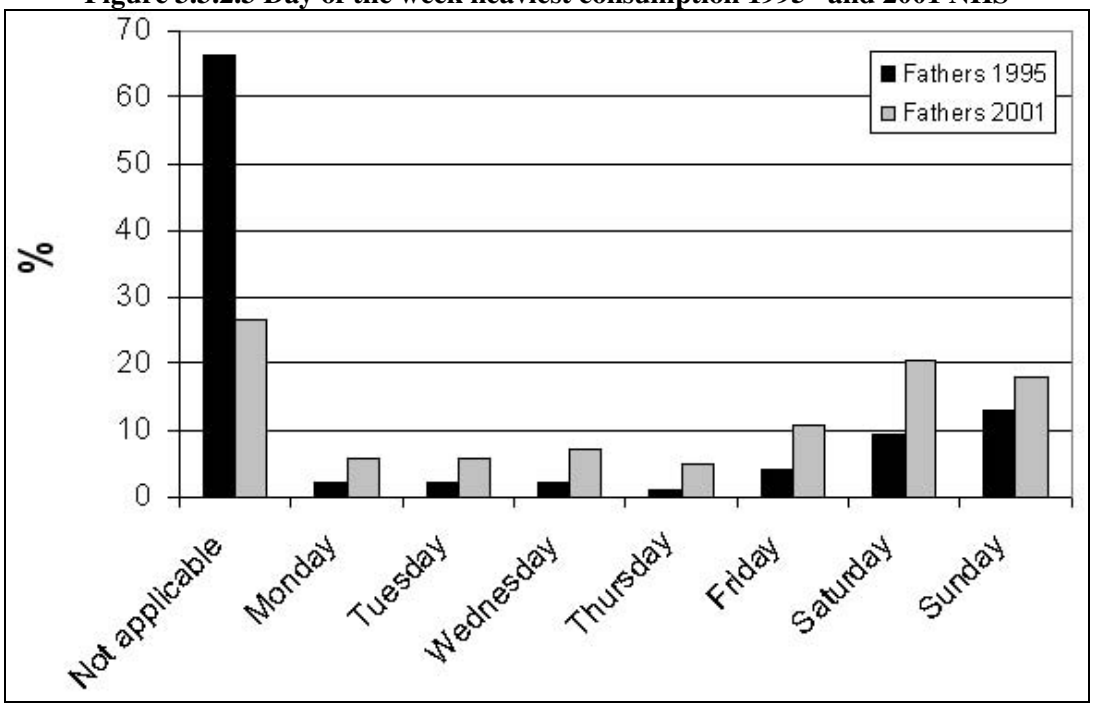
This information not available for 1995 as alcohol was already grouped into millilitres (see table 3.3.2.2)

Table 3.3.2.4 Day of the week heaviest consumption 1995* and 2001 NHS

	Fathers 1995		Fathers 2001	
	n	%	n	%
Not applicable	**1690**	**66.4**	**237**	**26.8**
Monday	**52**	**2.1**	**56**	**5.7**
Tuesday	**53**	**2.0**	**55**	**5.7**
Wednesday	**64**	**2.1**	**63**	**7.1**
Thursday	**42**	**1.2**	**48**	**5.2**
Friday	**108**	**4.1**	**98**	**10.8**
Saturday	**260**	**9.3**	**197**	**20.5**
Sunday	**327**	**12.8**	**172**	**18.1**
Total	**2596**	**100.0**	**926**	**100.0**

* for 1995 consumption from last 3 reference days

Figure 3.3.2.3 Day of the week heaviest consumption 1995* and 2001 NHS

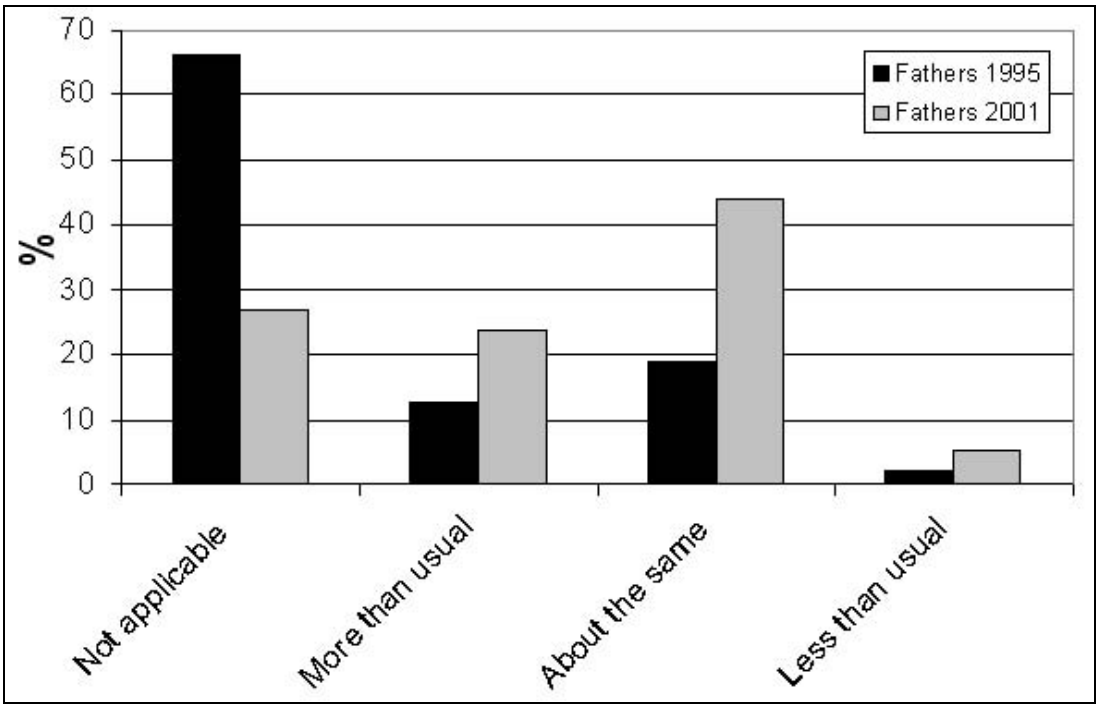


The heaviest days of consumption for all fathers (both NHS 1995 and 2001) was Friday, Saturday and Sunday, however these days of consumption were not as distinct as for the mothers in the NHS 1995 and 2001. A greater proportion of NHS 1995 fathers reported not drinking given that a not applicable response is assumed to be nil consumption of alcohol.

Table 3.3.2.5 Consumption in reference week compared to usual consumption 1995 and 2001 NHS

	Fathers 1995		Fathers 2001	
	n	%	n	%
Not applicable	1689	66.3	237	26.8
More than usual	344	12.5	224	23.7
About the same	503	18.9	416	44.2
Less than usual	60	2.3	49	5.3
Total	2596	100	926	100.0

Figure 3.3.2.4 Consumption in reference week compared to usual consumption 1995 and 2001 NHS



Almost half of fathers from the NHS 2001 reported their level of intake as 'about the same' as usual which is encouraging given that the majority of these fathers report nil consumption (26.8%) or consuming 10 — 15 standard drinks (11.7%) in a week which would be equivalent to approximately 1.5 — 2 standard drinks per day over the period of one week. Only 0.4% of fathers from the NHS 2001 and 4.1% from the NHS 1995 report having 31 standard drinks[1] which is the

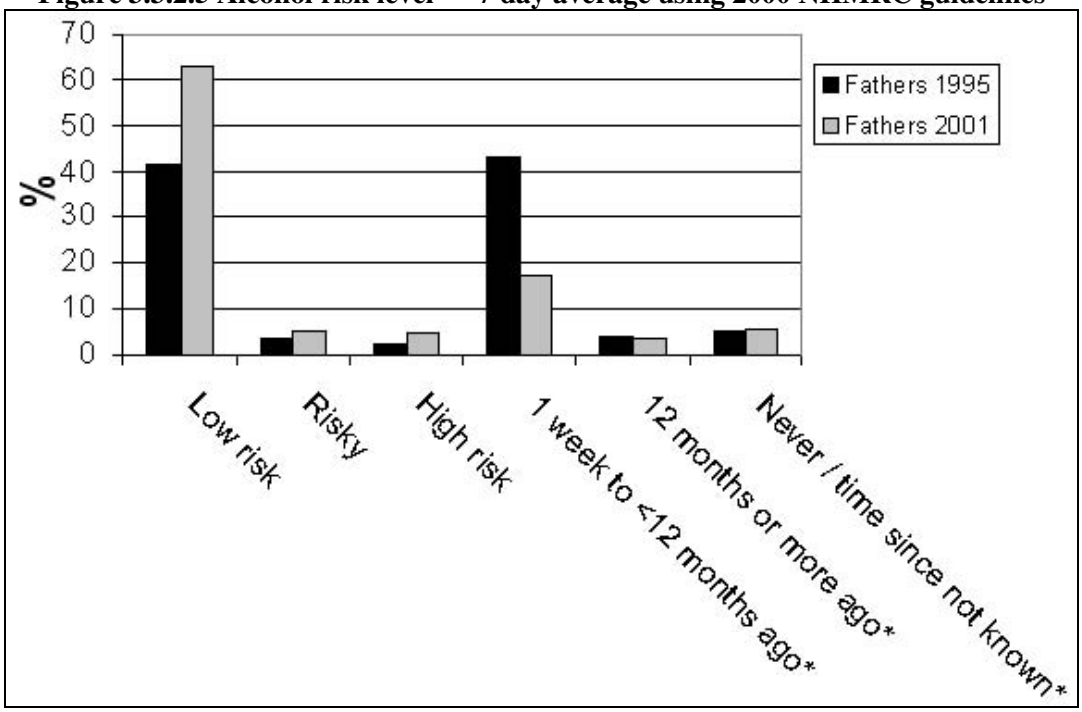
[1] Results obtained from more detailed analysis.

upper most level of the NHMRC recommendations for alcohol intake (National Health and Medical Research Council 2001).

Table 3.3.2.6 Alcohol risk level — 7 day average using 2000 NHMRC guidelines

	Fathers 1995* n	**%**	**Fathers 2001 n**	**%**
Low risk	542	41.5	587	62.8
Risky	40	3.4	53	5.4
High risk	39	2.3	49	5.0
Last consumed alcohol 1 week to less than 12 months ago	577	43.5	156	17.4
Last consumed alcohol 12 months or more ago	57	4.0	31	3.6
Never consumed alcohol or time since last consumed not known	65	5.3	50	5.9
Total	1320	100.0	926	100.0

Figure 3.3.2.5 Alcohol risk level — 7 day average using 2000 NHMRC guidelines



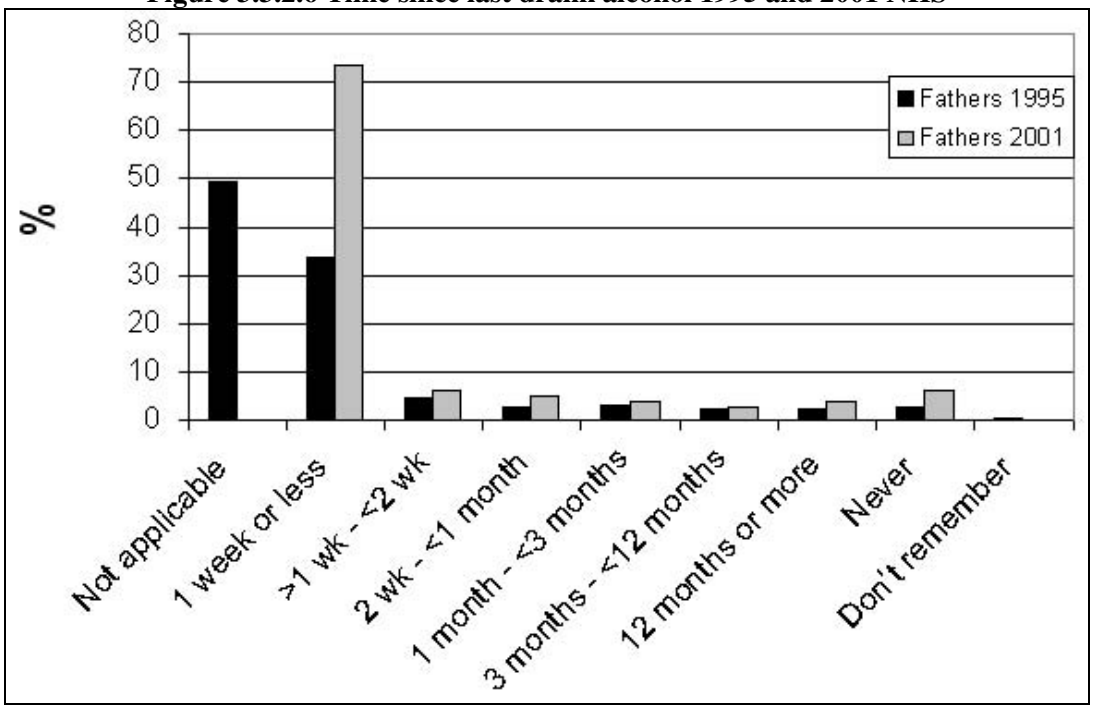
* time since consumed alcohol

Approximately 60% of fathers from the NHS 2001 are at low risk and then report alcohol consumption of one week to less than 12 months ago (17.4%). The majority of fathers (43.5%) in the NHS 1995 report alcohol consumption of one week to less than 12 months ago followed by 41.5% being at low risk.

Table 3.3.2.7 Time since last drank alcohol 1995 and 2001 NHS

	Fathers 1995*		Fathers 2001	
	n	%	n	%
Not applicable	1270	49.5	-	-
1 week or less	907	33.7	689	73.2
More than 1 week to less than 2 weeks	103	4.4	52	5.9
2 weeks to less than 1 month	70	2.6	48	5.1
1 month to less than3 months	72	2.8	33	3.8
3 months to less than12 months	46	2.0	23	2.6
12 months or more	57	2.0	31	3.6
Never	65	2.6	50	5.9
Don't remember	6	0.4	-	-
Total	2596	100.0	926	100.0

Figure 3.3.2.6 Time since last drank alcohol 1995 and 2001 NHS



It is assumed that fathers from the NHS 2001 who have not consumed alcohol (approximately 25%, see Table 3.3.2.3) may have been grouped into the one week or less category as there is no not applicable' grouping provided. Given this assumption, slightly less than three quarters of the NHS 2001 fathers report consuming alcohol in the last week, whereas only 33% of fathers from the NHS 1995 consumed alcohol in the last week.

Table 3.3.2.8 Main drink type consumed Fathers 1995[a] and 2001 NHS

	Fathers 1995*		Fathers 2001	
	n	%	n	%
Not applicable	-	-	237	26.8
Low alcohol beer	180	6.5	69	7.7
Mid strength beer	99	3.5	62	6.5
Full strength beer	531	19.7	318	34.1
Wine/champagne	261	9.0	145	14.0
Spirits/liquor	171	5.9	91	10.2
Fortified wine	33	1.2	4	0.6
Other	8	0.2	-	
Total	-	-	926	100.0

[a] multiple response question

Full strength beer is the most popular drink with fathers from both populations.

3.4 Perth Aboriginal Feeding Study

The Perth Aboriginal Feeding Study was conducted between May 2000 and July 2001. Complete results from this study are presented elsewhere (Gilchrist et al. 2004).

3.4.1 Cohort characteristics

The Perth Aboriginal Breastfeeding Study (PABS) used methodology very similar to the Perth Infant Feeding Study (PIFS I). All self-identified Aboriginal mothers who delivered in six Perth public hospitals between May 2000 and July 2001 were contacted and invited to participate in the study. A total of 455 mothers delivered during the study period and were asked to participate. Four hundred and twenty five (425) mothers completed the initial questionnaire. The sample was

consecutive and unselected. Those mothers agreeing to participate completed a self-administered baseline questionnaire while in hospital to determine breastfeeding initiation rates.

3.4.2 Methods

The baseline questionnaire was designed to identify the feeding method while in hospital and to collect information on variables known, or suspected, to be associated with breastfeeding initiation and duration, including sociodemographic, biomedical and psychosocial factors, along with hospital practices. A number of steps were taken to ensure that the questionnaire was easy to understand. The draft questionnaire was reviewed and modified by an adult literacy expert and then pilot-tested on a group of 20 new mothers. Further modifications were made based on their comments. Wherever possible the wording of the questionnaires was kept as close as practical to the Perth Infant Feeding Study to allow for later comparison (Scott et al. 1999; Scott, Binns & Aroni 1997) The data was analysed using SPSS version 10.

3.4.3 Ethics

The purpose of the study was explained to each mother and they were asked to sign a consent form. The confidentiality of the data was assured and the mothers were assured that they could withdraw from the study at any time without prejudice. The

NHMRC principles of research with aboriginal communities were followed.

(NHMRC 1991) The project received initial ethics clearance from the Human Ethics Committee of Curtin University. The project was then submitted for approval to the following ethics committees who all gave their approval:

Department of Health WA, Aboriginal Health Section
Derbarl Yerrigan Health Service
King Edward Memorial Hospital
Swan Health Services
Bentley Health Service
Fremantle Hospital
Joondalup Hospital

3.4.4 Results

A total of 460 identified Aboriginal mothers gave birth during the period of the study and 431 agreed to participate, a participation rate of 93%. The sample included 13 sets of twins, and one set of triplets. The largest Perth maternity hospital contributed 332 mothers to the study, while five other hospitals provided another 128 mothers.

The 431 participants completed the interviewer-administered baseline questionnaire while in hospitals and initiation rates are based on these responses. Follow up was achieved for 327 participants (follow up rate 75.9%) followed up by telephone interview. The interviews were conducted at 4, 8, 12, 16, 20 and 24 weeks postpartum and the participation totalled 1924 person-months.

At discharge from hospital 88.4% of mothers were breastfeeding, although 4.4% were also having some formula feeds. Of the mothers who were not breastfeeding, 76% had not attempted to breastfeed. The details of the breastfeeding rates are shown in Table 3.4.4.1

Table 3.4.4.1 Percentage of Perth Aboriginal women breastfeeding* at hospital discharge and selected time points†

Interview	Urban %	Rural %	Total %
At discharge	79.0	84.4	80.2
2 weeks	77.2	84.4	78.5
6 weeks	74.9	74.4	74.6
10 weeks	68.4	64.2	68.6
14 weeks	66.2	60.8	66.2
24 weeks	59.0	54.1	59.0

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

The variables likely to be associated with breastfeeding initiation are detailed in table 3.4.4.2.

Table 3.4.4.2 Odds ratios (95%CI) for Perth Aboriginal women breastfeeding at discharge from hospital

	Breastfeeding at discharge		Univariate odds ratio	
	Yes (%)	No (%)	OR	(95%CI)
Sociodemography				
Mother's age (years):				
14-19	156 (89.1)	19 (10.9)	1.00	
20-24	110 (88.0)	15 (12.0)	0.89	0.44-1.83
25-29	74 (92.5)	6 (7.5)	1.50	0.53-3.92
30	39 (9.5.1)	2 (4.9)	2.37	0.53-10.60
Mother's education (years of schooling):				
< 7	2 (40.0)	3 (60.0)	1.00	
8-10	37 (10.4)	319 (89.6)	5.75	0.93-35.52
11-12	2 (8.0)	23 (92.0)	7.67	0.77-76.44
> 12	3 (7.7)	36 (92.3)	8.00	0.94-68.13
Mother married:				
No	366 (89.7)	42 (10.3)	1.00	
Yes	16 (84.2)	3 (15.8)	0.61	0.17-2.19
Mother employed/studying before birth:				
No	334 (90.8)	34 (9.2)	1.00	
Yes	44 (83.0)	9 (17.0)	0.50	0.22-1.11
Mother's occupation:				
Employed/studying	18 (90.0)	2 (10.0)	1.00	
Others	361 (90.2)	39 (9.8)	1.03	0.23-4.60
Father's occupation:				
Employed/studying	40 (81.6)	9 (18.4)	1.00	
Others	342 (90.5)	36 (9.5)	2.14	0.96-4.76
Location:				
Urban	288 (88.9)	36 (11.1)	1.00	
Rural	97 (91.5)	9 (8.5)	1.35	0.63-2.90
Biomedical				
Parity:				
Primiparous	289 (90.9)	29 (9.1)	1.00	
Multiparous	92 (86.0)	15 (14.0)	0.62	0.32-1.20
Vaginal delivery:				
No	200 (93.5)	14 (6.5)	1.00	
Yes	183 (85.5)	31(14.5)	0.41	0.21-0.80
Birthweight (g):				
< 2500	90 (92.8)	7 (7.2)	1.00	
2500	294 (88.6)	38 (11.4)	0.60	0.26-1.39
Infant admitted to special care nursery:				
No	263 (87.7)	37 (12.3)	1.00	
Yes	115 (94.3)	7 (5.7)	2.31	1.00-5.33
Infant roomed in for 24 h/day:				
No	89 (93.7)	6 (6.3)	1.00	
Yes	292 (88.5)	38 (11.5)	0.52	0.12-1.27

	Breastfeeding at discharge		Univariate odds ratio	
	Yes (%)	No (%)	OR	(95%CI)
Psychosociol				
Mother attended antenatal classes for this or previous pregnancy:				
No	358 (90.6)	37 (9.4)	1.00	
Yes	28 (77.8)	8 (22.2)	0.36	0.15-0.85
Father prefers breastfeeding:				
No or ambivalent	172 (82.3)	37 (17.7)	1.00	
Yes	209 (96,8)	7 (3.2)	6.42	2.79-14.77
Maternal grandmother prefers breastfeeding:				
No or ambivalent	210 (85.7)	35 (14.3)	1.00	
Yes	171 (95.0)	9 (5.0)	3.17	1.48-6.77
Maternal grandmother breastfed at least one infant:				
No or ambivalent	75 (82.4)	16 (17.6)	1.00	
Yes	302 (91.5)	28 (8.5)	2.30	1.18-4.47

The significant factors were then entered into a logistic regression model. The final model is shown in Table 3.4.4.3. Alcohol consumption was not a significant factor in any of the univariate or multivariate models.

