Assessment of Risk of Foetal Alcohol Syndrome and other Alcohol Related Effects in New Zealand

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Abstract

The current research emerged from a definite need in New Zealand and was designed to be a base-line study to provide information on a number of issues relating to alcohol consumption in pregnancy. The results of this study indicate that the prevalence of alcohol consumption in pregnancy among New Zealand women is similar to that seen in a majority of other Western countries. It also indicates that greater proportions of younger women were drinkers in pregnancy, especially in the early stages and that the majority in this age group were drinking heavily. The prevalence of drinking in pregnancy at levels currently perceived to cause foetal harm observed in this study was also similar to that seen in other Western countries, where incidence rates for the prevalence of alcohol related birth defects are well established. The encounter of midwives with outcomes associated with heavy maternal alcohol consumption further confirms the risk for the prevalence of foetal alcohol syndrome and other alcohol related effects in New Zealand, at rates similar to other Western countries.

The results of this study also indicate that regular alcohol consumption exhibited a negative effect on intakes of vital nutrients like dietary folates and calcium among heavy drinking women of childbearing age and this effect is likely to continue in pregnancy. The functional role of these nutrients, pivotal to favourable outcome of pregnancy, raises concern as to what the dual consequences are of alcohol consumption and compromised nutritional status. The risk of foetal alcohol syndrome and other alcohol related effects in New Zealand is high and efforts have to be made to develop effective prevention strategies.

The current research also assessed the knowledge and attitudes of midwives on the issue of alcohol consumption in pregnancy. A high proportion of midwives perceived abstinence to be the best option in pregnancy. However, this perception of the midwives is not reflected in the behaviour of clients in their practice, as the prevalence of drinking among their clients was fairly high. However, the good response to this study by midwives and their keenness for further education on the issue of alcohol consumption in pregnancy indicates that midwives are keen to play an active role in reducing the prevalence of alcohol related birth defects in New Zealand.

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I am indebted to acknowledge a number of people who have played crucial roles in helping to make this research a reality. But most importantly, I acknowledge with gratitude and many thanks my Lord and Saviour Jesus Christ for giving me this rich experience of completely depending on Him for all my needs. I can truly join with the Psalmist and say that I have tasted the Lord and seen He is good and He truly is my good shepherd. I have experienced the promise of "*Ask and it shall be given unto you*" and enjoyed the bestowing of knowledge and understanding in matters known to Him before time and recorded in His word.

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promote safe drinking.

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Chapter - 1

Introduction

1.1 Background:

Knowledge of the teratogenic effects of alcohol can be traced back to antiquity. The oldest and the most popular book in the world, the Bible, records very distinct advice from God to a woman who was to conceive and bear the strongest child ever recorded.

"She may not eat anything that comes from vine, nor may she drink wine or similar drink...." (Judges 13: 14).

The context for this advice was that this woman was to bear a child who was to be a Nazarene, one separated unto God, and hence should be without blemish.

A review on alcohol and pregnancy quotes a report to the British parliament in the 1700's, describing offspring of alcoholic mothers as having a "Starved, shrivelled and imperfect look" (Streissguth, 1983a). A historical review of American and British literature by Warner and Rosett (1975) shows that observations made during England's Gin Epidemic (1720-1750) were followed by warnings of the 19th century medical writers that parental drinking could damage the foetus. Studies on the teratogenic effects of alcohol were also reported in the medical literature of the late 19th and early 20th century. An update on alcohol related birth defects highlights the work of Dr. William Sullivan, on 600 children born to 120 female alcoholic prisoners in a Liverpool Prison (Warren & Bast, 1988). According to Warren and Bast, this 1899 paper of Dr. Sullivan was the earliest description of what was later to be called fetal alcohol syndrome. In 1968, Lemoine and his co-workers published in French what was the first well-organized study on alcohol related birth defects among humans. They described a cluster of offspring characteristics that they felt was clearly related to maternal alcoholism, which included peculiar faces with protruding forehead, sunken nasal bridge, short upturned nose, retracted upper lip, receding chin and deformed ears, retarded growth in height and weight, a greater frequency of physical malformation, and psychomotor disturbances (Streissguth, 1983a). Jones and Smith (1973) in the United States recognised similar patterns of abnormalities in 8 children of alcoholic mothers and coined the term "Fetal alcohol syndrome". Mental retardation is a cardinal feature of this syndrome and it has emerged as the number one recognized disorder in which mental deficiency is a feature (Abel & Sokol, 1986; 1987). Earlier studies were largely focused on outcomes associated with maternal alcoholism or alcohol abuse during pregnancy. However, in recent years, research has expanded to include studies on the effects of moderate alcohol use and isolated instances of heavy drinking or binge drinking during pregnancy.

Research over the years on human populations and animal model experiments has confirmed that alcohol during pregnancy can cause birth deformities, independent of other factors such as poor diet and smoking (Abel & Grezerstein, 1979; Jones *et al.*, 1973; Jacobson *et al.*, 1993). An entire spectrum of manifestations has been recognised and published. The diagnostic criteria for this spectrum of effects have been published by the Institute of Medicine (1996) and are cited in Sampson *et al.* (1997). This spectrum of effects includes descriptions of Foetal Alcohol Syndrome (FAS), and Alcohol Related Effects (ARE). ARE includes Alcohol Related Birth Defects (ARBD) and Alcohol Related Neurodevelopmental Disorder (ARND). Foetal alcohol syndrome, although the most debilitating effect of maternal alcohol consumption, represents only one aspect, the upper end of the broad spectrum of abnormalities associated with prenatal alcohol exposure.

A definition of foetal alcohol syndrome arrived at by consensus has advanced the comparability of research and clinical data from around the world. The same cannot be said about the rest of the spectrum or consequences of moderate maternal drinking. There is a lack of consensus among researchers on outcomes associated with moderate and light drinking. There is also a lack in understanding of the full spectrum of effects of prenatal effects of alcohol, which has led many researchers and health professionals to believe that only alcohol abuse in pregnancy is detrimental to foetal health and well being. A plethora of literature has been published on the outcomes associated with maternal drinking, and this will be reviewed in the subsequent chapters of this dissertation.

Apart from the spectrum of outcomes associated with maternal drinking documented in the literature, alcohol is also a potential nutritional teratogen. There is also considerable evidence in the literature for the importance of the mother's nutritional status prior to pregnancy, at the time of conception and during pregnancy in programming the health of the foetus in adulthood[1]. The sensitivity of the foetus to a constant supply of nutrients for optimum growth and development and the effect of alcohol on nutrient metabolism, especially minerals and vitamins vital for normal development of the foetus, have been well documented in the literature. As the effects of alcohol are both direct and indirect, the consequent manifestations on the outcome of pregnancy are also likely to be multidimensional in nature.

While research on the teratogenicity of alcohol has reached adulthood in many countries, in New Zealand this research is still in its infancy. However, alcohol is the most widely used recreational drug in New Zealand and is an integral part of New Zealand culture. Many surveys have been conducted periodically to assess drinking among New Zealanders. However, studies on the prevalence and manifestations of maternal alcohol consumption are limited, which is reflected in the scarcity of literature published on this issue. Moreover, there are no prospective population based studies in New Zealand that have attempted to ascertain the prevalence of foetal alcohol syndrome and other alcohol related effects in New Zealand. This has led one overseas researcher to estimate the incidence of foetal alcohol syndrome in New Zealand to be zero (Abel, 1998). This totally preventable spectrum of disorders is largely under-recognised in New Zealand. Literature on the risks for the prevalence of these alcohol related disorders in New Zealand is also very sparse. However, the Dunedin and Christchurch longitudinal studies have indicated that on average 25% of 11-18 year olds and nearly 35% of 15 to 18 year olds respectively suffered from common psychiatric disorders (Fergusson *et al*., 1997). Whether these children who show behavioural problems in New Zealand were exposed to alcohol *in utero* is open for speculation, particularly as

[1] Proceedings of the first world congress on foetal origins of adult diseases, 2000.

recent research has also found prenatal alcohol exposure to be a risk factor in the onset of childhood depression especially among girls (O'Connor & Kasari, 2000).