The factors in breastfeeding duration are detailed in Table 3.4.4.4

Table 3.4.4.3 Factors associated with breastfeeding at discharge after adjustment for potential confounders* (n= 431)

Variable†	n	Odds Ratio	(95%Cl)
Sociodemography			
Maternal age (years):	421	1.13	1.03-1.24
Mother's education (years of schooling):			
7	5	1.00	
8-10	356	11.07	1.26-97.48
11-12	25	12.73	0.92-17.55
> 12	39	65.54	3.85-1115.73
Mother employed/studying before birth:			
No	368	1.00	
Yes	53	0.37	0.12-1.10
Father's occupation:			
Employed/studying	49	1.00	
Others	378	2.58	0.99-6.68
Biomedical			
Parity:			
Primiparous	318	1.00	
Multiparous	107	0.32	0.12-0.84
Vaginal delivery:			
No	214	1.00	
Yes	214	0.31	0.14-0.68
Psychosociol			
Father prefers breastfeeding:			
No	209	1.00	
Yes	216	8.99	3.46-23.39

-2 log likelihood (deviance) 206.34 d.f. 9

* Non-significant variables were mother's marital status, mother's occupation, location of residence, infant birth weight, infant admitted to special care nursery, infant roomed in for 24 h/day, mother attended antenatal classes for this or previous pregnancy, maternal grandmother prefers breastfeeding, and whether maternal grandmother had breastfed at least one infant.

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

Table 3.4.4.4 Factors associated with shorter overall duration of breastfeeding after adjustment for potential confounders* (n= 431)

Variable†	n	Relative risk	(95%CI)
Biomedical			
Parity:			
Primiparous	201	1.00	
Multiparous	61	1.71	1.03-2.82
Demand feeding:			
No	50	1.00	
Yes	212	0.19	0.12-0.32

-2 log likelihood (deviance) 806.69 d.f. 2

* Non-significant variables were maternal age, maternal education, mother's marital status, mother's employment status prior to birth, mother's occupation, father's occupation, location of residence, infant birth weight, method of delivery, infant admitted to special care nursery, infant roomed in for 24 h/day, mother attended antenatal classes for this or previous pregnancy, father's prefers breastfeeding, maternal grandmother prefers breastfeeding, and whether maternal grandmother had breastfed at least one infant.

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

3.4.5 Alcohol Consumption

Only a minority of Aboriginal mothers consumed alcohol during lactation. Three quarters (75%) reported not drinking during the 12 months after delivery of their last infant. There was no statistical difference in the duration of breastfeeding by alcohol consumption.

Of those who drank alcohol, the average intake was 0.75 standard drinks per day while lactating. The maximum reported was 4 standard drinks per day.

3.4.6 Smoking.

Smoking history was also obtained. More than two thirds (68.6%) of mothers at 6 months reported smoking and the percentage was similar in the early days postpartum.

Table 3.4.4.5: Number of cigarettes smoked by breastfeeding mothers at two weeks and six months post discharge

Cigarettes Smoked	Mothers (PARS) 2 weeks		Mothers (PABS) six months		Mothers (PIFS) 2 weeks	
	N	%	N	%	N	%
1-10	125	32.8	74	34.7	40	10.8
11-20	113	29.7	54	24.4	34	9.1
21-30	17	4.5	12	5.6	24	6.5
31-40	2	0.5	1	0.004		
41 or more	1	0.3				
Non-Smokers	120	31.5	69	32.4	274	73.7
Missing	3	0.8	3	0.01		
Total	373	100	213	100	372	100

Overall tobacco consumption was far more common than drinking alcohol in this sample of Aboriginal women.

3.5 Perth Infant Feeding Study II

Some of the core results PIFS II results have been reported elsewhere (Binns & Graham 2005; Graham et al. 2005) and in this section only information on alcohol and tobacco consumption that has been analysed specifically for this project and not reported elsewhere will be included.

The relevant variables from the large PIFS II data set include:

1. Effect of alcohol on the baby
2. Time of day that the mother drank alcohol
3. Days the mother drank alcohol in last two weeks
4. The number of standard drinks mother consumed
5. Baby's length (cms)
6. Baby's weight (grams)
7. Type of health problems experienced by the baby
8. Duration of breastfeeding in weeks was measured in the following way based on the protocol developed for Australia. (Webb et al. 2001; Binns & Davidson 2003):
    - duration of any breastfeeding in weeks (durany)
    - censoring factor of any breastfeeding (cfany)
    - duration of exclusive breastfeeding in weeks (durexcl)
    - censoring factor of exclusive breastfeeding (cfexcl)
    - duration of full breastfeeding in weeks (durfull)
    - censoring factor of full breastfeeding (cffull)
9. Other variables:
    - gender of baby;
    - parity: priniparous or multiparous
    - delivery method (delmeth)
    - mother's age (age4)
    - father's opinion on breastfeeding (dadpret)
    - maternal grandmother's opinion on breasfeeding (gmumpref)
    - mother's country of birth (mcob3)
    - mother attended antenatal classes or not (attclass)
    - years of education completed (educyrs2)
    - mother's occupations (motherocc4)
    - marriage statue (marital2)
    - has baby spent time in special care nursery? (scn)
    - infant feeding decision made before pregnant (whendec)
    - mother employed/studying part/full time at 6 month after birth (mw6mon)
    - mother employed/studying part/full time at 6 month before birth(mw6monbefore)

Within the overall objectives of the project (see Chapter one) the following specific research questions were used in the analysis of the PIFS II data.

1. What is the level of alcohol consumption by the mothers in the PIFS II study?
2. Which demographic variables are associated with alcohol consumption by the mothers in the PIFS II study?
3. Do the babies of mothers who drink alcohol behave differently?
4. Does the time mothers drink alcohol affect babies' sleep patterns?
5. Does the number of days of mothers drink alcohol affect babies' weight and length?
6. Does the number of drinks affect babies weight and length?
7. Does any drinking by the mother have an affect on the baby's health?
8. Does the number days of mothers drink alcohol affect babies' health?
9. Does the number of drinks affect babies' health?
10. Does mother have drinks affect the type of illnesses of the babies?
11. Which variables have an effect on the duration of any, exclusive and full breastfeeding (including the effects of alcohol consumption by the mother)?

Statistical methods and software used in this section:

Chi-Square test (Fisher' exact test), one-way ANOVA, and log linear regression were used. Since a censoring factor is involved, (due to losses to follow-up or the mother ceasing to breastfeed), Cox-regression was applied to find which variables had an effect on the duration of breastfeeding.

All data analyses were carried out using the Statistical Package for Social Science, Advanced statistics, Release 12.0 (SPSS for windows, SPSS Inc., Chicago, IL, USA).

3.5.1 Alcohol Consumption during lactation

The specific questions used to ascertain alcohol consumption are in Appendix B. These questions were asked at the time of delivery and again at 4, 10, 16, 22, 32, 40 and 52 weeks. Before becoming pregnant the majority of mothers consumed alcohol, 69% of mothers reported consuming alcohol before their pregnancy and 36% also consumed alcohol during the pregnancy. During lactation many of the mothers resumed drinking. At any time during lactation fewer than 50% of mothers consumed alcohol during lactation. The average daily consumption of standard drinks is shown in Table 3.5.1.1.

Table 3.5.1.1 Consumption of standard drinks per week pre and post birth (weeks post partum)

Number of Drinks	Pre Pregnancy	Pregnancy	4	10	16	22	32	40	52
0	32.7	64.6	59.5	55.7	54.9	50.2	51.1	52.7	50.9
1	8.3	7.9	13.9	15	14.6	14.2	14.2	11.3	11.1
2	10.4	5.8	12.6	10	10.2	11	9.5	7.9	6.1
3	3.2	1.2	4.9	6	5	5.4	7.3	7.6	11.9
4	6.5	2.9	2	2.2	2.7	3.3	3.7	3.3	6.7
5	2.6	0.7	2.2	1.4	3.4	3.2	2.5	4.6	4.2
6	6.3	1.5	1.2	3.8	2.5	2.3	3	3.9	2.7
7	0.3	0.2	0.4	1	0.4	1.2	1.3	2.9	2.4
8	4.6	4.9	0.2	0.8	1.2	2.3	1.5	0.9	1.1
9	2.2	1.9	0.4	0.4	0.8	0.4	0.9	0.9	1.6
10-15	9.5	4.5	2.2	1.6	2.2	3.8	3.6	3.4	1.3
15+	12.4	3.9	0.8	1	1.2	1	1.2	1.7	2.6

The mean consumption of alcohol per week in standard drinks was calculated and is shown in Table 3.5.1.2.

Table 3.5.1.2 Mean consumption of standard drinks (per week) pre and post birth by age (years)

Age	Pre Pregnancy	Pregnancy	4	10	16	22	32	40	52
<20	0	0	0.03	0.08	0.75	0.61	0.056	0	0
20-24	8.44	1.87	1.21	1.48	2	2.19	2.13	1.63	2.29
25-29	8.78	2.07	1.12	1.40	1.88	1.80	1.86	2.14	2.39
30-34	5.42	2.81	1.23	1.52	1.79	1.71	1.75	2.06	1.85
35+	5.45	3.03	1.72	1.76	1.76	2.84	2.32	2.54	2.5144

The mean consumption of alcohol per week in standard drinks was calculated and is then compared to the consumption by mothers in the 2001 NHS. Table 3.5.1.3. The number of non-drinkers is approximately the same for the NHS data and the PIFS II in the latter stages of lactation, ie when the majority of mothers have ceased breastfeeding.

Table 3.5.1.3 Consumption of standard drinks per week pre and post birth (weeks post partum) compared with the results from the 2001 NHS

Number of Drinks	PIFS II Pre Pregnancy	PIFS II Pregnancy	PIFS II Week 10 pos part.	PIFS II Week 40 post part.	NHS 2001 Mothers 1*	NHS 2001 Mothers 2*	NHS 2001 Mothers 3*
0	32.7	64.6	55.7	52.7	52.7	52.7	51.3
1	8.3	7.9	15	11.3	5.6	5.6	5.7
2	10.4	5.8	10	7.9	9.9	9.9	10.5
3	3.2	1.2	6	7.6	5.8	5.8	5.9
4	6.5	2.9	2.2	3.3	3.7	3.7	3.9
5	2.6	0.7	1.4	4.6	3.2	3.2	3.2
6	*6.3*	1.5	3.8	3.9	2.6	2.6	2.9
7	0.3	0.2	1	2.9	2	2	2
8	4.6	4.9	0.8	0.9	2	2	2.2
9	2.2	1.9	0.4	0.9	1.8	1.8	1.9
10-15	9.5	4.5	1.6	3.4	6.1	6.1	6
15+	12.4	3.9	1	1.7	4.6	4.6	4.8

* See section 3.1.1 for definitions of 'Lactating Mothers' used in the analysis of the 2001 National Health Survey.

When mothers who do not consume alcohol are removed from the calculations the weekly consumption in standard drinks is shown in Table 3.5.1.4.

Table 3.5.1.4: Consumption of standard drinks per week pre and post birth (weeks post partum) for mothers who consume alcohol

Pre Pregnancy	Pregnancy	4	10	16	22	32	40	52	
			Breastfeeding						
Mean	10.3785	7	3.0665	3.433	3.8197	4.3036	4.325	3.9227	3.125
95% CI lower	8.9122	5.936	2.4633	2.8203	3.1148	3.1334	3.3489	3.0869	2.1223
95% CI higher	11.8447	8.064	3.6697	4.0458	4.5247	5.4738	5.3011	4.7586	4.1277
Median	6	4.5	2	2	2	2.25	3	3	2
Std. Deviation	14.8224	7.7074	3.42114	3:27236	3.7131	5.8063	4.09386	3.09191	3.1353
Minimum	1	1	1	1	1	1	1	1	1
Maximum	150	70	24.5	19.25	20	50	21	15	17.5
			Not breastfeeding						
Mean			4.9151	4.9776	5.2014	5.05	4.7053	5.6022	5.3912
95% CI lower			3.2221	3.711	3.7489	4.0851	3.8839	4.5672	4.5202
95% CI higher			6.6081	6.2442	6.6539	6.0149	5.5267	6.6372	6.2623
Median			2.25	3	3	3.5	3	4	3
Std. Deviation			5.50103	5.19282	6.1811	4.83781	4.60199	6.10289	5.47162
Minimum			1	1	1	1	1	1	1
Maximum			25	28	31.5	28	24.5	42	28

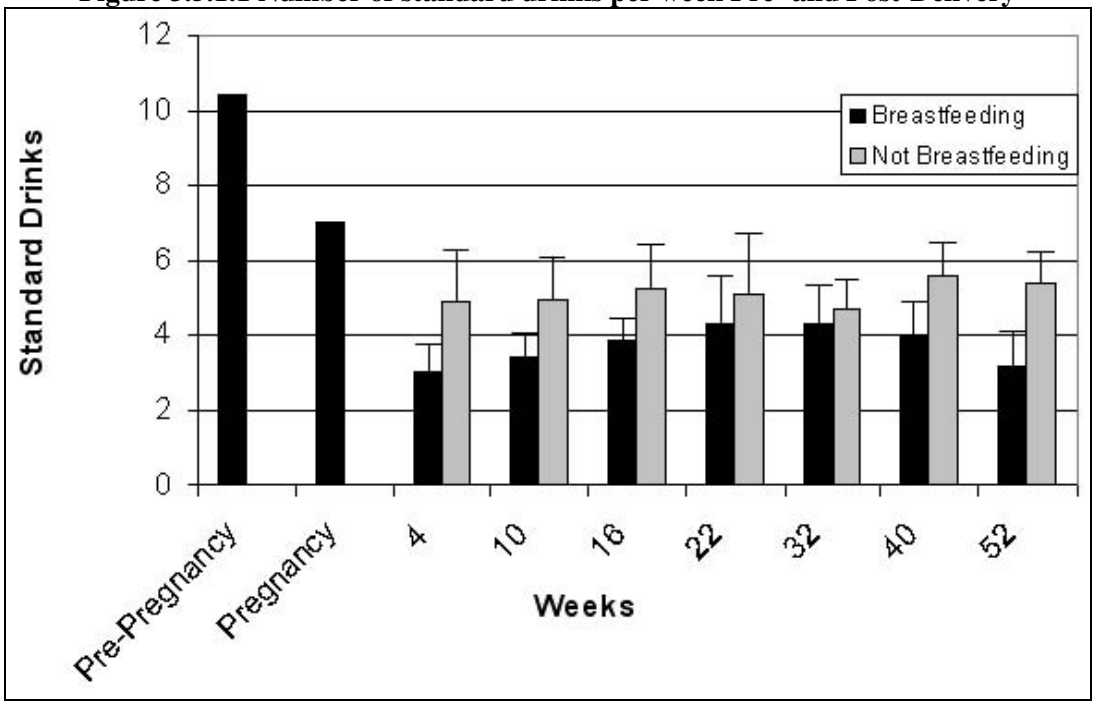
The type of alcohol drink consumed by mothers in the PIFS II are documented and compared to the results of the NHS in Table 3.5.1.5. The main difference is in the consumption of spirits. There is a decline in the consumption of the stronger alcoholic drinks from pre-pregnancy which persists throughout the year post pregnancy.

Table 3.5.1.5 The type of drinks consumed pre and post birth (weeks post partum) compared to the 2001 NHS.

	2001 NHS Pregnant Women %	2001 NHS Non-mothers %	PIFS II 4	Weeks 10	16	22	32	40	52	Pre Preg	Preg
Non-drinkers	71.5	45.4	40.5	44.3	45.1	49.8	48.9	47.3	49.1	35.4	67.3
Low alcohol beer	2.5	3.3	8.3	9.2	9.0	7.4	8.8	7.5	9.8	6.1	15.6
Mid strength beer	2.5	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Full strength beer	5.3	13.7	13.2	11.2	12.7	9.4	12.3	10.3	11.7	15.9	11.8
Wine/champagne	56.5	63.2	44.3	44.6	42.2	45.3	42.7	43.9	42.0	36.8	46.7
Spirits/liquor	28.1	35.5	21.5	22.1	19.3	19.9	20.4	23.7	21.6	34.3	21.2
Fortified wine	2.5	1.8	0.0	0.0	2.0	2.0	0.8	1.2	0.8	0.5	0.5
AlcoPops and Premixed drink	0	0	11.8	12.0	13.5	15.6	14.6	13.0	13.3	5.6	3.3
Other	2.5	3.1	0.9	0.8	1.2	0.4	0.4	0.4	0.8	0.7	0.9
Total (n)	528	507	486	483	465	465	455	587	587		

The relationship between the number of drinks consumed and breastfeeding status is shown in Figure 3.5.1.1.

Figure 3.5.1.1 Number of standard drinks per week Pre- and Post-Delivery



The relationships between the consumption of alcoholic drinks post partum and a number of demographic variables has been analysed and are shown in the following tables. The Iowa scale has been used in the PIFS as a measure of infant feeding attitudes and was administered to both mothers and fathers. The Iowa scale, a validated tool utilising a Likert scale with a set of 17 items, was developed in the 1990s at the Iowa State University as a method to measure maternal attitudes toward infant feeding. The scale has been shown to predict both the choice of infant feeding method and the duration of breastfeeding and was used in this study to examine its predictive value with a group of Australian mothers and fathers. The scale has previously been tested for reliability and validity in studies of women in the United States of America and Scotland (Mulder-Sibanda & Sibanda-Mulder 1999; Scott, Shaker & Reid 2004).

Table 3.5.1.6 Demographic variables and Alcohol Consumption at Week 4

Level of Drinking Age (years)	Non drinker N	Non drinker % within mothers age 5 year groups	Low risk N	Low risk % within mothers age 5 year groups	Moderate risk N	Moderate risk % within Mothers age 5 year groups	Total N
<20	26	81.30%	6	18.80%	0	0.00%	32
20-24	79	64.80%	41	33.60%	2	1.60%	122
25-29	106	62.40%	64	37.60%	0	0.00%	170
30-34	115	64.60%	62	34.80%	1	0.60%	178
35+	51	60.70%	32	38.10%	1	1.20%	84
Education (years)							
<12 years	164	65.90%	83	33.30%	2	0.80%	249
12 yrs	92	60.10%	61	39.90%	0	0.00%	153
>12 yrs	113	64.60%	60	34.30%	2	1.10%	175
Parity							
primiparous	130	60.20%	84	38.90%	2	0.90%	216
multiparous	248	66.80%	121	32.60%	2	0.50%	371
Birthweight							
<2500g	9	69.20%	4	30.80%	0	0.00%	13
2500g+	363	64.10%	199	35.20%	4	0.70%	566
Mothers country of birth							
Australia/NZ	269	62.90%	157	36.70%	2	0.50%	428
UK	27	50.90%	24	45.30%	2	3.80%	53
other	81	77.90%	23	22.10%	0	0.00%	104
Iowa Score Mother							
Low	200	69.40%	87	30.20%	1	0.30%	288
High	178	59.50%	118	39.50%	3	1.00%	299
Iowa Score Father							
Low	96	65.80%	49	33.60%	1	0.70%	146
High	99	55.00%	79	43.90%	2	1.10%	180
BMI grouped							
<20	74	69.20%	33	30.80%	0	0.00%	107
20 to <25	158	62.00%	96	37.60%	1	0.40%	255
25 to < 30	56	52.80%	47	44.30%	3	2.80%	106
30+	63	73.30%	23	26.70%	0	0.00%	86

The significant associations were mothers' country of birth (P<0.05), Mothers Iowa score (P<0.01) and BMI (P<0.0I).

Table 3.5.1.7 Demographic variables and Alcohol Consumption at Week 10

Level of Drinking Age (years)	Non drinker N	Non drinker % within mothers age 5 year groups	Low risk N	Low risk % within mothers age 5 year groups	Moderate risk N	Moderate risk % within Mothers age 5 year groups	Total N
<20	19	76.00%	6	24.00%	0	0.00%	25
20-24	62	57.41%	43	39.81%	3	2.78%	108
25-29	83	57.64%	61	42.36%	0	0.00%	144
30-34	82	52.23%	73	46.50%	2	1.27%	157
35+	36	49.32%	36	49.32%	1	1.37%	73
Education(years)							
<12 years	120	57.97%	85	41.06%	2	0.97%	207
12 yrs	74	53.24%	63	45.32%	2	1.44%	139
>12 yrs	83	53.55%	70	45.16%	2	1.29%	155
Parity							
primiparous	105	55.56%	81	42.86%	3	1.59%	189
multiparous	177	55.66%	138	43.40%	3	0.94%	318
Birthweight							
<2500g	8	61.54%	5	38.46%	0	0.00%	13
2500g+	272	55.74%	210	43.03%	6	1.23%	488
Mothers country of birth							
Australia/NZ	257	60.05%	167	39.02%	4	0.93%	428
UK	24	45.28%	27	50.94%	2	3.77%	53
other	78	75.00%	24	23.08%	2	1.92%	104
Iowa Score Mother							
Low	150	61.48%	90	36.89%	4	1.64%	244
High	132	50.19%	129	49.05%	2	0.76%	263
Iowa Score Father							
Low	74	57.81%	51	39.84%	3	2.34%	128
High	84	51.22%	79	48.17%	1	0.61%	164
BMI grouped							
<20	59	65.56%	31	34.44%	0	0.00%	90
20 to <25	120	54.55%	99	45.00%	1	0.45%	220
25 to < 30	41	42.71%	52	54.17%	3	3.13%	96
30+	44	56.41%	32	41.03%	2	2.56%	78

The significant associations were mothers' country of birth ($P<0.05$), and BM1 ($P<0.01$).