It has been estimated that the cost of treating foetal alcohol syndrome alone in the United States is about 321 million dollars a year (Sokol & Abel, 1987) or $ 1.4 million across the lifetime of one child (cited in Streissguth *et al*., 1991). This cost does not include the treatment or support provided for other manifestations of maternal alcohol consumption. Hence it is imperative to also develop preventive strategies to reduce the prevalence of this totally preventable disorder. Studies have shown that primary maternity caregivers as frontline health professionals can play a pivotal role in reducing the prevalence of drinking in pregnancy (Hilton and Condon, 1989; Ihlen *et al*., 1993; Jones-Webb *et al*., 1999). However, the attitudes of health professionals towards sensitive issues like alcohol consumption may predispose them either to pursue or to avoid identifying and counselling their patient. In New Zealand, midwives are the most preferred lead maternity caregivers. Assessment of attitudes of health professionals in New Zealand towards drinking in pregnancy may be even more important, due to the lack of mandatory guidelines on this issue.

1.2 Objectives of this research:

The primary purpose of the current research was to assess the risk of foetal alcohol syndrome and other alcohol related effects in New Zealand. The first method by which the research assessed the risk was by conducting a survey of midwives in New Zealand. This survey was designed to be a baseline study exploring a number of issues relating to drinking in pregnancy. The second method by which the research assessed the risk was by further analysis of data from the *"Nutrition during Pregnancy"*[2] study. The key objectives of the above two studies are outlined below.

Objectives of the survey of midwives:

1. To assess the prevalence of drinking among the clientele of midwives of New Zealand.

[2] This study was funded by the Ministry of Health, New Zealand.

2. To assess the attitudes and knowledge of midwives on alcohol consumption in pregnancy.
3. To assess the prevalence of outcomes associated with heavy maternal drinking in the clientele of midwives.

Objectives of further analysis done on data from the "*Nutrition during Pregnancy*" study:

1. To draw out a demographic profile of pregnant women according to their drinking status and style and frequency of drinking.
2. To draw out a profile of nutrient intakes of pregnant women according to their drinking status and style of drinking.

1.3 Outline of Chapters included in this dissertation:

In Chapter Two, literature will be reviewed to understand the manifestations of maternal alcohol consumption on the foetus. Emphasis will be placed on the critical period and critical dose of alcohol in pregnancy that is associated with various outcomes of maternal drinking. Literature on the incidence and prevalence of foetal alcohol syndrome and other alcohol related effects in New Zealand and elsewhere will also be reviewed and documented.

Chapter Three will deal with the review of literature on drinking habits of women of childbearing age in New Zealand and elsewhere and will be discussed primarily under three sections. Firstly, the usual drinking habits of women (non-pregnant) of childbearing age will be reviewed, as studies have shown that pre-pregnancy drinking behaviour is highly predictive of drinking habits in pregnancy (US Dept of Health and Human Services, 2000). Secondly, literature will be reviewed on drinking during the periconceptional period. The periconceptional period has been defined as the time around conception or a month prior to conception and two months into pregnancy (Shaw & Lammer, 1999; Russel & Skinner, 1988; Floyd et al, 1999). Finally, literature on the drinking behaviour of pregnant women will be reviewed and documented. Trends in drinking among pregnant women will also be reviewed, particularly those seen in overseas studies, as intervention programmes aimed at reduction of maternal alcohol consumption have been operational in some countries for nearly two decades. Lastly, literature will be reviewed on the role of primary maternity caregivers in reducing the prevalence of alcohol related effects. Studies on attitudes and knowledge of health professionals toward drinking in pregnancy will also be reviewed and documented.

Chapter Four will document the methodology employed to execute the survey of midwives in New Zealand. This Chapter will concentrate on the methods employed to construct the questionnaire for easy participation and to improve the response rate. The literature reviewed to construct some of the key questions and the limitations of the study design will also be discussed. In Chapters Five, Six, Seven and Eight the results from the survey of midwives will be reported and discussed.

In Chapter Nine, the methodology employed to do further analysis on the data of the "*Nutrition during pregnancy*" study will be documented. In Chapters Ten and Eleven, the results of these analyses will be reported and discussed.

Chapter Twelve will summarise the results of the "*Survey of midwives*" in New Zealand and the further analysis done on the "*Nutrition during pregnancy*" study and discuss the conclusions drawn. Recommendations for midwives and suggestions for future research directions in addressing the issue of alcohol consumption by women of child bearing age and pregnant women of New Zealand will also be included.

Chapter - 2

Effects of Maternal Alcohol Consumption on Foetal Development

2.1 Introduction:

Research on the teratogenicity of alcohol has progressed extensively since Jones and Smith first coined the term "Foetal alcohol syndrome" in 1973. However, the amounts of alcohol in pregnancy that produce defined physical, physiological or neurobehavioural effects on the foetus are far from being clearly established. Other questions that have vexed researchers worldwide are to precisely define the effects of timing and duration of exposure to alcohol in pregnancy on foetal outcome. The foremost reason for these gaps in understanding the outcome of maternal drinking is probably due to the fact that drinking of alcoholic beverages is a complex human behaviour. Most human studies depend on self-reported alcohol consumption and many studies have collected this information retrospectively. It is evident from the extensive literature available that maternal alcoholism and heavy drinking in pregnancy are associated with readily observable physical defects such as deficit in growth and damage to the central nervous system. However, studies on moderate and light drinking in pregnancy have produced conflicting results with regard to growth and physical defects but are more congruent on neurobehavioural outcomes. Moreover, maternal alcohol consumption is also known to have an indirect effect on foetal development by affecting maternal intake and metabolism of vital nutrients. An attempt has been made in the following sections to document some of the direct and indirect effects of maternal alcohol consumption on foetal development.

2.2 Categories and Diagnostic Criteria for Foetal Alcohol Embryopathy:

The diagnostic criteria for foetal alcohol syndrome widely accepted by researchers around the world are given below (cited in Sampson *et al*., 1997):

1. History of maternal alcohol abuse during pregnancy.
2. Growth deficiency of prenatal origin (height and /or weight).

3. A pattern of specific minor anomalies that include a characteristic face, generally defined by short palpebral fissures, midface hypoplasia, smooth and/or long philtrum and thin upper lip.
4. Manifestations in the central nervous system (CNS), including microcephaly or history of delayed development, hyperactivity, attention deficits, learning disabilities and intellectual deficits.

Patients exposed to alcohol *in utero* with some partial foetal alcohol syndrome phenotype and/or central nervous system dysfunction, but without sufficient features for a firm diagnosis of foetal alcohol syndrome, are identified as "Possible foetal alcohol effect", (Clarren and Smith, 1978). However, many infants born to alcoholic mothers without the classic features of foetal alcohol syndrome are at risk of being undiagnosed for milder developmental problems (Little *et al.*, 1990). In the early eighties researchers attributed 5% of all anatomic congenital anomalies to prenatal alcohol exposure (Sokol, 1981). A Finnish study (Autti-Ramo *et al*., 1992a) has identified nearly 60 minor physical anomalies and various craniofacial measurements associated with prenatal alcohol exposure. This study raised the question of the specific number of minor physical anomalies that should be included in a dysmorphological assessment. Training and expertise in diagnostic techniques are essential for accurate diagnosis of foetal alcohol syndrome and other alcohol related effects. Despite consensus regarding criteria adopted for diagnosis, clinicians continue to experience difficulties because none of the characteristic abnormalities is specific to the diagnosis (Aase, 1994). A recent study by the Institute of Medicine (cited in Report to the U.S. Congress, 1997) proposed five modified diagnostic categories and criteria.

1. Foetal alcohol syndrome with confirmed maternal alcohol exposure,
2. Foetal alcohol syndrome without confirmed maternal alcohol consumption,
3. Partial foetal alcohol syndrome with confirmed maternal alcohol exposure,
4. Alcohol related birth defects,
5. Alcohol related neurodevelopmental disorder.

This categorisation is broader than the previous to include congenital malformations and behavioural problems seen in infants exposed to alcohol *in utero*. Sampson *et al.* (1997) have grouped alcohol related birth defects and alcohol related neurodevelopmental disorders as alcohol related effects. A more recent term introduced by researchers is foetal alcohol spectrum disorders. This group of disorders includes foetal alcohol syndrome, foetal alcohol effects and alcohol related neurodevelopmental disorders (Streissguth and O'Malley, 2000). This disorder is characterised by emotional, behavioural, cognitive and/or social disability. Common symptoms in individuals with this disorder are attention problems, impulsivity, mood disorders, conduct and oppositional defiant disorder symptoms, drug and alcohol problems, impaired executive functioning, memory disturbances, learning disabilities, poor social skills and reduced ability to function independently as an adult (Lockhart, 2001).