Table 3.5.1.8 Demographic variables and Alcohol Consumption at Week 16

Level of Drinking Age (years)	Non drinker N	Non drinker % within mothers age 5 year groups	Low risk N	Low risk % within mothers age 5 year groups	Moderate risk N	Moderate risk % within Mothers age 5 year groups	Total N
<20	15	75.00%	5	25.00%	0	0.00%	20
20-24	53	54.64%	42	*43.30%*	*2*	2.06%	97
25-29	76	54.29%	62	44.29%	2	1.43%	140
30-34	88	56.77%	65	41.94%	2	1.29%	155
35+	39	52.70%	35	47.30%	0	0.00%	74
Education (years)							
<12 years	113	57.65%	81	41.33%	2	1.02%	196
12 yrs	74	56.92%	54	41.54%	2	1.54%	130
>12 yrs	80	51.61%	73	47.10%	2	1.29%	155
Parity							
primiparous	85	48.57%	88	50.29%	2	1.14%	175
multiparous	186	59.81%	121	38.91%	4	1.29%	311
Birthweight							
<2500g	7	58.33%	4	33.33%	1	8.33%	12
2500g+	260	55.56%	203	43.38%	2	0.43%	468
Mothers country of birth							
Australia/NZ	190	53.22%	163	45.66%	4	1.12%	357
UK	18	40.91%	24	54.55%	2	4.55%	44
other	62	73.81%	22	26.19%	0	0.00%	84
Iowa Score Mother							
Low	136	58.87%	91	39.39%	4	1.73%	231
High	135	52.94%	118	46.27%	3	1.18%	255
Iowa Score Father							
Low	72	59.02%	48	*39.34%*	*2*	1.64%	122
High	77	48.73%	81	51.27%	0	0.00%	158
BMI grouped							
<20	52	61.90%	31	36.90%	1	1.19%	84
20 to <25	110	51.16%	103	47.91%	2	0.93%	215
25 to < 30	43	48.31%	43	48.31%	3	3.37%	89
30+	51	65.38%	27	34.62%	0	0.00%	78

The significant associations were mothers' country of birth ($P<0.05$), and mothers Iowa score ($P<0.01$)

Table 3.5.1.9 Demographic variables and Alcohol Consumption at Week 22

Level of Drinking Age (years)	Non drinker N	% within mothers age 5 year groups	Low risk N	% within mothers age 5 year groups	Moderate risk N	% within mothers age 5 year groups	Total N
<20	15	71.43%	6	28.57%	0	0.00%	21
20-24	50	51.02%	46	46.94%	2	2.04%	98
25-29	68	49.64%	68	49.64%	1	0.73%	137
30-34	78	49.68%	79	50.32%	0	0.00%	157
35+	34	48.57%	35	50.00%	1	1.43%	70
Education (years)							
<12 years	107	53.77%	91	45.73%	1	0.50%	199
12 yrs	59	45.74%	68	52.71%	2	1.55%	129
>12 yrs	74	49.66%	74	49.66%	1	0.67%	149
Parity							
primiparous	81	46.82%	90	52.02%	2	1.16%	173
multiparous	164	52.90%	144	46.45%	2	0.65%	310
Birthweight							
<2500g	7	58.33%	4	33.33%	1	8.33%	12
2500g+	236	50.64%	227	48.71%	3	0.64% .	466
Mothers country of birth							
Australia/NZ	170	48.30%	180	51.14%	2	0.57%	352
UK	16	36.36%	27	61.36%	1	2.27%	44
other	58	67.44%	27	31.40%	1	1.16%	86
Iowa Score Mother							
Low	125	55.07%	99	43.61%	3	1.32%	227
High	120	46.88%	135	52.73%	1	0.39%	256
Iowa Score Father							
Low	64	50.79%	60	47.62%	2	1.59%	126
High	78	48.75%	82	51.25%	0	0.00%	160
BMI grouped							
<20	52	60.47%	33	38.37%	1	1.16%	86
20 to <25	97	45.33%	115	53.74%	2	0.93%	214
25 to < 30	38	42.70%	50	56.18%	1	1.12%	89
30+	46	59.74%	31	40.26%	0	0.00%	77

The significant associations were mothers' country of birth ($P<0.05$), and birth weight ($P<0.05$)

Table 3.5.1.10 Demographic variables and Alcohol Consumption at Week 32

Level of Drinking Age (years)	Non drinker N	% within mothers age 5 year groups	Low risk N	% within mothers age 5 year groups	Moderate risk N	% within mothers age 5 year groups	Total N
<20	15	88.24%	2	11.76%	0	0.00%	17
20-24	44	49.44%	42	47.19%	3	3.37%	89
25-29	72	54.96%	58	44.27%	1	0.76%	131
30-34	81	50.94%	77	48.43%	1	0.63%	159
35+	26	37.68%	43	62.32%	0	0.00%	69
Education (years)							
<12 years	107	57.22%	78	41.71%	2	1.07%	187
12 yrs	61	48.03%	64	50.39%	2	1.57%	127
>12 yrs	66	45.52%	78	53.79%	1	0.69%	145
Parity							
primiparous	78	47.27%	85	51.52%	2	1.21%	165
multiparous	160	53.33%	137	45.67%	3	1.00%	300
Birthweight							
<2500g	7	70.00%	3	30.00%	0	0.00%	10
2500g+	228	50.78%	216	48.11%	5	1.11%	449
Mothers country of birth							
Australia/NZ 166	48.54%	171	50.00%	4	1.17%	342	
UK	15	33.33%	30	66.67%	1	2.22%	45
other	56	72.73%	21	27.27%	0	0.00%	77
Iowa Score Mother							
Low	121	56.28%	93	43.26%	1	0.47%	215
High	117	46.80%	129	51.60%	1	0.40%	250
Iowa Score Father							
Low	65	53.72%	54	44.63%	2	1.65%	121
High	72	46.15%	82	52.56%	2	1.28%	156
BMI grouped							
<20	47	60.26%	31	39.74%	0	0.00%	78
20 to <25	100	46.73%	112	52.34%	2	0.93%	214
25 to < 30	32	38.10%	50	59.52%	2	2.38%	84
30+	47	64.38%	25	34.25%	1	1.37%	73

The significant associations were mothers' country of birth ($P<0.05$), and BMI ($P<0.05$)

Table 3.5.1.11 Demographic variables and Alcohol Consumption at Week 40

Level of Drinking Age (years)	Non drinker N	Non drinker % within mothers age 5 year groups	Low risk N	Low risk % within mothers age 5 year groups	Moderate risk N	Moderate risk % within mothers age 5 year groups	Total N
<20	15	88.24%	2	11.76%	0	0.00%	17
20-24	44	49.44%	42	47.19%	3	3.37%	89
25-29	72	54.96%	58	44.27%	I	0.76%	131
30-34	81	50.94%	77	48.43%	I	0.63%	159
35+	26	37.68%	43	62.32%	0	0.00%	69
Education (years)							
<12 years	107	57.22%	78	41.71%	2	1.07%	187
12 yrs	61	48.03%	64	50.39%	2	1.57%	127
>12 yrs	66	45.52%	78	53.79%	1	0.69%	145
Parity							
primiparous	78	47.27%	85	51.52%	2	1.21%	165
multiparous	160	*53.33%*	137	45.67%	3	1.00%	300
Birthweight							
<2500g	7	70.00%	3	30.00%	0	0.00%	10
2500g+	228	50.78%	216	48.11%	5	1.11%	449
Mothers country of birth							
Australia/NZ	166	48.54%	171	50.00%	4	1.17%	342
UK	15	33.33%	30	66.67%	1	2.22%	45
other	56	72.73%	21	27.27%	0	0.00%	77
Iowa Score Mother							
Low	121	56.28%	93	43.26%	1	0.47%	215
High	117	46.80%	129	51.60%	1	0.40%	250
Iowa Score Father							
Low	65	53.72%	54	44.63%	2	1.65%	121
High	72	46.15%	82	52.56%	2	1.28%	156
BMI grouped							
<20	47	60.26%	31	39.74%	0	0.00%	78
20 to <25	100	46.73%	112	52.34%	2	0.93%	214
25 to < 30	32	38.10%	50	59.52%	2	2.38%	84
30+	47	64.38%	25	34.25%	1	1.37%	73

The significant associations were mothers' country of birth (P<0.05), and IOWA score (P<0.05)

Table 3.5.1.12 Demographic variables and Alcohol Consumption at Week 52

Level of Drinking Age (years)	Non drinker N	Non drinker % within mothers age 5 year groups	Low risk N	Low risk % within mothers age 5 year groups	Moderate risk N	Moderate risk % within mothers age 5 year groups	Total N
<20	14	87.50%	2	12.50%	0	0.00%	16
20-24	42	53.16%	34	43.04%	3	3.80%	79
25-29	71	52.99%	59	44.03%	4	2.99%	134
30-34	77	48.73%	76	48.10%	5	3.16%	158
35+	30	44.12%	*37*	54.41%	1	1.47%	68
Education (years)							
<12 years	92	53.18%	75	43.35%	6	3.47%	173
12 yrs	63	50.00%	59	46.83%	4	3.17%	126
>12 yrs	75	50.00%	72	48.00%	3	2.00%	150
Parity							
primiparous	81	50.31%	77	47.83%	3	1.86%	161
multiparous	153	52.04%	131	44.56%	10	3.40%	294
Birthweight							
<2500g	7	58.33%	4	33.33%	1	8.33%	12
2500g+	225	51.37%	201	45.89%	12	2.74%	438
Mothers country of birth							
Australia/NZ	159	48.33%	159	48.33%	11	3.34%	329
UK	16	34.78%	27	58.70%	2	4.35%	46
other	58	73.42%	21	26.58%	0	0.00%	79
Iowa Score Mother							
Low	125	59.81%	80	38.28%	4	1.91 %	209
High	109	44.31%	128	52.03%	9	3.66%	246
Iowa Score Father							
Low	69	56.56%	52	42.62%	2	1.64%	122
High	71	45.81%	74	47.74%	7	4.52%	155
BMI grouped							
<20	45	63.38%	26	36.62%	0	0.00%	71
20 to <25	99	46.48%	106	49.77%	8	3.76%	213
25 to < 30	35	40.23%	48	55.17%	8	9.20%	87
30+	44	63.77%	24	34.78%	1	1.45%	69

The significant associations were mothers' country of birth ($P<0.05$), mothers' IOWA score ($P<0.05$) and BMI ($P<0.05$)

3.5.2. Do the babies of mothers who drink alcohol experience more or less health problems?

The mothers were asked if the infant had experienced any health problems since the last interview (interviews were held at 4, 10, 16, 22, 32, 40 and 52 weeks). Table 3.5.2.1 details the relationship between breastfeeding status and whether the mother drinks alcohol.

Hypotheses:

H_o: *There is no relationship between inothers having alcohol and babies having health problems.*

H_a: *There is some relationship between mothers having alcohol and babies having health problems.*

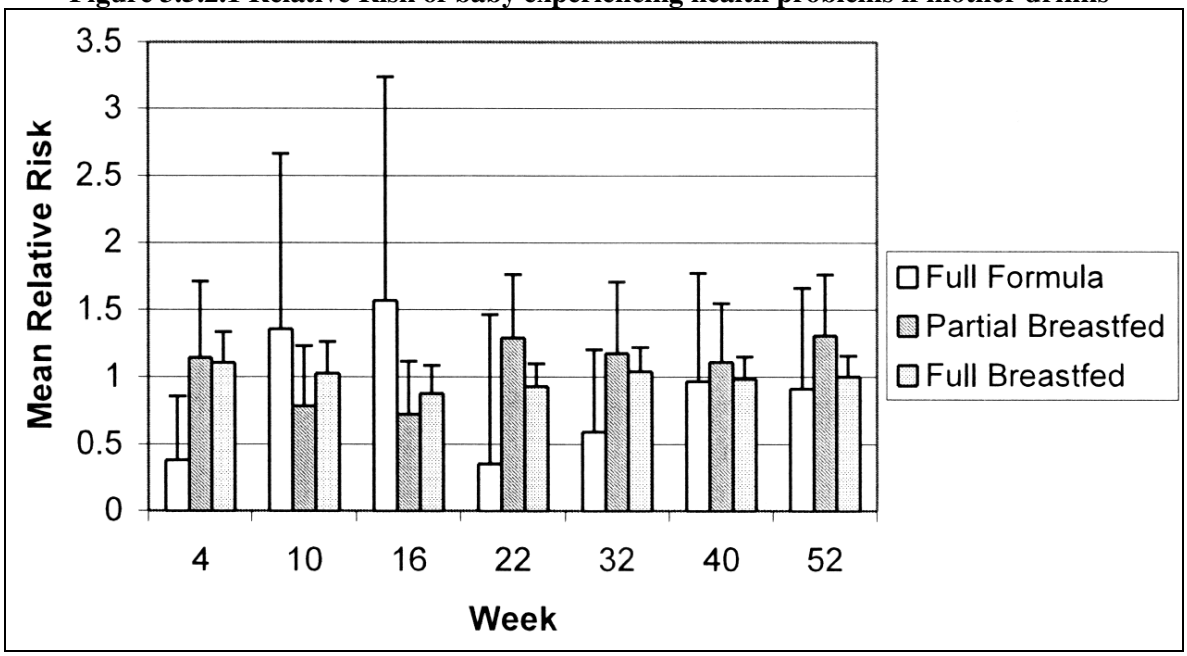
The feeding method in three groups (breastfeeding, formula or combination) and its relationship to health problems is shown in Figure 3.5.2.1.

At four weeks the two-sided asymptotic significant value (0.036) of the Chi-square test is less than 0.05 for the full formula fed group, indicating that there is an association between mother's drinking and baby's health problems for this group. Formulas fed babies have a slightly lower risk of having problem if their mother drinks in week 4. The reason for this is not clear, but analysis in the first few weeks after discharge may be confounded by hospital related factors and the residual immunity from the mother.

Also, the Chi-square test is less than 0.05 for the partial breastfed group, indicating that there is an association between the mother drinking and baby's health problems for this group. Partially breast fed babies have a higher risk of experiencing health problems in week 4. No association was found between mother's drinking and baby's health problems in the full breastfeeding group.

In the week 10 to week 52 period the two-sided asymptotic significant values (Fisher's exact significant values if expected cells values are less than 5) of Chi-square tests are all greater than 0.05 for full formula fed group, partial breastfed group and full breastfed group. This indicates that there are no statistically significant associations between mother's drinking and baby's health problems for these groups.

Figure 3.5.2.1 Relative Risk of baby experiencing health problems if mother drinks



The analysis was repeated with infant feeding classified into two groups. For week 4 to week 52, the two-sided asymptotic significant values (Fisher's exact significant values if expected cells values are less than 5) of Chi-square tests are all greater than 0.05 for formula fed group and breastfed group, indicating that there is no significant statistical association between mother's drinking and baby's health problems for the groups (see Figure 3.5.2.2).

Figure 3.5.2.2 Relative Risk of baby experiencing health problems if mother drinks

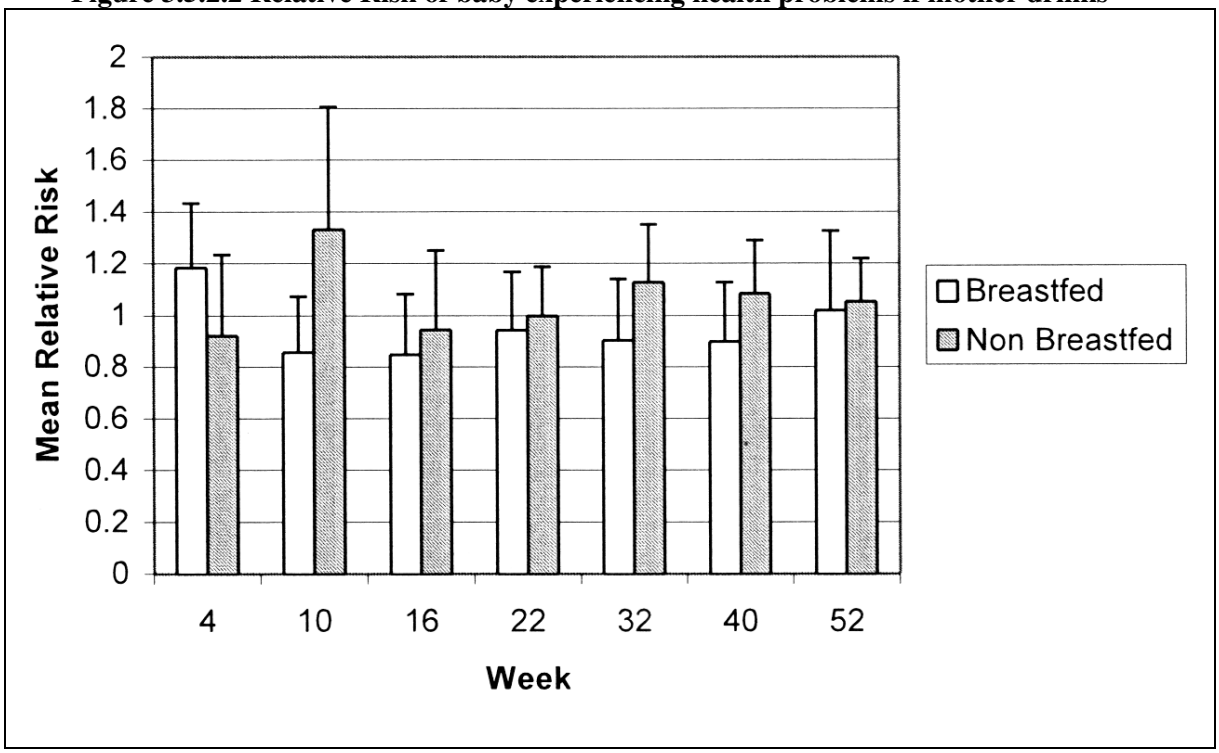


Table 3.5.2.1 Relationship between mother drinking alcohol and infant health (4 weeks)

Breastfeeding status		Baby experienced health problems	No health problems	Total
Breastfeeding	Drinks alcohol	83 (52)	77 (48)	160
	Non drinker	102 (44)	131 (56)	233 (100)
Not breastfeeding	Drinks alcohol	27 (51)	26 (49)	53 (100)
	Non drinker	42 (55)	34 (45)	76 (100)

The relationship between reported illnesses was related to breastfeeding status and not alcohol consumption. The relationship between breastfeeding and fewer reported health problems was statistically significant at 4, 10, 16 and 32 weeks.

3.5.3 Overall Perceptions of Health

Questions were asked in the study about the mothers' perceptions of their babies overall health.

Hypotheses:

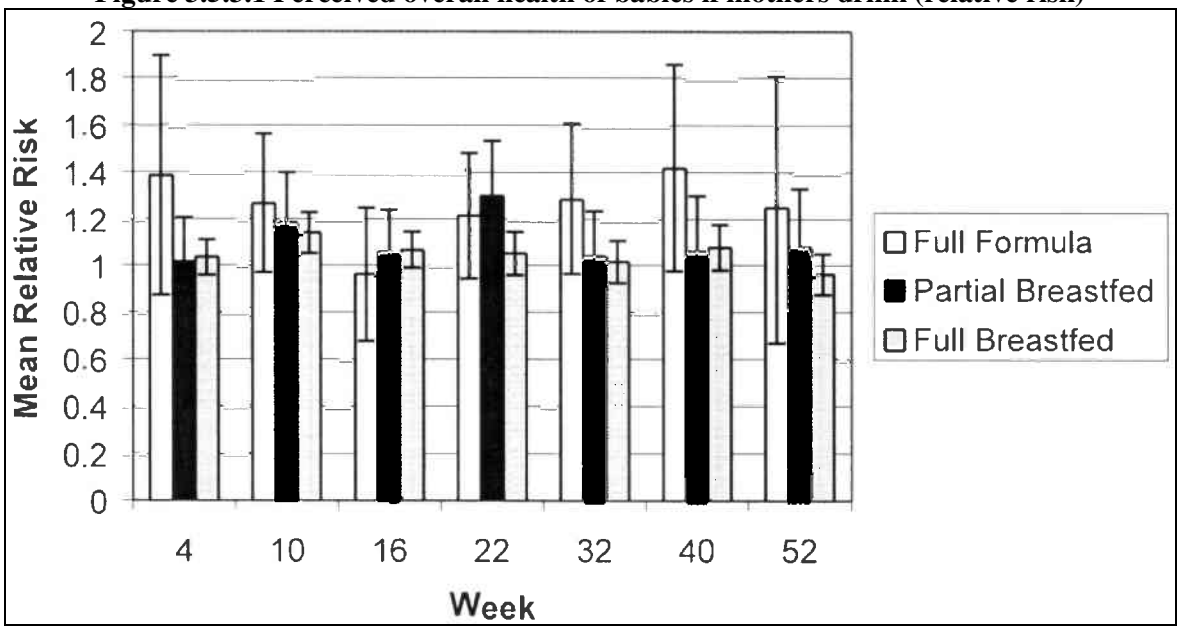
H_o: *There is no association between mothers having alcohol and babies' overall health.*

H_a: *There is some association between mothers haying alcohol and overall health.*

3.5.3.1 Analysis using the three classifications of infant feeding

For week 4 to week 52, the two-sided asymptotic significant values (Fisher's exact significant values if expected cells values are less than 5) of Chi-square tests are all greater than 0.05 for full formula fed group, partial breastfed group and fully breastfed group. This indicates that there is no significant statistical association between mother's drink and baby's overall health for these groups.