2.3 Possible mechanisms involved in the pathogenesis of foetal alcohol embryopathy:

Pregnancy is a dynamic anabolic process where the conceptus is nurtured to a fully-grown baby and brought into the world. The small and continuous physiologic adjustments in pregnancy vary with pre-pregnancy nutrition, genetic determination of foetal size and maternal life style behaviour (King, 2000). Alcohol consumption in pregnancy can exhibit both direct and indirect effects on the foetus.

2.3.1: Direct effects of maternal alcohol consumption:

Alcohol is known to directly affect intrauterine foetal growth, foetal brain development and cause physical anomalies. Alcohol also exhibits a negative effect on factors that influence embryonic and foetal events namely, nutritional, hormonal and cellular factors (Michaelis and Michaelis, 1994). Both alcohol and its primary metabolite acetaldehyde have been shown to exhibit direct foetotoxic effects (Fisher and Karl, 1988). A number of mechanisms possibly contribute to the damaging effects of prenatal alcohol exposure, the most marked of these being on the central nervous system. Hence a majority of studies on the effects of alcohol have focussed on the development of the foetal brain.

Maier and West (2001) in a review have highlighted some of the factors that influence the manifestation of the effects of prenatal alcohol exposure. These include maternal drinking pattern, differences in maternal metabolism, differences in genetic susceptibility, timing of alcohol consumption during pregnancy and variation in the vulnerability of different brain regions. Michaelis and Michaelis (1994) and Philips *et al.* (1989) have proposed that other host-factors such as maternal nutritional status, maternal health and maternal intake of other drugs may also influence the manifestation of prenatal alcohol exposure.

Researchers have used animal models and tissue-culture experiments to identify the potential mechanisms through which alcohol affects the foetus. Goodlett and Horn (2001) have reviewed some of the mechanisms that affect foetal brain development and which may ultimately result in cell death by necrosis or apoptosis. These mechanisms were increased oxidative stress, damage to the mitochondria, interference with the activity of growth factors, effects on glial cells, impaired development and function of chemical messenger systems involved in neuronal communication, changes in the transport and uptake of glucose, effects on cell adhesion and changes in the regulation of gene activity during development.

tissue level effects

Studies have also investigated the role of nutritional factors in the pathogenesis of foetal alcohol embryopathy. Normal growth and development of the foetus is dependent on constant maternal supply of nutrients. Alcohol-induced disruption of placental transport of nutrients has been postulated as one mechanism resulting in foetal malnutrition and hence compromised growth and development (Michaelis, 1990; Fisher, 1988). Studies with human placental tissue and animal experiments have shown that alcohol directly inhibits the transport of amino acids and glucose (Snyder *et al.*, 1992; Snyder *et al.*, 1986). A similar study using perfused human placental cotyledon and human placental vesicles observed that brief or acute exposure to ethanol did not have inhibitory effects in the transport of amino acids and glucose (Schneker *et al.*, 1989). However, the transport of pyridoxal (vitamin B_6) from the maternal compartment to the foetal compartment was significantly inhibited by a high acute dose of alcohol (Schenker *et al.*, 1992). Other animal experiments have shown ethanol-induced alteration in folate metabolism in the placenta, foetal liver and foetal brain (Lin *et al.*, 1992). Fisher (1988) also proposes that decreased availability of nutrients to the foetus could be due to poor maternal intake and decreased intestinal absorption in the mother of selected nutrients like thiamine and folate. Hillman and Steinberg (1982) have investigated the effect of alcohol consumption on folate metabolism and found that acute alcohol consumption disrupts normal folate homeostasis. Alcohol is thought to bring about the above effect by disrupting the normal pattern of storage and release of folate by the liver.

The role of retinoic acid (vitamin A) in embryonic development has been well established (Morriss-Kay and Sokolova, 1996) primarily, using animal models (Melton, 1991; Brickell and Tickle, 1989) for obvious ethical reasons. To achieve harmonious tissue organisation in the foetus, a given quantity of retinoic acid, in its *all-trans* or 9-*cis* forms should bind to specific receptors (Azais- Braesco and Pascal, 2000) indicating that a specific amount of retinoic acid is crucial for normal foetal development and increase or decrease in this level may have deleterious effects. An animal study has shown the prevalence of various abnormalities in the offspring of mice kept on a vitamin A deficient diet (Wilson *et al.*, 1953). Hathcock and colleagues (1990) in a review have demonstrated the teratogenesis of high vitamin A intakes. In this review, the pattern of birth defects also called retinoic acid syndrome included central nervous system, craniofacial, cardiovascular and thymus malformations. Some of these malformations are similar to those observed in alcohol exposed infants (Jones *et al.*, 1973). Literature indicates that the risk for foetal malformations is significantly increased with maternal intakes exceeding 10000 IU (3000 µgRE) of vitamin A (Rothman *et al.*, 1995). Reviewing studies that have assessed vitamin A intakes in pregnancy indicate that a high proportion of New Zealand women had markedly higher intakes than recommended in pregnancy (Benny *et al.*, 1991; McKenzie-Parnell *et al.*, 1993; Watson, 1996; Watson and McDonald, 1999). The study by Benny *et al.* (1991) that assessed nutrient intakes in pregnancy among women of the Wellington region indicated that the mean vitamin A intakes in the second and third trimesters of pregnancy was more than double the Australian recommended dietary intakes in pregnancy (750 µg RE). Although the study was done on a small sample of pregnant women and the results were reported separately for European, Maori and Pacific women, looking at the mean and standard deviation of the mean it was obvious some non-Pacific women had daily vitamin A intakes around 3000 µg RE. In a similar study on Dunedin pregnant women, McKenzie-Parnell *et al.* (1993) reported higher levels of vitamin A intakes (2000 to 2050 µg RE) per day at the 90th percentile. In the "*Maternal Nutrition and Infant outcome*" study (Watson, 1996) 80% of the women had vitamin A intakes greater than the Australian recommended dietary intakes and 20% had twice more than that was recommended in pregnancy. The maximum intake recorded was

6291 µg RE per day. In the more recent *"Nutrition during Pregnancy"* study, the mean daily intakes of vitamin A among pregnant women was higher than the Australian recommended dietary intakes but was not as marked as was seen in the earlier studies (Watson and McDonald, 1999). The effect of high intakes of vitamin A and alcohol in pregnancy may have a dual consequence on the foetus as ethanol can promote vitamin A deficiency and also the toxicity of vitamin A and beta-carotene (Leo and Leiber, 1999).

Animal experiments have also shown that ethanol affects vitamin A metabolism. Grummer and Zachman (1990) observed a reduction in the tissue concentration of vitamin A of the foetal liver and an increase in the levels in foetal kidney and lungs of rat foetuses. Grummer *et al.* (1993) have also reported altered retinol levels in foetal embryo and brain in alcohol-exposed pregnancies compared to control pregnancies. DeJonge and Zachman (1994) have reported lowered levels of retinoic acid and higher levels of retinol and retinyl Palmitate in alcohol-exposed foetal hearts.

Based on the effect of alcohol on the metabolism of retinol, Duester (1991) and Pullarkat (1991) have independently put forward a theory that gives a specific possible explanation for some of the manifestations of fetal alcohol embryopathy. Retinoic acid is an important regulator of fetal development and it acts by binding to nuclear receptors to form a transcription factor that regulates gene expression in the growing foetus. Retinoic acid is particularly important in regulating the formation of limb buds in the growing foetus, and probably also in regulating the growth of and connections formed by neuronal cells in the brain. Optimum concentrations of retinoic acid are critical to direct morphogenesis of the central nervous system and the limb bud. Both retinol (vitamin A) and ethanol (alcohol) are oxidised to retinal and acetaldehyde respectively by the same enzyme, alcohol dehydrogenase (ADH). Retinal and acetaldehyde are again metabolised to retinoic acid and acetic acid respectively by the same enzyme aldehyde dehydrogenase (ALDH). It is possible that ethanol and acetaldehyde interfere with the synthesis of retinoic acid by competing for the enzymes that catalyse its formation and hence too little retinoic acid is produced during critical stages of fetal development. In contrast, the study by Chen *et al.* (1996) did not find the competitive inhibition of the conversion of retinol to retinoic acid as a significant factor in the ethanol induced embryotoxicity. However, a more recent study by Molotkov and Duester (2002) indicates that ADH1 plays a central role in interactions between retinol and ethanol, thus suggesting that the primary defect leading to adverse interaction may be reduced clearance of retinol to retinoic acid through the ADH metabolic pathway.