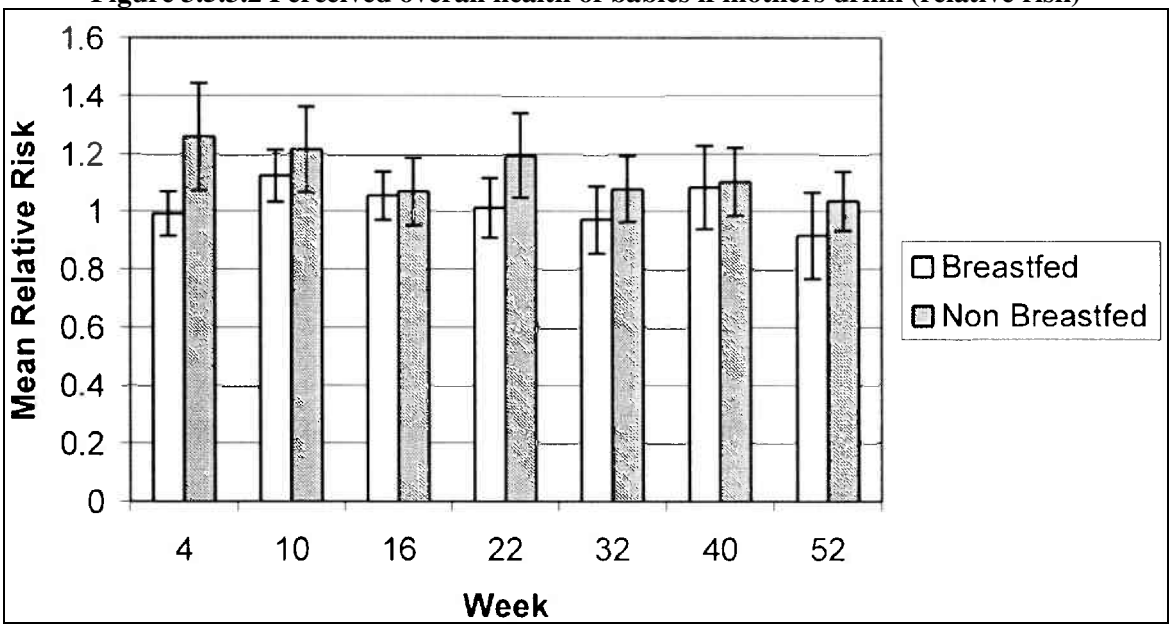
Figure 3.5.3.1 Perceived overall health of babies if mothers drink (relative risk)



The data was also analysed using feeding method as a bivariate variable. For week 4 to week 52, except week 10, the two-sided asymptotic significant values (Fisher's exact significant values if expected cells values are less than 5) of Chi-square tests are all greater than 0.05 for formula fed group and breastfed group. This indicates that there is no statistical significant association between mother's drink and baby's overall health for these groups.

For week 10, the two-sided asymptotic significant values (0.005 and 0.003) of Chi-square tests are less than 0.05, indicating that the data provided enough evidence to reject the null hypothesis in both groups. This implies that there is a statistically significant association between drinking alcohol and baby's overall health in week 10 regardless of feeding method used. The mothers of babies who drank alcohol perceived their infants to be healthier than the mothers who did not drink, but this only applied to the period leading up to the week 10 interview.

Figure 3.5.3.2 Perceived overall health of babies if mothers drink (relative risk)



3.5.4 Sleeping behaviour of infants and mother's alcohol consumption

Many mothers believe that having alcohol will help a mother settle her baby and help it sleep longer at night. However reviews of infant behaviour and alcohol do not support this relationship (see Appendix A). Mothers were asked to describe their infant's behaviour and the variables in the questionnaires describing baby's sleep behavior were recoded into the following three categories:

Category 1: baby slept as usual

Category 2: baby slept differently (settled)

Category 3: baby slept differently (unsettled).

Also, the variables describing the time that the mother drank alcohol were recoded into four categories:

Category 1: just after feeding baby

Category 2: just before or with evening meal

Category 3: related to other meals (before/after meals)

Category 4: various times throughout the day.

Hypotheses:

H_o: There is no relationship between the time of mother having alcohol and the breastfed babies' sleep behavior.

H_a: There is some relationship between the time of mother having alcohol and the breastfed babies' sleep behavior.

The summary results of the analysis are shown in Table 3.5.4.1. Sleeping patterns were not related statistically to the time of alcohol consumption. The analysis was repeated at each interview point in the study with similar results (weeks 4,10, 16, 22, 32, 40, 52).

There are several cells that have an expected count of less than five therefore the Fisher's exact tests were performed. The two-sided exact significant values of the Fisher's exact tests are greater than 0.05, indicated that at each time point, drinking has the same level of effect on baby's sleep for week 4 to week 52. It implies that the data does not provide enough evidence to reject the null hypothesis and we conclude that there is no statistical significant relationship between the time of the mother consuming alcohol and the baby's sleep behavior during these weeks.

All above Chi-Square tests are not statistically significant. The data does not provide enough evidence to reject the null hypothesis that there is no relationship between the time of mother having alcohol and the baby's sleep behaviour.

Table 3.5.4.1 Relationship between time of alcohol consumption and effect on infant's sleep habits.(week 4). Numbers are displayed (Percentages in brackets)

			baby sleep as usual	**Baby sleep differently (settled)**	**baby sleep differently (unsettled)**	
Breast feeding	time have drink	just after feeding baby	34 (92)	2 (5)	1 (3)	37 (100)
		just before or with evening meal	67 (94)	3 (4)	1 (1)	71 (100)
		related to meals(before/after meals)	2 (100)	0	0	2 (100)
		various times through a day	42 (95)	2 (5)	0	44 (100)
	Total		**145 (94)**	**7 (5)**	**2 (1)**	**154 (100)**
Not BF*	time have drink	just after feeding baby	5 (100)			5
		just before or with evening meal	31 (100)			31
		related to meals(before/after meals)	3 (100)			3
		various times through a day	14 (100)			14
	Total		**53**			**53**

***** Breastfeeding

Further analysis was then undertaken.

Seven Chi-square tests were carried out to test the hypotheses. Except for week 4, week 10, and week 40, there are statistically significant chi square values reported from the crosstabulation for week 16, week 22, week 32 and week 52.

Week 16:

For those mothers who drank alcohol "just after feeding baby", the two-sided exact significant value of the Fisher's exact test (0.027) is less than 0.05, therefore a different number of breast feeds is associated with a the different level of effect on baby's sleep for this group. It implies that the data provides enough evidence to reject the null hypothesis and we conclude that there is statistically significant association between the number of breast feeds and the baby's sleep

behaviour at week 16, controlling by the time the mother has alcohol ie "just after feeding baby".

However, it is not clear where the association is. We explore it by recoding two dummy variables: babies' sleep as usual, babies' sleep differently. We also grouped the number of feeds into two pairs: no feed and with feed, no feed or feed less than twice and feed more three times. Further chi- square tests were carried out for the two pairs.

1) no feed versus with feeds during the night

   There is no significant difference for the first pair, indicating there are no statistically significant associations between feeds and the babies sleep behaviour for this group.

2) no feed or feeds <= 2 versus feeds >= 3

   The two-sided exact significant value of the Fisher's exact test (0.027) is less than 0.05, implies there is an association between the feeds and the sleep for this group. The babies whose mothers feed them more than three time are less likely (Odds ratio = 0.032, 95% CI (0.002, 0.527)) to sleep as usual compared with those babies whose mothers do not feed them or feed them less than twice during night. Note that there are many cells with readings less than 5.

Week 22:

For those mothers who drink alcohol "just before or with evening meal", the two-sided exact significant value of the Fisher's exact test (0.008) is less than 0.05, indicating that 'different number of breastfeeds' offers a different level of effect on baby's sleep for this group. It implies that the data does provide enough evidence to reject the null hypothesis and we conclude that there is a statistically significant association between the number of breastfeeds and the baby's sleep behaviour at week 22, controlled by the time the mother has alcohol, "just before or with evening meal".

Still, it is not clear where the association is. We again explore it by recoding two dummy variables: babies' sleep as usual, babies' sleep differently. We also grouped the number of feeds into two pairs: no feed and with feeds, no feed or feed <= 2 and feed more than two times. Further chi-square tests were carried out for the two pairs.

1) no feed versus with feeds during night

   The two-sided exact significant value of the Fisher's exact test (0.028) is less than 0.05

for the first pair, implies there is an association between the feeds and the sleep behaviour for this group. The babies whose mothers did not feed them are more likely (RR = 1.103, 95% CI (1.106, 1.208)) to sleep as usual compared with those babies whose mothers did feed them during night. Note that there are many cells with readings less than 5.

2) no feed or feeds <= 2 versus feeds >=3

There is no statistical difference between the second pair. Hence, there is no statistical significant association between feeds and the babies sleep behavior for this group.

Week 32:

For those mothers who drank alcohol "at various times throughout the day", the two-sided exact significant value of the Fisher's exact test (0.04) is less than 0.05, indicating that the different number of breastfeeds offers a different level of effect on baby's sleep for this group. However, since there were many cells empty for this group, no odds ration or relative risk can be calculated and the results lack strength from a statistical point of view.

Week 52:

For those mothers who drank alcohol "just before or with evening meal", the two-sided exact significant value of the Fisher's exact test (0.014) is less than 0.05, indicating that the different number of breastfeeds offers a different level of effect on baby's sleep for this group. It implies that the data does provide enough evidence to reject the null hypothesis and we conclude that there is a statistically significant association between the number of breastfeeds and the baby's sleep behavior at week 52, controlled by the time the mother has alcohol "just before or with evening meal". However, similar to the data in week 32, there are too many empty cells for this group and hence the odds ratio or relative risk cannot be calculated based.

Overall this data does not show that drinking alcohol is more likely to result in a baby sleeping better throughout the night. The data suggests a weak and variable association between drinking alcohol and having a baby with a more disturbed sleeping pattern. However the number of mothers who were drinking significant amounts of alcohol at a time when it is likely to have maximum breastmilk levels was very small and hence the power of this study to detect significant relationships is quite limited.

3.5.5 Initiation of breastfeeding and relationship to drinking alcohol

A comprehensive analysis of the factors involved in breastfeeding initiation has been undertaken. Alcohol consumption was not related to breastfeeding initiation.

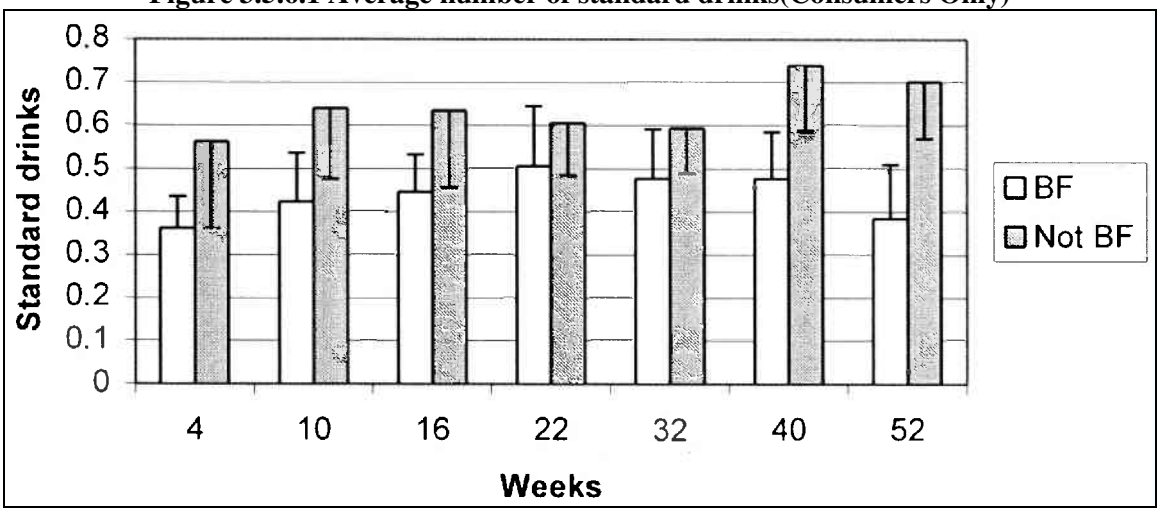
3.5.6 Duration of breastfeeding and relationship to drinking alcohol

Apart from the 40-week time point there was no significant difference in the likelihood of breastfeeding between women who drank alcohol and those who did not. However there is some indication that those who drank alcohol, breastfed for a shorter period of time (see Table 3.5.6.1).

Table 3.5.6.1 Proportion of mothers drinking alcohol and the relative risk of not breastfeeding in the Perth Infant Feeding Study Mark II

Week of Interview	Drinking No (%)	Yes (%)	Total n	% of all mothers (N)	RR of not breastfeeding if drinking (95% CI)
4	158 (40.2)	235 (59.8)	393	75.3 (522)	1.02 (0.86 — 1.12)
10	155 (47.5)	171 (52.5)	326	64.7 (504)	0.92 (0.78 — 1.08)
16	136 (47.9)	148 (52.1)	284	58.9 (482)	0.92 (0.78 — 1.09)
22	121 (48.4)	129 (51.6)	250	52.1 (480)	1.11 (0.93 — 1.34)
32	94 (48.5)	100 (51.5)	194	42.0 (462)	1.08 (0.90 — 1.30)
40	65 (41.4)	92 (58.6)	157	34.1 (461)	1.25 (1.04 — 1.49)
52	48 (44.0)	61 (56.0)	109	24.2 (450)	1.18 (0.96 — 1.44)

Figure 3.5.6.1 Average number of standard drinks(Consumers Only)



The relationship between drinking any amount of alcohol and breastfeeding status is shown in Figure 3.5.6.1, Figure 3.5.6.2 and Figure 3.5.6.3. 'Any alcohol drinking' meant that the mother had consumed alcohol since the last interview, a period of 6-10 weeks. In Figure 3.5.6.3 the data is presented as the relative risk of not breastfeeding together with 95% confidence intervals. These results show that generally alcohol consumption was not related to breastfeeding status, except at 40 weeks.

Figure 3.5.6.2 Breastfeeding status by whether mother had drunk alcohol.

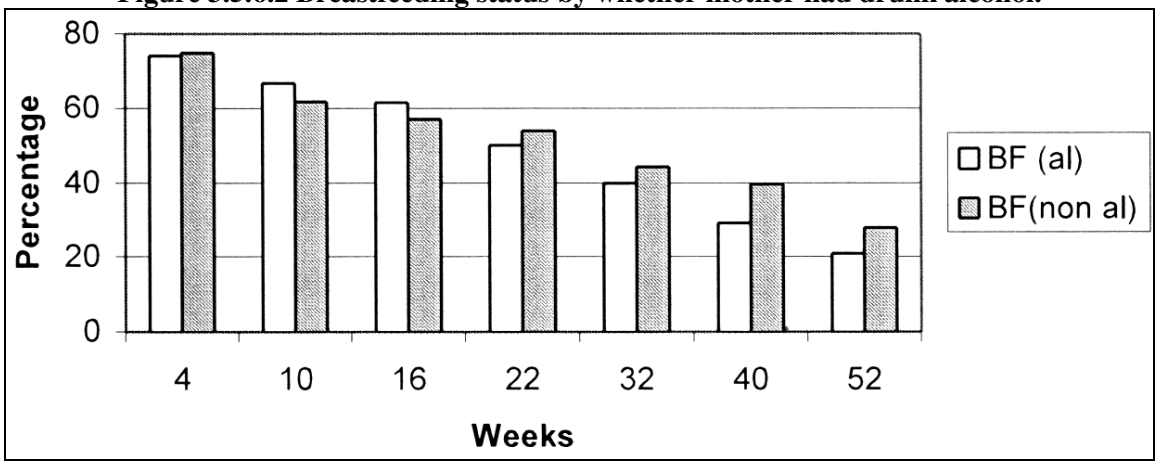
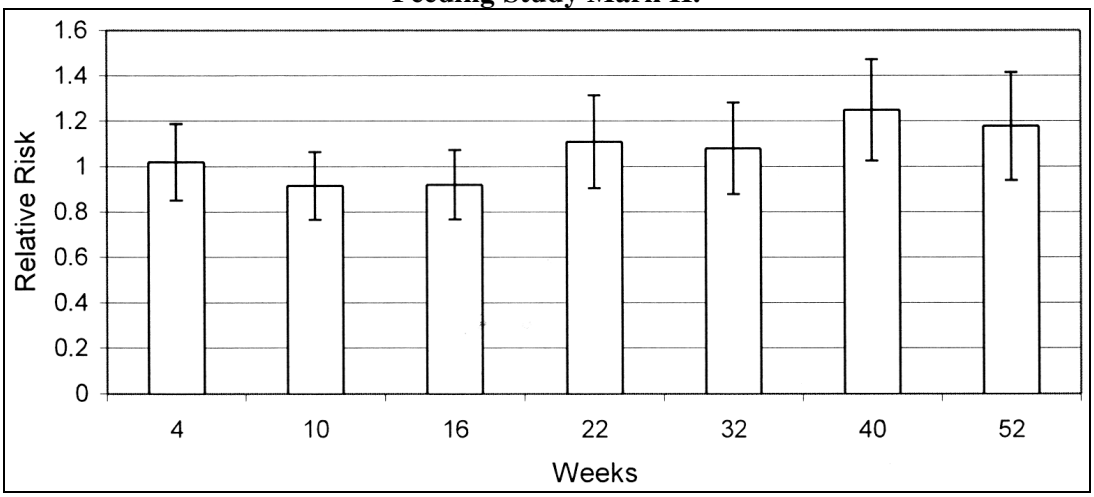


Figure 3.5.6.3 Relative risk of not breastfeeding if consuming alcohol in the Perth Infant Feeding Study Mark II.



There is some indication from this study that mothers who drank alcohol breastfed for a shorter period of time than non-drinkers.

The breastfeeding experiences of the mothers in the 95th percentile of alcohol consumption were compared to those who did not consume alcohol during the study. There was no statistical difference in the duration of any breastfeeding, full breastfeeding or exclusive breastfeeding. However it should be noted again that the number of these heavy consumers was quite small.

Because of interest in the effects of alcohol and health outcomes, further analyses of maternal alcohol consumption and health parameters were performed.

3.5.7 Multivariate modeling of variables that may have an effect on the duration of any, exclusive and full breastfeeding. (This includes considering mothers' intention of breastfeeding and when they plan giving solids to babies)

Cox-regression was applied to model the time-to-event data and to determine which variables have an effect on the duration of breastfeeding (any, exclusive and fully), for those mothers who were breastfeeding at the time of discharging.

The censoring factor that is used here describes the status at the time mothers wish to change from breast-feeding to formula feeding. Cox-regression is used to model the time-to-event data to determine the factors that are associated with mothers, who were breastfeeding at the time of discharge from hospital and are quick to switch to other feeding methods from the breast-feeding. Backward elimination procedure was applied.

This analysis was carried out again with two new variables, one is "how mothers intend to feed their babies in next few weeks?" and the other is "when mothers plan to give their babies solids?"

Recoding:

Variables describing, "how mothers intend to feed their babies in next few weeks?", were grouped into three categories:

Category 1 'continue bottle'

Category 2 'continue breastfeeding'

Category 3 'combined bottle and breastfeeding'.

Variable describing, "when mothers plan to give their babies solids??" was grouped into five categories:

Category 1 'before 3 months'

Category 2 '4 to 6 months'

Category 3 '> 7 months'

Category 4 'when baby ready'

Category 5 'do not know'.

Table 3.5.7.1 Duration of any breastfeeding: Variables in the Equation

	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
attclass	-.320	.142	5.095	1	.024	.726	.550	.959
educyrs2	.258	.127	4.107	1	.043	1.295	1.009	1.662
parity	.364	.149	5.998	1	.014	1.440	1.075	1.927
mcob3	-.123	.092	1.781	1	.182	.884	.738	1.059
dadpref	.355	.128	7.644	1	.006	1.426	1.109	1.833
gmumpref	.447	.138	10.528	1	.001	1.563	1.193	2.047
sex	.216	.124	3.053	1	.081	1.241	.974	1.582
age4			12.428	3	.006			
age4(1)	.492	.221	4.941	1	.026	1.635	1.060	2.522
age4(2)	.477	.212	5.054	1	.025	1.611	1.063	2.441
age4(3)	.031	.210	.022	1	.883	1.031	.684	1.555
Newg2la			24.193	4	.000			
Newg21 a(l)	.598	.349	2.927	1	.087	1.818	.917	3.605
Newg21 a(2)	.030	.305	.010	1	.921	1.031	.567	1.876
Newg2l a(3)	-.637	.357	3.1'81	1	.075	.529	.263	1.065
Newg21a(4)	-.346	.317	1.188	1	.276	.708	.380	1.318
AlcoFirst			4.386	7	.734			
AlcoFirst(1)	-.128	.439	085	1	.771	.880	.372	2.081
AlcoFirst(2)	.154	.431	.128	1	.721	1.167	.501	2.715
AlcoFirst(3)	.170	.450	.143	1	.706	1.185	.491	2.863
AlcoFirst(4)	.258	.491	.276	1	.599	1.294	.494	3.388
AlcoFirst(5)	.137	.476	.082	1	.774	1.146	.451	2.915
AlcoFirst(6)	.049	.499	.010	1	.922	1.050	.395	2.791
AlcoFirst(7)	.305	.546	.312	1	.576	1.357	465	3.959

Exp(B) is the predicted change in the hazard for a unit increase in the predictor and it can be interpreted as relative risk. There are seven statistically significant relative risk values: baby's sex, mother's age, fathers' and grandmothers' opinions on breastfeeding, whether mothers attended antenatal classes, and whether the baby was under a special care nursery.

- Mothers attended antenatal classes were less likely to stop any breastfeeding their babies (RR =0.726, 95% CI (0.55, 0.959)) compared those not attending the antenatal classes.

- Mothers having education completed < 12 years were more likely to stop breastfeeding their babies (RR =1.295, 95% CI (1.009, 1.662)) compared with those having more than (>=)12 years education.

- Mothers who have their first baby were more likely to stop breastfeeding their babies (RR =1.44, 95% CI (1.075, 1.927)) compared with those had more than one baby.

- Babies whose fathers preferred bottle feeding or who were ambivalent were more likely (RR = 1.426, 95% CI (1.109, 1.833)) to have been weaned from breastfeeding compared with those babies whose fathers preferred breastfeeding.

- Babies whose grandmothers preferred bottle feeding or who were ambivalent, were more likely (RR = 1.563, 95% CI (1.193, 2.047)) to have been weaned from breastfeeding compared with those babies whose grandmothers preferred breastfeeding.

- Mothers younger than 25 years old (RR = 1.635, 95% CI (1.06, 2.522)) and aged between (25, 29) (RR = 1.611, 95%CI (1.063, 2.441)) were more likely to stop breastfeeding their babies compared with mothers older than 35 years old.

- There is a statistically significant value = 0 for variable describing, "When mothers plan to give their babies solids" to the duration of any breastfeeding. However, there are no significant values for other sub-categories. Hence any observed differences between these mothers' categories could be due to chance.

Table 3.5.7.2 Duration of exclusive breastfeeding: Variables in the Equation

		SE	Wald	df	Sig.	ExpB)	95.0% CI for Exp(B) Lower	Upper
Newg21 c			2.186	4	.702			
Newg2lc(1)	-.034	.171	.041	1	.840	.966	.691	1.351
Newg21 c(2)	.144	.124	1.343	1	.247	1.155	.905	1.473
Newg21c(3)	.068	.232	.086	1	.769	1.071	.679	1.688
Newg2lc(4)	.236	.267	.777	1	.378	1.266	.749	2.138
age4			7.802	3	.050			
age4(1)	.317	.191	2.764	1	.096	1.373	.945	1.996
age4(2)	.164	.178	.842	1	.359	1.178	.830	1.670
age4(3)	-.085	.174	.236	1	.627	.919	.653	1.293
attclass	-.281	.119	5.601	1	.018	.755	.599	.953
educyrs2	.251	110	5.231	1	.022	1.285	1.037	1.593
parity	.256	.125	4.183	1	.041	1.292	1.011	1.652
bwtgr	1.468	.411	12.748	1	.000	4.342	1.939	9.721
scn	-.732	.184	15.819	1	.000	.481	.335	.690
AlcoFirst			6.888	7	.441			
AlcoFirst(I)	.744	.381	3.822	1	.051	2.105	.998	4.439
AlcoFirst(2)	.775	.378	4.195	1	.041	2.170	1.034	4.553
AlcoFirst(3)	.703	397	3.137	1	.077	2.019	.928	4.395
AlcoFirst(4)	.794	.435	3.338	1	.068	2.212	.944	5.183
AlcoFirst(5)	.708	.424	2.781	1	.095	2.029	.883	4.662
AlcoFirst(6)	.478	.438	1.189	1	.275	1.612	.683	3.805
AlcoFirst(7)	1.098	.480	5.243	1	.022	2.998	1.171	7.674
dadpref	.150	112	1.815	1	.178	1.162	.934	1.446
Newq2O			17.322	2	.000			
Newg20(1)	-.525	.651	.651	1	.420	.592	.165	2.117
Newg20(2)	-1.092	.269	16.496	1	.000	.336	.198	.568

- Mothers who attended antenatal classes were less likely to stop exclusively breastfeeding their babies (RR =0.755, 95% CI (0.599, 0.953)) compared with those never attended the antenatal classes.

- Babies whose mothers had less than 12 years education were more likely (RR = 1.285, 95% Cl (1.037, 1.593)) to have stopped exclusively breastfeeding compared with those babies whose mothers had more than 12 years education

- Mothers who have their first baby were more likely to stop exclusively breastfeeding their babies (RR =1.292, 95% CI (1.01 I, 1.652)) compared with those that had more than one baby.

- Babies which weighed less than 2500g were more likely (RR = 4.342, 95% CI (1.939, 9.721)) to have been weaned from exclusive breastfeeding compared with those babies whose weight was heavier than 2500g.

- Babies who were not put in the special care nursery were less likely to have stopped exclusively breastfeeding (RR = 0.481, 95%CI (0.335, 0.69)) compared with those babies who had been put under special care nursery.

- Mothers who started to drink alcohol at week 4 were more likely to stop breastfeeding (RR = 2.17, 95% CI (1.034, 4.553)) compared with those started drinking alcohol at week 52.

- Mothers who did not start drinking alcohol until week 40 were more likely to stop exclusively breastfeeding (RR = 2.998, 95% CI (1.171, 7.674)) compared with those who started drinking alcohol at week 52.

- Mothers who intend to continue breastfeeding their babies were less likely to stop exclusively breastfeeding (RR = 0.336, 95% CI (0.198, 0.568)) compared with those who intended to use combined (or other) method.

Table 3.5.7.3 Duration of fully breastfeeding: Variables in the Equation

	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
age4			10.434	3	.015			
age4(1)	.409	.181	5.079	1	.024	1.505	1.055	2.147
age4(2)	.079	.177	.202	1	.653	1.083	.766	1.531
age4(3)	-.027	.172	.025	1	.875	.973	.695	1.363
attclass	-.248	1 19	4.358	1	.037	.780	.618	.985
gmumpref	.096	.115	.698	1	.403	1.101	.879	1.379
bwtgr	.555	.394	1.983	1	.159	1.742	.805	3.769
educyrs2	.292	.108	7.302	1	.007	1.338	1.083	1.654
dadpref	.309	.119	6.796	1	.009	1.363	1.080	1.720
AlcoFirst			6.500	7	.483			
AlcoFirst(1)	.254	.349	.530	1	.467	1.289	.651	2.554
AlcoFirst(2)	.442	.347	1.621	1	.203	1.556	.788	3.075
AlcoFirst(3)	.543	.368	2.179	1	.140	1.720	.837	3.536
AlcoFirst(4)	.443	.407	1.182	1	.277	1.557	.701	3.460
AlcoFirst(5)	.133	.394	.114	1	.736	1.142	.527	2.474
AlcoFirst(6)	.162	.412	.154	1	.694	1.176	.524	2.637
AlcoFirst(7)	.430	.458	.881	1	.348	1537	.626	3.770
Newg20			9.108	2	.011			
Newg20(1)	.263	.649	.164	1	.686	1.300	.364	4.642
Newg20(2)	-.700	.270	6.712	1	.010	.496	.292	.843
Newg2la			28.624	4	.000			
Newg21 a(1)	.215	.297	.525	1	.469	1.240	.693	2.220
Newg21 a(2)	-.454	.254	3.192	1	.074	.635	.386	1.045
Newg21a(3)	-.923	.299	9.553	1	.002	.397	.221	.713
Newg21 a(4)	-.709	.269	6.944	1	.008	.492	.290	.834

- Mothers younger than 25 years old (RR = 1.505, 95% CI (1.055, 2.147)) were more likely to stop fully breastfeeding their babies compared with mothers older than 35 years old.

- Mothers attended antenatal classes were less likely to stop fully breastfeeding their babies (RR =0.78, 95% CI (0.618, 0.985)) compared with those who never attended the antenatal classes.

- Mothers having education completed < 12 years were more likely to stop any breastfeeding their babies (RR =1.338, 95% Cl (1.083, 1.654)) compared with those having more than >=12 years education.

- Babies whose fathers preferred bottle feeding or who were ambivalent were more likely (RR = 1.363, 95% CI (1.08, 1.72)) to have been weaned from been fully breastfed compared with those babies whose fathers preferred to breastfeeding.

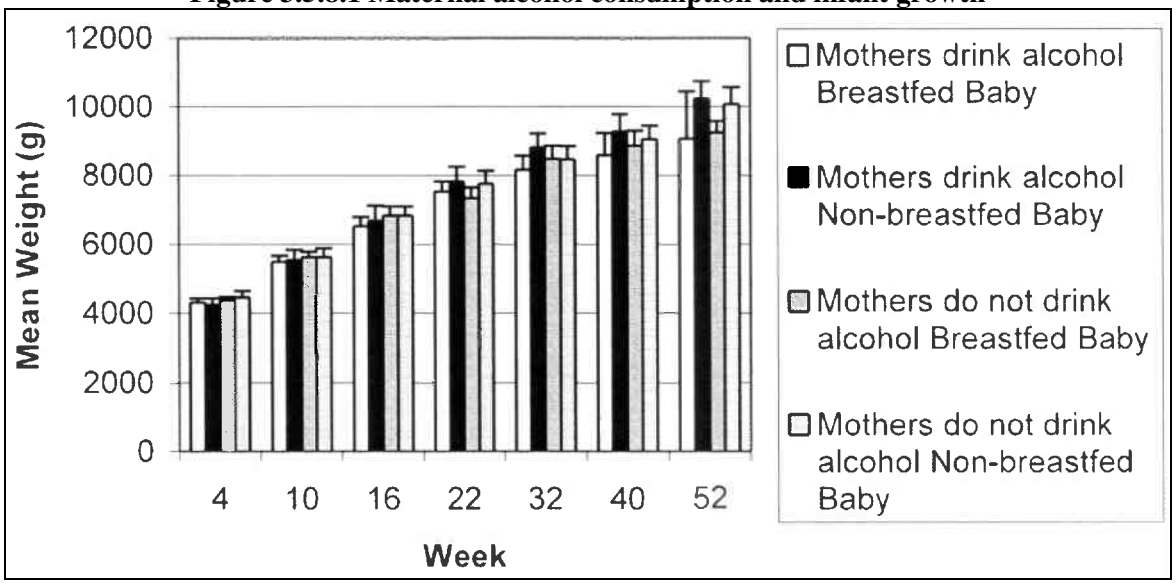
- Mothers who intended to continue breastfeeding their babies were less likely to stop fully breastfeeding (RR = 0.50, 95% CI (0.29, 0.84)) compared with those intended to use combined (or other) methods.

- Mothers who planned to give solids to their babies when they were over 7 months were less likely to stop fully breastfeeding (RR = 0.49, 95% CI (0.29, 0.84)) compared with those that did not know when they should give their babies solids (those don't have any plan).

3.5.8 Alcohol Consumption and Infant growth

The growth of infants over the first 12 months was related to maternal alcohol consumption. Figure 3.5.8.1 which includes the confidence intervals, shows that there is no influence of maternal alcohol consumption on infant growth. No effect was found for low birth weight infants or for infants of normal birthweight.

Figure 3.5.8.1 Maternal alcohol consumption and infant growth



A similar analysis was undertaken relating alcohol intake to the length of the infants. There was no relationship between maternal alcohol consumption and linear growth.

3.5.8.1 Summary of alcohol, breastfeeding and infant health

1) The mothers in this study reduced their alcohol intake considerably during pregnancy and lactation.

2) The IOWA scale of infant feeding perceptions predicted alcohol intake. Mothers who were more committed to breastfeeding consumed less alcohol.

3) There was a weak association between alcohol consumption and

4) breastfeeding.

5) There was no association between infant behaviour (sleeping patterns), and health and drinking patterns.

6) Mothers from Asia drink significantly less than mothers born in Australia, New Zealand or Europe. This explains the strong association between country of birth and postnatal drinking patterns.

7) Overall alcohol consumption levels during lactation were low. This would indicate that to study these associations in Australia, either a much larger sample is required or some way of identifying high consumers should be used. Obviously it would not be ethical to mount an intervention study where mothers were asked to consume larger quantities of alcohol.

3.5.9 Duration of breastfeeding and relationship to smoking

There is some indication from this study that mothers who drank alcohol, breastfed for a shorter period of time than non-drinkers. Smoking however appeared to have a stronger influence on breastfeeding than drinking alcohol. The association between maternal smoking and the lack of breastfeeding is a consistent finding across various study types and populations (Amir & Donath 2002). At all time periods in this study mothers who smoked were less likely to breastfeed and were more likely to have a shorter duration of breastfeeding and to begin complementary feeding sooner than non-smoking mothers. The study found that there was a similar prevalence of smoking among fathers and mothers but the impact of the importance of not smoking was seen in the timing of when each parent stopped smoking. The largest decrease in the smoking prevalence of mothers occurred during pregnancy while for fathers it occurred once the baby was delivered, perhaps as the presence of a new infant was only fully realised after the birth. Increasing the awareness of fathers, to the need to stop smoking sooner could assist mothers who smoke to stop smoking and so increase the duration of breastfeeding.

The proportion of mothers who reported smoking before their pregnancy was 39% and 26% continued to smoke during pregnancy.

The prevalence of parents smoking across the study time points is shown in Figure 3.5.9.1. A greater proportion of fathers smoked at all time points than mothers, with the prevalence ranging from 24% to 46%. The proportion of mothers smoking ranged from 23% to 39%. The largest decrease in the smoking prevalence of mothers occurred during pregnancy. In contrast fewer fathers stopped smoking during their partner's pregnancy and instead the largest decrease in the smoking prevalence of fathers occurred once the baby was delivered.

Figure 3.5.9.1 Smoking prevalence of parents during the first year of their infant's life compared to before and during the confinement period in the Perth Infant Feeding Study Mark II

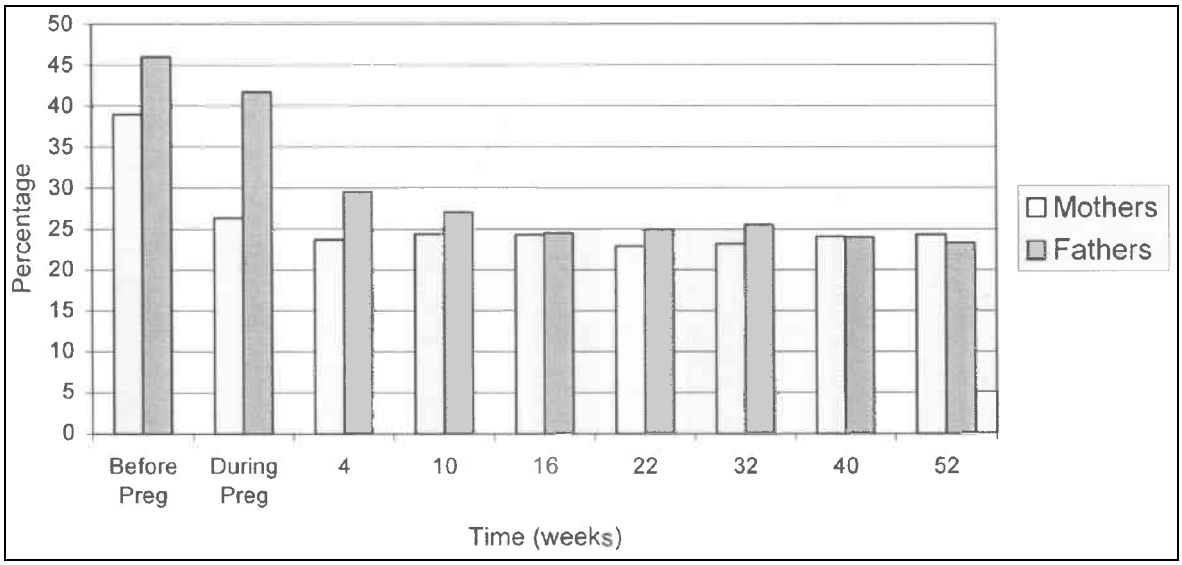


Table 3.5.9.1 Proportion of mothers smoking and the relative risk of not breastfeeding in the Perth Infant Feeding Study Mark II

Week of Interview	Smoking		Total		RR of not breastfeeding if smoking (95% CI)
	Yes (%)	No (%)	n	% of all mothers (N)	
4	80 (20.4)	313 (79.6)	393	75.1 (523)	1.65 (1.22—2.23)
10	55 (16.9)	271 (83.1)	326	64.6 (505)	1.90 (1.52 — 2.38)
16	43 (15.4)	236 (84.6)	279	58.5 (477)	1.82 (1.49 — 2.22)
22	35 (14.0)	215 (86.0)	250	52.1 (480)	1.63 (1.37 — 1.94)
32	22 (11.3)	172 (88.7)	194	42.0 (462)	1.54 (1.34 — 1.77)
40	20 (12.7)	138 (87.3)	158	.34.2 (462)	1.33 (1.18 — 1.50)
52	15 (13.8)	94 (86.2)	109	24.1 (452)	1.19 (1.08 — 1.31)

Smoking had a significant relationship with breastfeeding (see Table 3.5.9.1 and Figure 3.5.9.2). At all interview points mothers who smoked were significantly less likely to breastfeed. For example (from Table 3.5.9.1), mothers who smoked at the 10 week interview time point were almost twice as likely not to breastfeed, as women who did not smoke.

Figure 3.5.9.2 Relative risk of mothers not breastfeeding if smoking in the Perth Infant Feeding Study Mark II.

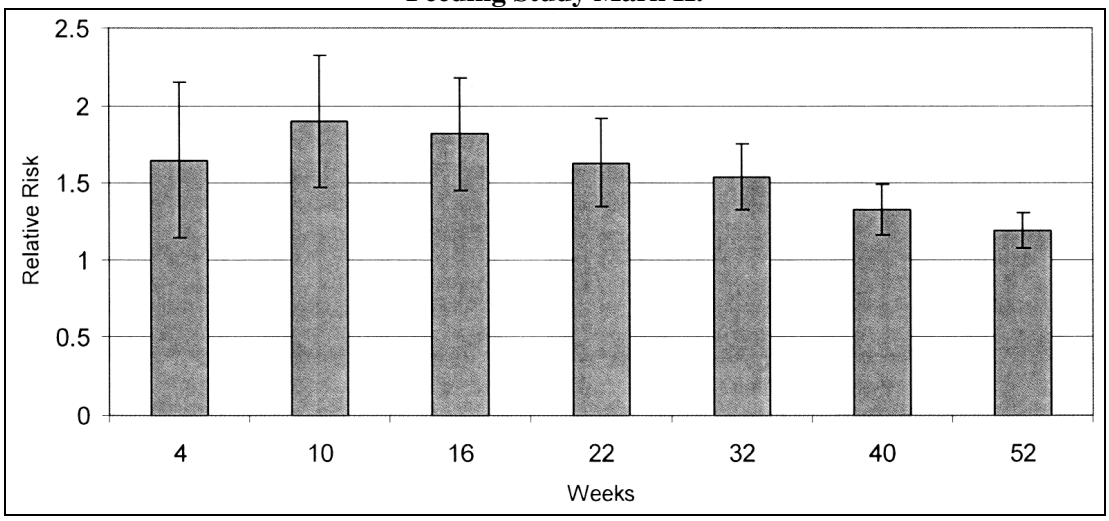
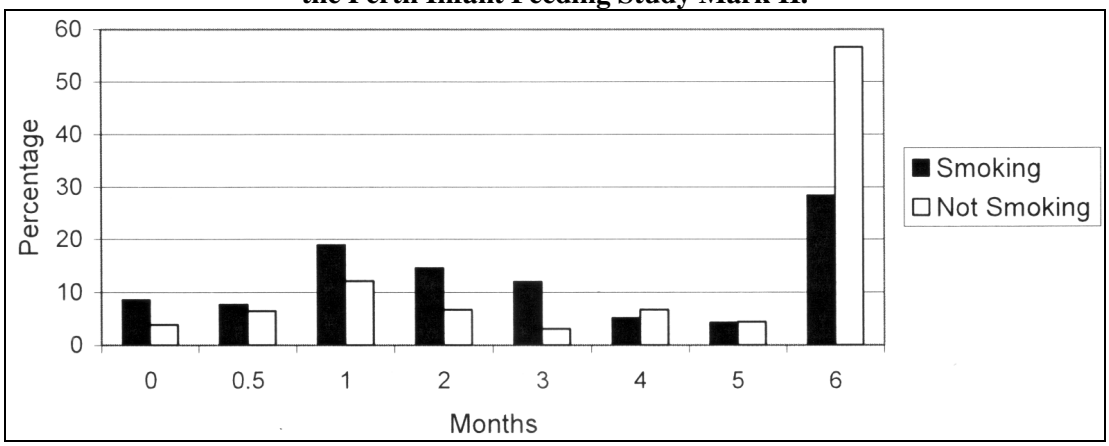
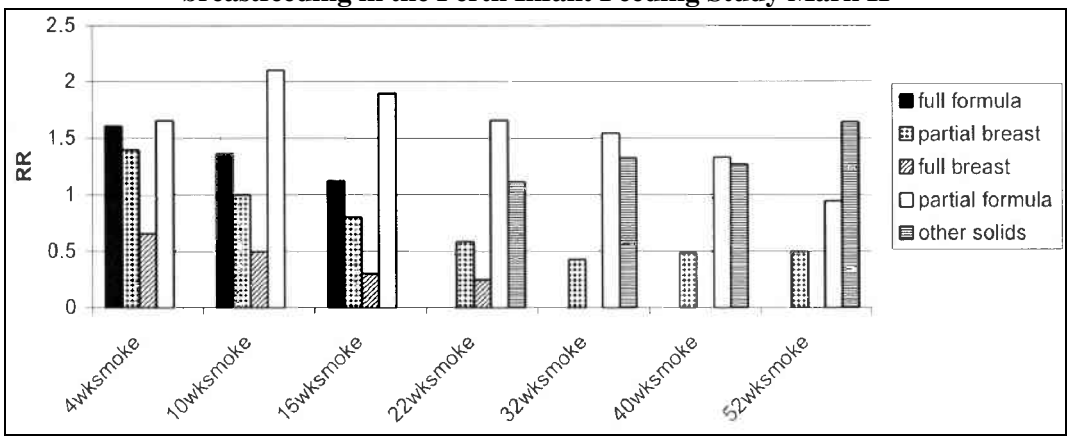


Figure 3.5.9.3 Duration of breastfeeding by the smoking status of mothers at four weeks in the Perth Infant Feeding Study Mark II.



Using the smoking status of mothers at 4 weeks as a baseline with which other time periods are compared, the proportion of mothers who continued to breastfeed and smoke decreased and was less than that of mothers not smoking and breastfeeding from five months and onwards (see Figure 3.5.9.3). By six months after delivery, the proportion of mothers continuing to breastfeed and smoke was only about half that of mothers not smoking.

Figure 3.5.9.4 Relative risk of mothers who are smokers either using formula or breastfeeding in the Perth Infant Feeding Study Mark II



The likelihood of mothers fully breastfeeding their infant and smoking decreased over the period of the study and was always less than one (see Figure 3.5.9.4) while the risk of providing full or partial formula for their infant was almost always greater than one. The likelihood of mothers giving their infant solids and smoking was always more greater than one from 22 weeks.

4.0 Qualitative data

A series of six focus groups were conducted during the period of the project. Women eligible to participate in the focus groups were currently breastfeeding or had been breastfeeding within the previous 12 months and represented a cross section of the socioeconomic scale of Perth postcodes. In total 47 women took part in the qualitative data collection. Women were asked to discuss their understanding of the effect alcohol has on breastfeeding, their attitudes to consuming alcohol whilst breastfeeding and their perception of the use of alcohol during breastfeeding (see Appendix C for questions).

4.1 Main themes

4.1.1 Breastmilk production

The majority of mothers had heard from varying sources that alcohol, in particular stout, could increase breastmilk production. Family and friends had been the source of this information. The women were unable to explain how the increase in breastmilk occurred and there was a mixed response with regard to how successful consuming stout had been in increasing their breastmilk supply.

4.1.2 Consumption of alcohol

Most women had consumed wine during breastfeeding and had done this at the evening meal or after the last feed for the evening. Most women expressed that initially when they first commenced breastfeeding they would rarely drink however as the child matured and they fed less the tended to consume more alcohol on a more regular basis. Most women consumed wine and reported that they would be less likely to consume spirits due to the higher alcohol content.

There was a general consensus from the women that they had been more diligent in abstaining from alcohol throughout their pregnancy due to the perception that there was more chance of the alcohol getting into the baby's system than when breastfeeding. In addition, mothers expressed that due to their abstinence during pregnancy they were entitled to recommence drinking alcohol once the baby had been born.

> *'More conscientious when I was pregnant because of the developing foetus. You have to give it a chance. Once they're out you can breastfeed them.'*

4.1.3 Advice on consuming alcohol

Most women had read that consuming alcohol throughout pregnancy could cause Foetal Alcohol Syndrome (FAS) however many reported that they had been unable to find any information about consuming whilst breastfeeding and that often what information they did find was conflicting. Most had read books when researching about the risks to the baby when consuming alcohol and a smaller number had asked their obstetrician, GP, child health nurse, Breastfeeding Australia (BFA) or searched the web.

> *'I asked my obstetrician and my sisters-in-law and tried to read up on it and all I find is conflicting (information).'*

> *'I don't think I was actively discouraged even from my obstetrician I wasn 't encouraged but I wasn 't discouraged put it that way. He never said I shouldn 't have any.'*

> *'I find that there seems to be a degree of acceptance of alcohol during breastfeeding from the GPs. My GP was very lackadaisical about it and I have friends who are GPs who like me have the occasional drink with a meal. I wouldn't say they drink a lot but it does seem to be quite accepted by the medical profession.'*

Many women reported a need to have more information about breastfeeding during lactation readily available in the community, particularly information that was correct.

> *'There seems to be a lot about pregnancy but none about when feeding.'*

4.1.4 Effect of alcohol on the baby

Mothers who had consumed alcohol whilst breastfeeding were asked about the effect on the baby while those mothers who had not consumed alcohol in close proximity to feeding were asked about the perceived effect on the infant.

Those mothers who reported drinking responded that they thought the baby had been more unsettled however many of them were unable to tell if this was just a coincidence or if there were other events (e.g. teething, had left baby with a baby sitter then fed when came home) that were causing the baby to be unsettled.

There were many various thoughts regarding the perceived effect of the alcohol on the baby. These are divided into short and long term effects and are listed in point form below.

Short term

- Baby would sleep better
- Baby would be more irritable
- Would put baby to sleep faster
- Baby would get a 'mini' hangover ('If they [adults] get a headache from it maybe the baby does as well.')

Long term

- Damage to the brain. Have developmental or neurological problems
- Baby would become reliant on alcohol if consumed regularly
- Get ADHD

4.1.5 Support for breastfeeding

There was a mixed response regarding the support family and friends had shown for the mothers during breastfeeding. A repeated theme was the pressure women experienced from family and friends to consume alcohol particularly with regard to helping the mother relax and promoting sleep in the baby.

> *'I used to get comments from my in-laws that a glass of red wine is good for you. It's good for her (the baby). It's medicinal. The family reasoning is that it's a way of life for Italian and Greek families.'*

The women stated that because there was so much conflicting advice about whether to consume alcohol or not it was difficult to respond to this pressure. They felt that some 'medical statement' or similar that outlined exactly what women should do with regard to alcohol intake during lactation would help provide them with a response to this pressure.

4.1.6 Conclusion

There is a variable level of knowledge regarding consuming alcohol and breastfeeding amongst breastfeeding mothers. Many women did not drink out of concern of not knowing the effects of alcohol on the infant. Most women did endeavour to seek more information regarding the effects of alcohol on the breastfeeding infant however they often found this information conflicting. Many were aware of the recommendations regarding alcohol during pregnancy and felt that a similar level of information was required to provide direction and support during lactation.

5.0 Discussion

The consumption of alcohol in Australia is part of the cultural norm however it appears from the above analysis of various population groups that alcohol intake during lactation is minimised by mothers.

Data from the 1995 and 2001 National Health Surveys indicate that the majority of mothers as defined by the data assumptions are low risk consumers of alcohol. There is however a small proportion of Lactating Mothers who show trends of alcohol intake not dissimilar to Non-mothers. Non-mothers were more likely to have higher intakes of alcohol on a more regular basis however the majority of this population also maintained a low risk intake and consumed alcohol within NHMRC recommendations (National Health and Medical Research Council 2001). Most pregnant women were least likely to consume alcohol and consumed alcohol at the lower levels of intake. In the 1995 NHS a small proportion of pregnant women (10%) consumed alcohol at higher intakes (10 to >15 standard drinks) however 20% of pregnant women report that their intake during the reference week is 'more than usual'.

Friday, Saturday and Sunday were the days when all women were most likely to consume alcohol, and wine followed by spirits was the preferred beverage.

Fathers from the 2001 NHS consume alcohol and in greater amounts than fathers from the 1995 NHS. Fathers from the 2001 NHS show a more regular pattern of drinking and a lower risk level than fathers from the 1995 NHS.

Alcohol does not appear to have an effect on the breastfeeding outcomes of Aboriginal women. Aboriginal women from the Perth Aboriginal Feeding Study report an average intake of 0.75 drinks per day with no women exceeding the general NHMRC recommendations (National Health and Medical Research Council 2001) for women.

In the Perth Infant Feeding Study (Mark 1I) alcohol intake during lactation was analysed together with many health issues. Overall alcohol intake during lactation is not statistically significantly related to health outcomes and duration of breastfeeding. However there is a trend in the data that suggests the introduction of alcohol during lactation (particularly in the first four weeks) is associated with stopping exclusive breastfeeding.

Alcohol consumed through the breastmilk is often purported as a method to help induce sleep in young babies. In the PIFS (II) research there is a lack of evidence to support or refute this theory.

Alcohol intake was not associated with infant sleeping patterns or growth of the infant.

Interestingly smoking was statistically significant in relation to breastfeeding duration with mothers who smoke being less likely to breastfeed and to breastfeed for a short period. Most mothers quit smoking during pregnancy, however fathers were more likely to await the arrival of the newborn infant before they stopped smoking.

Despite the lack of a clear and concise health directive regarding alcohol intake during lactation many mothers limit their intake during this period.

Limitations of this study

This report, a detailed compilation of the consumption of lactating women in Australia. The data is an analysis from several difference sources, the National Health Surveys of 1995 and 2001, specific data collected as part of the Perth Infant Feeding Study II and qualitative data from a series of focus groups. The collection of any data on alcohol is always difficult and is often subject to under-reporting. In this series of studies standardised questions developed and tested for the National HealthShat is not dependent on the methodology used is the responsible healthy behaviour of the mothers in the PIFS II study. One objective of the project was to study the effect of drinking alcohol on various infant behaviours. Most of the mothers who consumed alcohol did so in very small quantities and in doing so minimised the impact on the infants. This responsible behaviour made it difficult to find statistically significant associations between variables such as alcohol intake and sleeping patterns.

Conclusions

This report provides a detailed report of alcohol consumption by lactating and pregnant mothers in Australia.

1) The National Health Surveys, PIFS II and PABS show that alcohol consumption by most mothers while pregnant and lactating is quite restrained. About one third of mothers drink any alcohol while pregnant and this only increases to 40% while lactating.

2) Mothers want to know about the effects of alcohol as it is such an important part of Australian society, yet little information is given by health professionals or at antenatal classes.

3) Mothers who smoked before becoming pregnant tried to stop or to reduce their intake. Smoking cigarettes was associated with shorter duration of breastfeeding. With Aboriginal

mothers the rate of smoking was very high during pregnancy and lactation.

4) The IOWA scale of infant feeding perceptions predicted alcohol intake. Mothers who were more committed to breastfeeding consumed less alcohol.

5) There was a weak association between alcohol consumption and breastfeeding. Particularly this applied to full and exclusive breastfeeding.

6) There was no association between infant behaviour (sleeping patterns), and health and drinking patterns.

7) Mothers from Asia drink significantly less than mothers born in Australia, New Zealand or Europe. This explains the strong association between country of birth and postnatal drinking patterns.

Overall alcohol consumption levels during lactation were low. This would indicate that to study these associations in Australia, either a much larger sample is required or some way of identifying high consumers should be used. Obviously it would not be ethical to mount an intervention study where mothers were asked to consume larger quantities of alcohol.

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Appendix A Alcohol and Lactation: A Comprehensive Review

Alcohol and Lactation: A Comprehensive Review

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Introduction

Breastfeeding is the safest and best method for nurturing and optimising infant growth and health. In 2001 the World Health Organisation (WHO) Expert Consultation recommended exclusive breastfeeding for six months, with the introduction of complementary foods after this time, a position now adopted in Australia (National Health and Medical Research Council 2003b; National Health and Medical Research Council 2003a). Alcohol is an important part of most human societies and mothers need advice on its use during lactation. The term 'alcohol' describes a series of organic chemical compounds, however only one type, *ethyl alcohol* or *ethanol, is* found in significant quantities in drinks intended for human consumption.

Alcoholic beverages are a source of great enjoyment in many societies, but alcohol problems are an important public health concern(National Health and Medical Research Council 2001). Considerable research has been conducted into the effects of alcohol on the developing embryo and fetal alcohol syndrome (FAS) has become recognised as the foremost preventable, nongenetic cause of intellectual impairment (O'Leary 2004). The literature regarding FAS will not be addressed in this paper however it is important to note that there are well documented recommendations to restrict or limit alcohol intake during pregnancy (National Academy of Sciences 1990; National Health and Medical Research Council 2001). Many studies report a reduced alcohol intake during pregnancy and a return to prepregnancy levels, or at least higher intakes than during pregnancy, shortly following birth(O'Connor, Brill & Sigman 1986; Mennella & Gerrish 1998; Little, Lambert & Worthington-Roberts 1990).

The United States Institute of Medicine National Academy of Sciences (National Academy of Sciences 1991) recommends that alcohol consumption by lactating women in excess of 0.5 g/kg of maternal weight may be harmful to the infant, partly because of potential reduction in milk volume. Although no recommendation is given, the American Academy of Pediatrics, outlines that alcohol intake is 'compatible with breastfeeding' however the following effects are noted on the infant; 'with large amounts, drowsiness, diaphoresis, deep sleep, weakness, decrease in linear growth, abnormal weight gain; and maternal ingestion of 1g/kg daily decreases milk ejection reflex' (p780) (American Academy of Pediatrics 2001). The most recent Australian alcohol guidelines published by the NHMRC(National Health and Medical Research Council 2001) provide a guideline for alcohol consumption for pregnant, or soon to be pregnant women (Guideline I I). An appendage to this guideline is some 'prudent' advice for lactating women not to exceed the levels of drinking recommended during pregnancy, and to consider not drinking at all.

The aim of this paper is to review the literature on the physiological process and hormonal control of lactogenesis, the milk ejection reflex ('let down'), and the effect of alcohol on these processes in both the short term and long term. These three questions will be addressed:

1. What is the effect of alcohol intake on the hormonal control of lactogenesis?

2. What effect do blood alcohol levels have on the breastmilk concentration of alcohol and subsequent infant blood alcohol levels?

3. What is the effect of alcohol intake on the breastfeeding infant?

Methods

A literature review was conducted using the electronic databases PubMed, CINAHL, Proquest, Health and Medical Complete, Science Direct and ISI Web of Knowledge from 1990-2004. The search terms *'breastfeeding', 'breast feeding', 'breastmilk', 'breast milk', 'lactation', 'alcohol', 'ethanol'* and *'drugs'* were used and in addition relevant journals and bibliographies were specifically searched.

The US Department of Health and Human Services (US Department of Health and Human Services, National Institutes of Health & National Institute of Alcohol Abuse and Alcoholism 2004) defines a standard drink as containing approximately 14 grams (about 0.6 fluid ounces) of pure alcohol. The Australian National Health and Medical Research Council (NHMRC) (National Health and Medical Research Council 2001) outline a standard drink as containing 10 grams (12.5 millilitres) of alcohol. All references to alcohol volumes have been converted to Australian standard drink equivalents (unless stated otherwise).

References used in this paper (at first use) have been classified using the NHMRC guide, *'How to use the evidence: assessment and application of scientific evidence'* (National Health and Medical Research Council 2000) (see Table 1). While originally developed for clinical guidelines, the guidelines can be used in public health assessments recognising that in research on maternal and infant alcohol intakes, ethical restraints on human experimentation limit the types of research that can be undertaken. In this review paper expert consensus statements and evidence from experimental studies with animals and/or cells that may provide valuable adjunct information and are given a rating of Level V. In addition, the Royal Australian College of General Practitioners 'strength of recommendation' criteria have also been used to classify the quality of the reference articles (The Royal Australian College of General Practitioners 2001).

Table 1 NHMRC levels of evidence and RACGP Strength of recommendation

	NHMRC Level of evidence
I	Evidence obtained from a systematic review of all relevant randomised controlled trials.
II	Evidence obtained from at least one properly designed randomised controlled trial.
II-1	Evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).
III-2	Evidence obtained from comparative studies (including systematic reviews of such studies) with concurrent controls and allocation not randomised, cohort studies, case-control studies, or interrupted time series with a control group.
III-3	Evidence obtained from comparative studies with historical control, two or more single arm studies, or interrupted time series without a parallel control group.
IV	Evidence obtained from case series, either post-test or pretest/post-test.
V	Evidence provided by expert consensus statements, experimental animal and cell studies.
	RACGP Strength of recommendation
A	There is good evidence to support the recommendation.
B	There is fair evidence to support the recommendation.
C	There is poor evidence regarding the inclusion or exclusion of the recommendation but recommendations may be made on other grounds.
D	There is fair evidence against the recommendation.
E	There is good evidence against the recommendation.

The physiology of lactation

Lactogenesis

Specialised glands that secrete breastmilk are already present at birth. However it is not until puberty that they develop further and during pregnancy they become fully functional. The development of these mammary glands and the initiation of milk secretion from the numerous alveoli containing the milk secreting cells within the gland are regulated by hormonal control(Heil & Subramanian 1998). The commencement of this secretory differentiation during pregnancy is referred to as 'lactogenesis stage I'. However the gland will remain inactive until activated hormonally. 'Lactogenesis stage 11' is the onset of milk secretion often occurring at day four postpartum (Neville & Morton 2001)

The most important hormones for the initiation and maintenance of lactation are prolactin and oxytocin. Prolactin levels rise throughout pregnancy controlling the final development of the mammary gland secretory mechanism. At the same time high levels of placental lactogen, oestrogen and progesterone prevent the prolactin from initiating lactation and it is not until the baby is born that levels of progesterone and oestrogen fall initiating stage II of lactogenesis. This allows prolactin to exert its effects on the mammary tissue and initiate milk secretion.

Once lactation has been established, prolactin is also essential for the maintenance of lactation. In response to the infant's suckling, prolactin is released from the anterior pituitary gland and enables the mammary gland to produce milk before the next feed. The lactating mammary gland exercises a local feedback inhibitory control over milk synthesis, autocrine control, based on a supply=demand feedback loop of control. The higher the intensity of the sucking the greater the release of prolactin into the blood and this response will continue as long as the infant is allowed to suckle more than once per day(Picciano 1996; Heil & Subramanian 1998). However there does not appear to be a direct relationship between prolactin and milk yield as the autocrine control 'downregulates' milk synthesis to match the mother's supply of milk to the infant's appetite(National Health and Medical Research Council 2003b).

Milk ejection reflex

The 'milk ejection reflex' or 'milk let down' is responsible for expelling the milk from the alveoli into small ducts leading to the nipple. It is under the hormonal control of oxytocin, which is secreted into the blood stream from the posterior pituitary gland(Clement, Glasier & McNeilly 1992). Like prolactin, oxytocin is released in response to suckling or other stimuli (e.g. hearing the baby cry) and ensures effective emptying of the breast by the infant(Neville 2001; Mennella 2001a Ultrasound imaging of milk ejection indicates that infant milk intake is positively related to the number of milk ejections (Ramsay 2004). *(Evidence level Ramsay—NHMRC IV)*

The effect of alcohol on the mother

Maternal blood alcohol concentration

Alcohol enters breastmilk by passive diffusion and reflects levels in maternal blood within 30 — 60 minutes after ingestion .(Schulte 1995; Lawton 1985; Bailey & Ito 1997; Kesaniemi 1974; Mennella & Beauchamp 1993). *(Evidence level Schulte; Bailey & Ito — NHMRC V, review article: Evidence level Lawton; Kesaniemi — NHMRC IV; Evidence level Mennella & Beauchamp — NHMRC II)* Factors that influence the blood alcohol concentration (BAC) of the mother include body weight, amount of adipose tissue, stomach contents at the time of alcohol ingestion, rate at which alcohol beverages are consumed, and the amount and strength of alcohol in the drink. The phase of a woman's menstrual cycle will also influence her rate of absorption of alcohol with low oestrogen levels being associated with a higher BAC. Low oestrogen levels are present during amenorrohoeic lactation and therefore drinking during these times will cause a higher BAC, a higher degree of intoxication, resulting in a higher alcohol concentration in breastmilk. The baby will therefore ingest more alcohol during feeding(Schulte 1995).

Effect of alcohol on lactogenesis and the milk let down

In many parts of the world folklore suggests that women should drink alcohol (particularly beer) to enhance breastmilk supply and promote breastfeeding success. For example in Germany women drink malt beer. In Mexico women are encouraged to drink a local plant fermented juice called pulque daily during pregnancy and lactation, and Indochinese women in California drink wine steeped in herbs to promote successful lactation (Mennella 2001a). However it seems the evidence to support this enhanced effect of alcohol on breastfeeding is limited and unsupported (Koletzko & Lehner 2000; Mennella & Beauchamp 1993). *(Evidence level Koletzko & Lehner – NHMRC V, review article; Evidence level Mennella & Beauchamp – NHMRC II)*

High amounts of alcohol consumption by lactating mothers have been shown to suppress lactation through an effect on oxytocin(Howard & Lawrence 1999). *(Evidence level Howard & Lawrence – NHMRC V, review article)* In a study of 40 women Cobo (1973) found that ethanol blocks the release of oxytocin and that the degree of inhibition is dose dependent. This study measured intramammary pressure and found doses of alcohol below 0.5g/kg body weight have little effect on the suckling induced increase in pressure (i.e. milk ejection). With ethanol doses between 0.5 and 1g/kg most women show no effect and others experience a partial or complete block of the response. Doses between 1 to 1.5g/kg completely blocked the response in approximately half of the women and partially blocked the response in the remainder of the women. Doses from 1.5 to 2g/kg decreased the milk ejection response in all women with the average decrease in response being approximately 80%(Cobo 1973). *(Evidence level – NHMRCII)* (NOTE l g per kg is 6 standard drinks for a 60kg woman and results in a blood alcohol level of 0.15 if consumed in one hour).

Cobo postulates that it is possible that doses higher than 2g/kg (equivalent to approximately 12 standard drinks) in a 60kg woman could completely inhibit the suckling induced oxytocin release in humans. This is a central effect of ethanol as the mammary gland response to exogenous oxytocin was not changed by ethanol. On the basis of comparative studies Fuchs suggests an inhibitory dose of 1.1-1.5g/kg ethanol for women(Cobo 1973; Fuchs 1969; Subramanian 1999). *(Evidence level Fuchs; Subramanian – NHMRC V, animal study).*

Beer in quantities ranging from 800m1 to one litre, has been shown to increase serum prolactin secretion in normal men and nonlactating women as beer is reported to have different effects as a galactagogue, unlike ethanol alone(Carlson, Wasser & Reidelberger 1985; DeRosa et al. 1981). However in a study by Mennella and Beuchamp (Mennella & Beauchamp 1993) *(Evidence level – NHMRC II)* the authors propose a decrease in the milk ejection reflex as a possible cause for the decrease in milk intake by infants through the effect of the alcohol on oxytocin and not on prolactin. This view is supported by Subramanian (1999) and a later study by Heil and Subramanian (2000)(Heil & Subramanian 2000). *(Evidence level – NHMRC V, animal study)*

Lactational performance has been shown to decrease in both animal and human studies of alcohol intake and breastfeeding. Tavares do Carmo(Tavares do Carmo et al. 1999) and colleagues showed a graded inverse response to alcohol and Mennella and Beuachamp(Mennella & Beauchamp 1991) undertook similar experiments in lactating mothers.

Lactating rat dams were allocated to one of three groups; I) alcohol treated (AL), 20% ethanol diluted in drinking water and food ad lib; 2) pair fed (PF), nutritional control receiving a solid diet per day and per 100g (body weight to give an equivalent daily caloric intake as the AL rats; and control rats (C) receiving a solid diet and drinking water ad lib(Tavares do Carmo et al. 1999). *(Evidence level – NHMRC V, animal study)* Lactational performance was reduced in the AL dams and there was a decrease in milk yield of these mothers in comparison to the two other groups. The milk production was even lower than that of the group receiving the same daily energy intake indicating a direct effect of alcohol negatively effecting milk production. The reduced milk production of the AL mothers was also associated with a significant decrease in weight gain in their pups(Tavares do Carmo et al. 1999).

Murillo-Fuentes et al (2001) studied the effect of chronic alcoholism during gestation and/or lactation using five groups of new-born pups. As in the previous studies the amount of milk consumed was significantly lower for alcohol administered groups compared to control and pair-fed groups (P<0.00I), with milk consumption lowest in the pups exposed to ethanol during gestation and lactation. Once again body weight also decreased in offspring fed from alcohol fed dams (Murillo-Fuentes et al. 2001).

These results support those of Tavares do Carmo et al (1999) (Tavares do Carmo et al. 1999) in that the decrease in milk intake by the pups exposed to ethanol during lactation appears to be the result of the adverse effects of alcohol on oxytocin release rather than maternal malnutrition as this effect is not apparent in the pair-fed group.

Mennella and Beuachamp (1991) *(Evidence level –NHMRC II)* evaluated the effect of maternal alcohol intake on breastmilk intake as well as breastmilk odour and infant behaviour. Twelve lactating nonsmoking mothers were given ethanol in orange juice (0.3g/kg body weight)[2] on one test day, or orange juice alone (control) on the other test day (test days separated by one week)(Mennella & Beauchamp 1991). Infants were weighed immediately before and after each feed and the volume of milk consumed by the infant was estimated by dividing the weight of the milk consumed by 1.031, the specific gravity of mature human milk. The infants consumed significantly less milk during the testing session in which mothers drank alcohol (120.4 +/- 9.5m1) compared to the orange juice alone (156.4 +/- 8.2m1) ($P<0.001$). There was no difference in the number of feedings or the total length of time during which infants were attached to the breast between the two testing sessions, indicating that an observed decrease in milk intake by the infants was not due to a decrease in the duration of the feeds.

Three possible mechanisms, acting separately or interacting to cause this overall reduced intake, have been proposed. First there was a reported change in flavour of the breastmilk, which may have altered the infant's behaviour. Second the reduced breastmilk intake may be a direct effect of alcohol on the infants and changes in sleeping behaviour observed on the day of the alcohol ingestion may suggest a phannacologic effect of the alcohol. Third is the possibility that a decrease in milk production by lactating mothers may have resulted from an alcohol induced inhibition of antidiuretic activity. Moreover, as has been suggested previously (Cobo 1973; Subramanian 1999; Mennella & Beauchamp 1993), ethanol may effect the milk-ejection reflex, despite the low doses used in this study.

In the Mennella and Beauchamp (1993) study, the volume of milk consumed by the infant was measured by weighing the infant before and after each feed. The lactational capacity of the mother was reduced during the four hour testing sessions in which the mothers drank the alcoholic beer as the infants consumed significantly less breastmilk (149.5 +/- 13.1 ml) compared to the session in which mothers drank the nonalcoholic beer (193.1 +/- 18.4 ml) ($P<0.03$). The observed intake was not due to a decrease in the total amount of time they were attached to the breast for the two sessions.

In a later study by Mennel la (1998) 22 lactating women were tested on two days, separated by one week, after expressing milk (completely emptying the breast) using an electric pump following doses of either a 0.3g/kg dose of alcohol in orange juice or an equal volume of orange juice alone. The results showed a significant decrease in the amount *of* milk expressed following maternal alcohol consumption (79.4 +/- 5.3 ml) compared with the orange juice control (89.5 +/- 5.8 ml) ($P<0.05$), a decrease *of* 9.3% in the two hours following consumption *of* the alcoholic beverage. Despite the infant consuming less milk post maternal alcohol consumption, there was no change in the energy content *of* the milk, which poses the question of how the infant compensates for this deficit in intake in the short term and *if* this potential for decreased intake is maintained with regular alcohol consumption (Mennella 1998). *(Evidence level — NHMRC II)*

This result is again consistent with a similar study by Mennella (2001b) (Mennella 2001 b)

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[2] This amount of alcohol approximates the ethanol content of approximately 1.5 standard drinks.

(Evidence level — NHMRC II) in which infants consumed approximately 20% (P<0.05) less breastmilk during the four hours after exposure to alcohol in mother's milk despite being breastfed the same number of times. The physiological response to alcohol on oxytocin is demonstrated by Ramsey et al (2004) through ultrasound imaging illustrating that the number of milk ejections influences the amount of milk the infant consumes, therefore a decrease in the number of milk ejections will decrease the volume of milk consumed(Ramsay 2004).

Duration

Howard and Lawrence (1998) (Howard & Lawrence 1998) present data on drug (alcohol, cigarettes, marijuana/hashish, and cocaine) use during pregnancy and breastfeeding from the United States 1988 National Maternal and Infant Health Survey (NMIHS) *(Level of evidence — NHMRC V, review article).* Results from this study found that women who drank alcohol more than six times per week were equally likely to choose breast or formula feeding, and women whose consumption was less than six drinks per week were almost twice as likely to choose breastfeeding (OR 1.9; P<0.05). Interestingly breastfeeding duration for women who consumed alcohol or who were more frequent users of cocaine did not differ significantly from the duration of women who did not use these drugs.

A study by Little, Lambert and Worthington-Roberts (1990)(Little, Lambert & Worthington-Roberts 1990) *(Evidence level — NHMRC III-2)* investigated the relationship between levels of maternal smoking and drinking of 463 women at preconception, during pregnancy, and in the postpartum period. Drinking and smoking were estimated in three cohorts of postpartum women; 1) never breastfed; 2) breastfed for less than one month; 3) breastfed for more than three months (women who weaned between one and three months were not studied). Approximately 80% reported drinking some alcohol in the month before conception, with alcohol use dropping after conception, and only 40% of subjects reporting drinking in the last trimester. After delivery, drinking rose and by the end of the third month postpartum, 69% of the total sample reported some drinking however not to the level reported at preconception. The changes over time were consistent for all groups. The study found that women still nursing at three months postpartum generally reported less drinking in all the time periods, especially less binge drinking, than women in the other two groups. Contrary to previous findings (Howard & Lawrence 1998) and most worthy of note was that women who weaned early almost always reported the highest frequency of all drinking patterns, and they were more likely to report binge drinking (RR = 4.1: 99%-CI 1.72, 9.62), smoking (RR =1.5; 99%-Cl 1.14, 1.96) and heavy smoking (RR = 6.9; 99%-CI 2.80, 16.90) at three months postpartum than women who were still nursing, even after preconception habits were taken into account. Women who never breastfed tended to be intermediate or more like nursing women.

In this study (Little, Lambert & Worthington-Roberts 1990) differences in smoking and drinking habits by lactation history cannot be attributed to differences in age, education, race, marital status, employment outside the home or parity, as these were accounted for in the analysis. These results provide support for a recommendation to reduce or eliminate alcohol intake during lactation, which would help foster the mindset of abstinence that appears to be so easily maintained during pregnancy. By preparing women for a continued abstinence of alcohol following pregnancy women may be more inclined and mentally prepared to maintain this behaviour throughout lactation thus possibly promoting prolonged breastfeeding duration.

Table 2. Key articles evidence table; the effect of alcohol on the mother

Effect on the mother	Grading	Reference	Strength of Recommend-ation (A, B, C, D)	Key findings
Effect on blood alcohol				
	IV	Kesaniemi (1974)	C	Ethanol reaches human milk in almost the same concentration as in the blood at 30 minutes after administration.
	IV	Lawton (1985)		Alcohol appeared quickly in both fore- and hindbreastmilk at a level equivalent to or higher than the corres•onding blood samples.
Effect on milk ejection reflex				
	V Animal study	Fuchs (1969)	C	Lactating dams alcohol intake • 1.0kg/kg body weight - no effect on milk removal • 2.0kg/kg body weight - significant reduction on milk removal • >2.0kg/kg/body weight further reductions in milk yield • 5g/kg/body weight - complete inhibition of the milk ejection reflex. Ethanol inhibits oxytocin release in the rat.
	II	Cobo (1973)	B	Maternal alcohol intake of • <0.5g/kg body weight - no effect • 0.5 - 1 g/kg body weight - varying individual effect from no effect to complete block of milk ejection response • 1.5 - 2g/kg body weight - decreased milk ejection response (average decrease 80%) • >2g/kg body weight - complete inhibition of the milk ejection reflex.
	II	Mennella and Beauchamp (1991)	B	Maternal alcohol intake of 0.3g/kg body weight decreases milk intake in infants and is proposed to be a result of a decrease in the milk ejection reflex.
	V Animal study	Subramania n (1999)	C	Alcohol administration in lactating dams inhibited the suckling induced oxytocin release.
	V Animal study	Heil and Subramania n (2000)	C	Lactating dams alcohol intake of 1.0kg/kg body weight and 2.0kg/kg body weight. Pups of the 2.og/kg groups reduced milk intakes and lower body weights despite elevated suckling induced prolactin release suggesting alcohol's primary impact is through oxytocin.

The effect of alcohol on the infant

Infant alcohol absorption

Ethanol is a nonpolar compound and as ethanol is water soluble it will pass easily through biological membranes and be distributed proportionally throughout the water compartments of the body .The average water content of breastmilk is 87.5% and that of blood is 85%. For this reason it is expected that the ethanol concentration at equilibrium would be slightly higher in breastmilk(Lawton 1985).

The rate of absorption and elimination of alcohol in the breastmilk, and level attained in the baby's blood was investigated by Lawton (1985). Eight mothers were asked to consume as much alcohol as they could in the shortest possible time (range of intake: 0.56g/kg body weight – 1.50g/kg/body weight). Samples of breastmilk were expressed and blood samples taken. Results show that women who consumed moderate to high intakes had alcohol levels higher in breastmilk than in blood. However at lower alcohol intakes, blood and milk alcohol levels were similar. The rate of elimination of alcohol from breastmilk and blood were similar. The level of alcohol in breastmilk falls as blood alcohol levels fall because retrograde diffusion of alcohol from the milk back to the blood stream occurs. Any alcohol present in milk stored in the breast returns to the blood supply to maintain equilibrium during elimination, regardless of emptying the breasts (Anderson 1995; Lawton 1985). *(Evidence level Anderson – NHMRC V, review article)*

Using the baby of 'subject one' from the Lawton study as an example, the maximum blood alcohol value of the baby can be calculated. This baby was six months old and weighed 6.5kg. This is equivalent to the 5^{h} percentile for boys and the 25th percentile for girls. During the experiment it consumed 180ml breastmilk while the mother was near her maximum blood alcohol level (119mg alcohol/dl blood). Thus the baby would have consumed 245mg of alcohol'(37mg/kg body weight). However taking into consideration the body water content of approximately 0.60g/kg of body weight then the blood alcohol level would rise to approximately 6mg alcohol/dl blood. Even taking into account the limited activity of alcohol dehydrogenase (–20% of an adult's capacity) in a young baby, the author proposes that it is 'improbable that occasional exposure to alcohol of that quantity would affect the child' (p 73) (Lawton 1985).

On the two testing occasions for 'subject one' in the Lawton study(Lawton 1985) the maternal alcohol intake was 0.75g/kg body weight and I .05g/kg body weight respectively. These levels are higher than in many of the studies found to inhibit the milk ejection reflex (Cobo 1973; Mennella & Beauchamp 1993; Mennella & Beauchamp 1991; Mennella 1998; Mennella 2001b) and higher than that recommended by the Institute of Medicine(National Academy of Sciences 1991). *(Evidence level – NHMRC V, expert authority)*

An earlier study by Kesaniemi (Kesaniemi 1974) *(Evidence level –NHMRC IV)* concurs with Lawton (Lawton 1985) as to the level of maternal alcohol intake suggested not to cause harm to the infant. Kesaniemi states that mothers receiving approximately 0.6g/kg body weight ethanol orally would result in maternal blood and milk ethanol levels of 18.2 +/- 2.5umol/ml (83.7mg/dl blood) and 16.9 +/- 2.5umol/ml, respectively. At similar levels of intake a 5kg infant receiving 200ml of milk would receive about 180mg ethanol or about 36mg/kg body weight, which Kesaniemi states is 'unlikely to have harmful effects on the infant' (p.84). However similar to the Lawton study small numbers of women were used (12 mothers) and the alcohol was given very rapidly after fasting conditions.

Contrary to these results are those from subsequent research (to be discussed later) by Little and colleagues(Little et al. 1989) who suggest that intakes of 232mg by a 5kg infant may be detrimental to the motor development of the infant.

Fulton (1990) *(Evidence level — NHMRC V, review article)* calculates that the amount of ethanol taken in through breastmilk is relatively small at 0.3g by a 5kg infant after six standard drinks by a 60kg mother in one sitting. However given the developmental problems that can occur, the developing infant's brain must be extremely sensitive to small amounts of ethanol or accumulation occurs(Fulton 1990). Infants detoxify alcohol in the first four weeks of life at a rate half that of an adult owing to decreased alcohol dehydrogenase activity of the liver as liver maturation is not complete until about three months old. For this reason alcohol exposure will have a more severe affect on a younger child(Kesaniemi 1974; Fulton 1990; Schulte 1995).

Ho and colleagues (Ho et al. 2001) *(Evidence level — NHMRC V, experimental)* developed a nomogram to guide lactating women who drink alcohol on how to avoid exposure of their infant to ethanol through breastmilk. Taking into account Total Body Water (TBW), BAC and body weight, the average maximal elimination rate of 15mg/dl/h (V_{max} x V_d) was used. Time is calculated from the beginning of drinking, alcohol metabolism is assumed constant at l5mg/dl, height of the woman is 162.56cm and one drink is a standard Australian drink serve of 10g of alcohol. At the end of each time period it is proposed that the alcohol content of the milk will be zero.

Table 3 Alcohol and breastfeeding: time (h:min) until the zero level in milk is reached for women at different body weights

Maternal Weight	**Number of standard drinks**									
kg	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
45	1:54	3:50	5:45	7:40	9:36	11:31	13:27	15:22		
47	1:52	3:44	5:37	7:29	9:22	11:14	13:07	14:59		
50	1:51	3:43	5:35	7:27	9:18	11:11	13:03	14:54	16:52	
52	1:48	3:37	5:26	7:15	9:05	10:53	12:42	14:31	16:47	
54	1:46	3:32	5:19	7:05	8:52	10:38	12:25	14:11	16:21	
57	1:45	3:31	5:17	7:02	8:48	10:34	12:20	14:05	15:58	
59	1:42	3:26	5:09	6:52	8:36	10:19	12:02	13:45	15:52	
61	1:40	3:21	5:02	6:43	8:24	10:05	11:46	13:28	15:29	16:50
63	1:38	3:17	4:56	6:34	8:13	9:52	11:30	13:10	15:09	16:27
66	1:37	3:15	4:53	6:31	8:10	9:48	11:26	13:04	14:48	16:20
68	1:35	3:12	4:47	6:24	8:00	9:36	11:12	12:48	14:42	16:00
70	1:33	3:07	4:41	6:15	7:50	9:24	10:57	12:31	14:24	15:40

Adapted from (Ho et al. 2001)

Infant development

For ethical reasons there are limited human intervention studies on the effect of alcohol on the behavioural state of infants however observational studies provide some information in this area. Most research has been done using small amounts of alcohol consumed by the mother and the subsequent behavioural effect on the infant is then evaluated.

A case report by Binkiewicz, Robinson and Senior (1978)(Binkiewicz, Robinson & Senior 1978) *(Evidence level — NHMRC V, case report)* documents the effect of chronic excessive alcohol intake by a breastfeeding mother on her four month old baby. The mother of the infant had ceased drinking during the pregnancy and had resumed drinking 'in order to promote milk production' once the baby had been born. A random sample of expressed breastmilk contained 100mg/dl of alcohol and her reported intake was at least fifty, 360m1 cans of beer per week, and additional more concentrated alcoholic drinks (approximately 10 Australian standard alcoholic drinks per day, over a one week period).

Symptoms evident in the infant at four months were an increased weight gain and a simultaneous slowing in rate of growth. Her length for age was below the third percentile, she was obese, and her facial appearance was 'balloon shaped'. Alcohol increases cortisol levels in the blood and can give rise to a clinical pattern which closely resembles Cushing syndrome. Confirmation of the condition was established by impaired suppressibility of cortisol secretion by dexamethasone and increased excretion of cortisol in the urine. With no other problems she was eventually diagnosed with Pseudo-Cushing Syndrome, subsequently reversed with the removal of alcohol from the mother's diet.

In a landmark epidemiological study by Little et al (1989)(Little et al. 1989) *(Evidence level — NHMRC III-2) 400* infants were investigated to determine the relationship between mother's use of alcohol during breastfeeding and the infant's development at one year of age. The independent variable used was average daily alcohol consumption and no adjustment was made for length of breastfeeding. The Bayley Mental Development Index (MDI) was used to measure mental development and the Psychomotor Development Index (PDI) measured motor development. Results showed a strong linear relationship between chronic exposure to ethanol in breastmilk and the PDI. At a clinical level the motor effect was small (4-5% decrease in test scores) with moderate alcohol intake of 1.4 – 2.8 standard Australian drinks per day. However at a population level the effect is considerable, and even more so with over a 15% decrease in test scores in a small number of infants whose mothers were heavy drinkers (>—8.4 standard Australian drinks). The association persisted despite being controlled for over 100 potentially confounding variables (including maternal tobacco, marijuana, and heavy caffeine use). No relation was apparent between the infant's exposure to ethanol and the MDI.

With the intake of six Australian standard drinks by a 60kg lactating mother, in one sitting, the ingestion of ethanol through the breastmilk is estimated (using the Kesaniemi method) (Kesaniemi 1974) to be 232mg in a 5 kg infant and can be harmful. Little et al (1989) propose that the ethanol is detrimental possibly because the developing brain is extremely sensitive to ethanol even in very small quantities; or the small quantities ingested during lactation are accumulated in the infant because it is metabolised or excreted more slowly than in adults. The authors suggest that serial doses of ethanol accumulate in the infant as supported by the association between an 'absolute alcohol' score (representing the average daily exposure that could accumulate in the infant) and the PDI found in this study. There was no significant association between the infant's exposure to maternal binges during lactation (which would be less likely to result in an accumulation of ethanol in the infant) and the PDI.

Infant behaviour

A study by Mennella (1997) (Mennella 1997) *(Level of evidence – NHMRC 11)* investigated the effect of the flavour of alcohol in breastmilk on the suckling response of infants. Forty nonsmoking, lactating women expressed breastmilk, which was then divided into two aliquots of unaltered milk, or alcohol flavoured breastmilk (32 mg ethanol/dl, the average concentration detected in human milk approximately one hour after lactating women drank an acute dose of 0.3g/kg alcohol). The milk was then bottle fed to infants on demand and the pattern of suckling, the amount of milk consumed, and the suckling responses were recorded. The difference in suckling ability as a result of maturation was eliminated however no direct comparison between breast and bottle feeding was made in this study.

Interestingly results showed that infants consumed significantly more and sucked more frequently when drinking the alcohol flavoured milk. This is inconsistent with the diminished intake by infants of breastmilk immediately following mother's exposure to alcohol as reported previously(Mennella & Beauchamp 1993; Mennella 2001b; Mennella & Beauchamp 1991). This increased intake is consistent with the proposed effect of alcohol suppressing the action of oxytocin, resulting in a decrease in the milk ejection reflex and breastmilk output, as in this study infants were able to bottle feed on demand and were stimulated to do so by the sweet flavour of the ethanol in the milk. This study indicates that infants can readily detect flavours in breastmilk and show a distinct preference for the alcohol flavoured milk over and above the unaltered milk.

As this study reveals that infants do not reject the flavour of alcohol in human milk outside the context of breastfeeding, other factors might be responsible for the diminished milk intake observed during breastfeeding after maternal alcohol consumption, other than the effect on oxytocin. The author proposes that ethanol consumption may inhibit anti-diuretic activity, causing dehydration and decreased milk output or alters the milk-ejection reflex as previously discussed. Alternatively maternal alcohol consumption may alter the composition of mother's milk(Vilaro et al. 1987) *(Evidence level – NHMRC V, animal study)* so that although infants are consuming a smaller volume during breastfeeding, they ingest the same amount of calories.

Mennella and Beauchamp (1991) (Mennella & Beauchamp 1991) *(Evidence level – NHMRC II)* tested the effect of alcohol ingestion by 12 lactating women, on the odour of breastmilk and the subsequent behaviour of the infant. Twelve non-smoking women expressed 15ml of milk and then consumed either orange juice or ethanol in orange juice (0.3g/kg body weight) equivalent to 1.5 Australian standard drinks, within 15 minutes on two different testing days separated by one week. Milk samples were obtained at 30 minutes, one, two and three hours after each beverage was consumed on the testing days. The ingestion of alcohol significantly altered the odour of breastmilk as perceived by a panel of adults. To determine the effect on the infant, infants were videotaped during each nursing, and the sleeping behaviours, and how long the infant slept during each testing session was recorded during the session and at home until the next morning.

Infants sucked significantly more frequently during the first few minutes of the feedings on the day when their mother consumed the alcoholic orange juice ($P<0.008$), however there was no significant difference between the total number of sucks on the two days of testing (control vs. alcohol: 856.7 +/- 103.4 vs. 877.2 +1-102.3). There was no significant difference in the total amount of time infants slept during the three hour testing sessions (control vs. alcohol: 65.10 +1-10.96 vs. 62.97 +1- 12.04 minutes) or for the remainder of the day until the children awoke the next morning however the number of times the infants slept increased on the days when the mother consumed alcohol (6.6 +/-0.7 vs. 7.8 +1- 0.9, paired t (11 df) = 2.31, $P<0.05$). In effect, the infants slept for shorter periods and more often, on the day when their mothers consumed alcohol.

There was a compensatory increase in the number of demand breastfeedings by infants that occurred post exposure to alcohol in a later study by Mennella (2001)(Mennella 2001 b). *(Level of evidence — NHMRC II)* Using the study design described previously(Mennella & Beauchamp 1991) 12 nonsmoking women were given ethanol in orange juice (0.3g/kg body weight) on one test day and orange juice alone on the other. For the following four hours infants were videotaped during breastfeeding and were weighed immediately before and after each feeding. Consistent with previous findings(Mennella & Beauchamp 1993; Mennella 1998) the infants consumed approximately 20% less breastmilk during the first four hours after exposure to alcohol in mother's milk. Interestingly however the infants then compensated for this diminished intake during the 8 - 12 hours following alcohol exposure in mother's milk by increasing the number of breastfeedings that occurred in this time.

Given the folklore that maternal alcohol consumption can promote sleep in breastfeeding infants Mennella and Gerrish (1998) (Mennella & Gerrish 1998)(NHMRC *level of evidence — II)* further tested the effect of exposure to alcohol in breastmilk on infants' sleep and activity levels in the short term. Fifteen nonsmoking lactating women and their infants were tested on two days separated by one week. Mothers expressed approximately 100ml of milk and an actigraph was placed on each infant's left leg and used to monitor sleep and activity patterning.

After the actigraph had been in place for 15 minutes the infants were bottlefed mother's milk alone (control condition) on one test day and mother's milk containing 32mg of ethanol per 100ml on the other. The amount of alcohol ingested by the infants (taking into consideration each infant body weight) was estimated to range from 4.00 to 6.41mg/kg (mean 5.24 +/- 0.2), which is similar to what would be experienced at the breast after the consumption of 0.3g/kg dose by the mother.

Overall results from this study show short term exposure to a small amount of alcohol in breastmilk results in definite changes in infant's sleep-wake patterning. All infants slept for the same number of times during each test session however there was a significant reduction in the length of time spent sleeping after they consumed the alcohol flavoured milk compared with the breastmilk alone (on average a 25% reduction; 78.2 minutes compared with 56.8minutes after feeding with alcohol in breastmilk). The reduction in sleep was attributable to a shortening in the longest sleeping bout and the amount of time spent in active sleep. There was no significant difference in the amount of time spent in active sleep during the first half of the 3.5 hour testing session (control vs. alcohol 18.2 +/- 3.8 vs. 17.0 +/- 4.2 minutes; P =0.84), however infants spent significantly less time in active sleep during the second half of the testing session (i.e. 1.75 to 3.5 hours) following alcohol exposure (control vs. alcohol, 25.2 +/- 5.5 vs. 8.6 +1- 2.6 minutes; P = 0.09). There was no significant difference in the number of times the infants breastfed or the amount of milk consumed during these breastfeeds after alcohol exposure.

These results are contrary to those found previously(Mennella & Beauchamp 1991) in which there was no significant difference in the total amount of time infants slept during the three hour testing session.

To determine if these effects on infant sleep behaviour were a result of the experience to the flavour of the breastmilk the authors repeated the study on another group of breastfed infants using non-alcohol based vanilla in place of alcohol (Mennella & Gerrish 1998). However results show there was no significant difference in the amount of time the infants spent in active sleep during the 3.5 hours testing session in which they ingested their mothers breastmilk flavoured with vanilla compared with breastmilk alone. Nor were there significant differences in the number of sleeping bouts, amount of time spent in quiet or total sleep, latency to sleep, longest sleep bout, or activity levels during wakefulness after exposure to the vanilla flavoured milk. This suggests that it is not the flavour per se that is responsible for the disruptions in the sleep-wake patterning exhibited after alcohol exposure in breastmilk.

Mennella and Garcia-Gomez (2001) (Mennella & Garcia-Gomez 2001)(Evidence *level — NHMRC II)* repeated the alcohol and sleep patterning study with the exception of extending the monitoring period to 24 hours. Twenty three breastfed infants and their mothers were tested using the same methods as those outlined previously(Mennella & Gerrish 1998).

Following the testing infants were monitored for the next 24 hours, with the first 3.5 hours of monitoring occurring at the test centre and the remaining 3.5 — 24 hours being spent at home. During the first half of the centre 3.5 hour testing session there was no significant difference in the amount of time spent in active sleep. However during the second half of this session (1.75 – 3.5 hours) infants exposed to alcohol in mother's milk spent less time in active sleep, compared to the control condition. Infants exposed to alcohol then compensated for such decreases in the following 20.5 hours when mothers refrained from drinking alcohol, by exhibiting a 22.4 +/- 7.0% increase in active sleep.

Mothers were unaware of changes in their infants' behaviour following exposure to alcohol and it is likely that the decrease in active sleep would go unnoticed as infants tended to fall asleep immediately following alcohol exposure but then woke up shortly afterwards resulting in a decrease in the amount of time spent in active sleep in the hours immediately following exposure to alcohol in mother's milk.

Together these studies (Mennella & Garcia-Gomez 2001; Mennella & Gerrish 1998; Mennella & Beauchamp 1991) demonstrate that exposure to small amounts of alcohol in the mothers' milk has a direct, although subtle effect, on infant sleep patterning and the infants' ability to modulate behaviours in response to acute ethanol exposure (Mennella 2004). The mechanism for this reduction in (Mennella & Garcia-Gomez 2001; Mennella & Gerrish 1998; Mennella & Beauchamp 1991) remains to be explained, with the exposure to alcohol resulting in significantly less time spent in active sleep immediately after exposure to alcohol in their mothers' milk.

The authors propose,(Mennella & Gerrish 1998) based on their findings, that acute exposure to alcohol reduces the time spent in active sleep (but not quiet sleep). This may explain the findings of Little et al (1989)(Little et al. 1989) that infants who were chronically exposed to alcohol in breastmilk exhibited a slight deficit in motor, but not mental, development, at one year of age.

Animal model studies and experimental studies in humans suggest that pre- and postnatal experiences with the smell and taste of ethanol can affect later responsiveness to ethanol. Breastfed infants (6-13 months) exposed to ethanol (determined from questionnaires about maternal and paternal alcoholism and alcohol intake) exhibited different behaviours in the presence of ethanol scented toys compared with less exposed infants. Exposed infants demonstrated increased 'mouthing' of the scented toy(Mennella & Beauchamp 1998). Whether mouthing the flavour scented toy indicates familiarity with the flavour of ethanol, which in turn leads to a greater willingness to accept ethanol-flavoured substances remains to be investigated.

Growth indices

Investigations using animal studies have enabled the effect of alcohol intake on various indices within infants such as development, body weight and metabolism, to be studied for longer periods of time.

The effects of maternal alcohol intake in lactating dams on the development of their offspring were studied using an animal model by Detering et al (1979)(Detering et al. 1979). *(Evidence level – NHMRC V, animal study)* Dams were fed a regular stock diet (control), liquid diet containing 35% of the energy as ethanol (50g/L resulting in a blood alcohol level of 61±6mg%), or a liquid diet containing dextrin substituted for the calories supplied by ethanol (isoenergetic=lE).

Results from the study conclusively show that those pups whose dams received ethanol during either the pre- and postnatal period or only in the postnatal period had retarded physical growth that was more severe than that observed as a result of simple malnutrition (the IE diet alone).

This is supported by a later study in which the pups of alcohol treated dams demonstrate a significant reduction in combined weight compared to control pups (15 days experimental period). This decrease is associated with reduced milk production in the alcohol fed dams despite their milk having a higher energy content due to a greater lipid concentration(Vilaro et al. 1987). *(Evidence level–NHMRC V, animal* study)

In a later study the physical activities, physical growth and the histological appearance of the cerebellum of 81 control pups nursed by non-alcohol consuming dams were compared with 103 pups nursed by alcohol-consuming dams(Hekmatpanah, Haghighat & Adams 1994). *(Evidence level – NHMRC V, animal study)* Pups exposed to alcohol opened their eyes several days after pups in control groups and had a lower average litter weight and brain weight that was evident until alcohol was removed from the diet. Myelin formation and the appearance of the Purkinje cells[3] was considerably delayed and failed to be as prolific as that of the controls at day 30. These degenerative changes were independent of the pups' weight. This study highlights the considerable growth and developmental problems occurring in pups as a result of alcohol intake in the lactating dams and the potential similar harm that could take place in humans with continued alcohol intake during lactation.

Lactational performance, brain and liver composition, circulating metabolites, plasma nutrients and metabolites were investigated using three different groups allocated as follows: l) alcohol treated (AL), which received 20% ethanol and food ad lib; 2) pair fed (PF), as a nutritional control that received an equivalent daily caloric intake as the AL rats; and control rats (C) which received a solid diet and tap water ad lib(Tavares do Carmo et al. 1999). *(Evidence level – NHMRC V, animal study)*

The dams in the AL group had a decreased milk yield compared to the other two groups and this was associated with a decreased collective weight gain of the AL pups. In addition, the brain weight was significantly reduced in the AL and PF animals ($P<0.05$) compared to the C group and the brain protein content was decreased in AL pups compared to the other two groups ($P<0.05$). However when corrected for body weight (g/100g body weight), the brain was heavier in the AL and PF litters than in the controls, and may be indicative of a preservation of the brain despite the decreased body weight.

The amount of DNA indirectly reflects the number of cells and when expressed as DNA per total brain weight the AL pups had lower values than those of the C or PF pups ($P<0.05$), possibly indicating a lower number of brain cells. This was also apparent in the liver of the AL pups with the total amount of DNA per liver being significantly ($P<0.05$) lower in the pups of both the AL and PF dams, suggesting that the liver of these animals had less cells than the C group despite the cell size being the same. The AL and PF pups also had a lower liver weight ($P<0.05$), and had a lower liver protein ($P<0.05$) and liver glycogen ($P<0.05$) concentration than the control pups.

[3] A specific type of nerve cell that carries each and every piece of information outputted by the cerebellum. These cells possess a great deal of control over the refinement of motor activities.

It is proposed that these lower levels of protein and glycogen are metabolic adaptations in response to the malnutrition being experienced by the AL pups. It is known that the lipid content increases in the milk of alcohol treated rats(Vilaro et al. 1987). This high lipid content partially compensates for the alcohol induced malnutrition occurring in the AL pups and allows the proper metabolic adaptations to prevent severe hypoglycaemia and maintain minimum liver stores of glycogen. However despite the effect of undernutrition precipitated by maternal alcohol intake, these metabolic adaptations are not enough to prevent the impaired brain development intensified by the ethanol consumption, evident in the AL pups (Tavares do Carmo et al. 1999).

Results are supported in a later study by Oyama et al (2000) (Oyama et al. 2000) *(Evidence level – NHMRC V, animal study)* who found that pups suckled by alcohol fed (5%, 10%, 20% ethanol solution groups) lactating darns had significantly lower body weights compared to controls ($P<0.05$). However only pups of lactating dams exposed to higher alcohol levels (10% and 20%) experienced a significant decrease in brain weight ($P<0.05$) suggesting a preservation of the pups' brain or a profound reduction in overall body growth as possible hypotheses for the difference between alcohol groups.

The decrease in body weight of the alcohol exposed pups could be related to the fact that ethanol intake impairs oxytocin release and subsequently inhibits the milk let-down reflex (Subramanian 1999; Heil & Subramanian 2000) and is responsible for the decreased body weight evident in previously reported animal studies(Tavares do Carmo et al. 1999; Vilaro et al. 1987).

Liver weight of the 5% and 10% alcohol exposed pups was significantly decreased ($P<0.05$). ATP-citrate lyase activity is indicative of liver lipogenesis and affected by the composition of the diet. Similar to previous results (Tavares do Carmo et al. 1999) all alcohol exposed pups experienced a decrease in liver weight, and there was a decrease in ATP-citrate lyase activity which could be related to an increased milk lipid content in the alcohol treated rats(Vilaro et al. 1987). The ingestion of the 5% ethanol solution by the dams decreased pups' brain lipogenesis rate from glucose.

Results from this study indicate that the effects of maternal alcohol intake on pups' development and metabolism are dose-dependent and although the low intake of ethanol (5%) did not have an effect on brain or liver weight it did have an effect on brain metabolism.

The phenomenon of insulin resistance has more recently been an area of investigation with regard to alcohol intake during lactation. In a study by Chen and Nyomba (2004) maternal alcohol consumption during lactation and its effect on glucose homeostasis in rat pups was investigated. Results demonstrate that the offspring of rats exposed to alcohol during lactation exhibit insulin resistance regardless of having normal birth weight and growth pattern. Despite a lack of clarity in determining the mechanism for this effect, the study highlights the importance of lactation as a vulnerable period for the future metabolic homeostasis of the infant(Chen & Nyomba 2004). *(Evidence* level – *NHMRC V, animal study)*

Table 4. Key articles evidence table; the effect of alcohol on the infant

Effect on the infant	Grading	Reference	Strength of Recommend-ation (A,B,C,D)	Key findings
Effect on infant alcohol absorbtion				
	IV	Kesaniemi (1974)	C	Maternal alcohol intake of 0.6g/kg body weight unlikely to have harmful effects on the infant when maternal use is temporary.
	II	Mennella and Beauchamp (1993)		Estimated by multiplying the milk intake by the concentration of ethanol detected in breastmilk and taking into account infant body weight. Estimate dose ranged from 2.3 - 8.4mg/kg which is approximately 0.8 - 2.8% of the maternal dose.
Effect on infant development				
	Case Study	Binkiewicz et al (1978)	C	Long term high level alcohol intake causes Pseudo-Cushing syndrome in an infant, subsequently reversed with alcohol withdrawal.
	III-2	Little et al (1989)	C	Maternal alcohol intake of approx. 0.8g/kg body weight has detrimental effect on infant motor development.
Effect on infant behaviour				
	II	Mennella (1997)	B	Infants consumed significantly more and sucked more frequently when drinking alcohol flavoured breastmilk compared with unaltered breastmilk.
	II	Mennella and Gerrish (1998)	B	Exposure to alcohol results in significantly less time spent in active sleep immediately after exposure to alcohol in maternal milk.
Effect of alcohol on growth indices				
	V Animal Study	Deterring et al (1979)	C	Pups whose dams received ethanol during either the pre- and postnatal period or only in the postnatal period had retarded physical growth that was more severe than that observed as a result of simple malnutrition
	V Animal Study	Heil and Subramanian (2000)	C	Lactating dams alcohol intake of 1.0kg/kg body weight and 2.0kg/kg body weight. Pups of the 2.og/kg groups reduced milk intakes and lower body weights despite elevated suckling induced prolactin release suggesting alcohol's primary impact is through oxytocin.

Conclusion

The evidence supporting severe limitations on the consumption of alcohol during pregnancy and subsequent outcomes is abundant(O'Leary 2004) and robust guidelines outlining recommendations for alcohol intake during this time are well documented(National Health and Medical Research Council 2001). However there is a paucity of scientific information regarding the effect of alcohol during the vulnerable postnatal period of lactation.

In animal and human studies alcohol has been shown to disrupt the hormonal control of lactation by decreasing the milk ejection reflex through the inhibition of oxytocin. Doses as low as 0.3g/kg/body weight (equivalent to 1.5 standard Australian drinks) have been reported to have an inhibitory effect with a subsequent decrease in milk intake by infants. Most often undetected, this decrease in intake with regular low level alcohol consumption over an extended period of time will contribute to a significant decrease in milk intake and a resulting decline in infant body weight, growth and other vital developmental indices. Further studies examining milk let-down using the more advanced technique of ultrasound imaging would provide additional evidence in this area.

Ethanol is water soluble and enters the breastmilk by passive diffusion, reflecting maternal blood levels (or higher) within 30 — 60 minutes. The low oestrogen levels present during ammenorrhoeic lactation promote a higher maternal BAC and as a result the baby will ingest more alcohol during breastfeeding. Further evidence suggests this dose may be rendered more potent due to the limited activity of alcohol dehydrogenase in infants. There is an absence of information reporting the effect of breastmilk alcohol concentrations on infant blood alcohol levels.

Despite the popular folklore belief that consuming alcohol when breastfeeding(Mennella 2002) will promote lactation, and relax the infant and mother, the available research provides evidence to the contrary. Exposure to small amounts of alcohol in the mothers' milk has a direct effect on infant sleep patterning resulting in significantly less time spent in active sleep immediately after exposure to alcohol in breastmilk. It is important for mothers to establish sound breastfeeding patterns in the first month and if a mother has a restless baby (as most are in the first few weeks) the introduction of alcohol may exacerbate this restlessness, prompting her to discontinue breastfeeding at this critical time. Advising mothers to restrict all alcohol intake during this first month will support continued breastfeeding.

Based on the available evidence the authors prudently recommend lactating mothers consume only one to two standard drinks after breastfeeding. Advice restricting alcohol consumption during the first month of breastfeeding and providing direction on levels of consumption and timing of intake will enable lactating women to consume alcohol in quantities and conditions conducive to the optimal development of their young infant while supporting prolonged breastfeeding duration (see Box 1).

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Box 1. Suggested Advice for Alcohol Intake of Breastfeeding Mothers

1. No alcohol in the first month.
2. After that — limit alcohol intake.
   a. Preferable 1 - 2 standard drinks per day
   b. Drink just after a breastfeeding
3. If wanting to drink more than (2) then expressing milk in advance and skipping one feed may be an option to consider.

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Appendix B Questions on alcohol consumption included in the PIFS II study

72d. **Do you drink alcoholic drinks at present?**
1 = yes; **2** = no GO TO Q104 _____

72e. **How many days in the last 2 weeks did you have a drink?** _____

72f. **When during the day do you have a drink?**
1 = just before feeding the baby; **2** = just after feeding the baby; **3** = in-between feeds; **4** = at no particular time; **5** = just before or with the evening meal _____

72g. **How many standard drinks do you have each. time?**
(read out standard drink equivalents) _____

72h. **What type of alcoholic drink do you drink mostly?**

A	B	C	D	E	F	G
☐	☐	☐	☐	☐	☐	☐
☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐
☐	☐	☐	☐	☐	☐	☐
☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐
☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐

A _____
B _____
C _____
D _____
E _____
F _____
G _____

Appendix B Questions on alcohol consumption included in the PIFS II study

72i. **On the days when you drink, do you find that** _____ (baby) (choose all relevant answers)....

1 = is easier than usual to put down; **2** = is more difficult than usual to put down; **3** = stayed awake all night; **4** = slept through the night; **5** = slept more than usual through the night; **6** = slept the same as he/she usually would; **7** = other responses

other responses: _____

A	B	C	D	E	F	G
□□ □□	□□ □□	□□ □□	□□ □□	□□ □□	□□ □□	□□ □□
□□	□□	□□	□□	□□	□□	□□

A _____

B _____

C _____

D _____

E _____

F _____

G _____

Appendix C Focus Group Questions

Opening Question

Lead in with how group found breastfeeding?

- Initial experiences?
- Positive experiences?

How did most people find their appetite at this time?

How did they manage this?

- Eat more/less?
- Eat a certain type of food?
- Cravings?

Transition Questions

Did they find that some foods upset the baby?

- How?

Had they heard of any foods to promote breastmilk production?

- What foods?
- Who suggested by?

Key Questions

Did anyone drink alcohol while breastfeeding?

NO did not drink alcohol

- If no, why not?

Did people want to drink alcohol while breastfeeding but were unsure?

- Why unsure?

Did anyone seek advice about drinking alcohol while breastfeeding?

- Who from?
- What did they say?
- Why?
-

YES did drink alcohol

Mostly when did you have a drink?

What type of drink?

How much each time?

Was there any pressure to have a drink?

- Who from?

Alternatively was there any pressure NOT to have a drink?

- Who from?

Did the alcohol have an effect on the baby?

- How?

How does everyone think alcohol would affect a baby?

Ending Question

Other information to share?

Summarise and close

Thank participants for coming.