2.3.2: Indirect effects of maternal alcohol consumption:

Regular alcohol consumption may also exert an indirect effect on the foetus by affecting maternal nutritional status. Literature on the effects of alcohol consumption on maternal nutritional status is very sparse. However, Stewart and Streiner (1994) found that the relative risk for unhealthy dietary habits[3] among pregnant women (N = 446) who were drinkers was twice that of pregnant non-drinkers. This risk was more than five times among pregnant women who consumed more than 7 standard drinks per week in comparison to those who consumed less than 7 standard drinks per week. Although the effects of alcohol on the foetus, especially the brain, are independent of the nutritional status of the mother (Abel & Grezerstein, 1979), poor nutritional status, particularly seen among heavy drinkers, may be a contributing factor to unfavourable outcomes of pregnancy (Abel, 1995; Michaelis and Michaelis, 1994; Philips *et al*., 1989). Literature on the contribution of poor nutritional status in women consuming alcohol toward infant outcome is very scarce. However, animal studies (Weinberg *et al*., 1990) have indicated that maternal nutritional status is an important variable in determining both direct and indirect effects of ethanol on the foetus. The above study also implies that the interactive effects of ethanol and nutrition may also affect the development of the foetus.

The teratogenic actions of alcohol on foetal development are likely to be multifaceted and complex in nature. Evidence from literature reviewed indicates that prenatal alcohol exposure has numerous structural and functional effects on the developing foetus, many of which are still largely unknown.

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[3] The authors did not define the term "Unhealthy dietary habits".

2.4 Critical periods of foetal alcohol exposure:

In this section, literature on outcomes of maternal drinking during the period just before conception, periconception and the three trimesters of pregnancy has been reviewed. Experimental studies have shown that the period of pregnancy during which maternal drinking occurs, especially binge drinking, is one of the main factors that influence the outcome of pregnancy (Webster, 1989). Studies have also shown that vulnerability to the effects of alcohol may even start prior to conception. The study by Soltes *et al.* (1996) indicates that chronic ethanol exposure prior to conception can lead to spontaneous abortion and anatomic abnormalities in the surviving foetuses. Kaufman (1997) in a recent review explains the possible reasons for such spontaneous abortions and birth defects in the surviving foetuses. In his review he points out the role of alcohol as a spindle-active agent. Exposure to heavy doses of alcohol as in binge drinking can affect the meiotic spindle apparatus during the menstrual cycle. The ovulated oocyte may as a consequence have an abnormal chromosome constitution. If this aneuploid oocyte is fertilised there is a high possibility of it being spontaneously aborted. However, if the fertilised ovum survives to term the infant shows moderate to severe degrees of mental retardation, craniofacial and other abnormalities and reduced life expectancy. In one of the earliest reports (Jones *et al.*, 1973) on malformations in infants associated with maternal alcoholism, one infant had a severe defect in the positioning of the hands which was similar to those found in babies with the 18 trisomy syndrome.

The periconceptional period, defined as one month prior to conception and two months into pregnancy, (Shaw & Lammer, 1999; Russel & Skinner, 1988; Floyd *et al.*, 1999) is extremely important in teratology research, as it represents the period of organogenesis when the foetus is most vulnerable to toxic exposures (Streissguth *et al.*, 1989). Studies have associated periconceptional drinking (N = 531) with spontaneous abortion and lowered apgar scores in surviving infants (Russel & Skinner, 1988). In this study information for two alcohol scores namely PPAA (absolute alcohol per day prior to pregnancy) and IPD (Indications of Problem Drinking) were collected. On studying the pregnancy outcome, the authors found that the risk for spontaneous abortion increased by 25% for every additional ounce of absolute alcohol consumed prior to pregnancy recognition. This study was done on a systematic sample of obstetric patients who were administered a questionnaire for self-completion. Multiple regression analysis was used to assess the utility of PPAA and IPD as predictors of several pregnancy outcomes including spontaneous abortion. Potential confounding socio-demographic and health factors such as, maternal race, maternal socio-economic status, cigarette smoking and use of psychoactive drugs were controlled for by including the interactions of these factors with alcohol effects in the model used. However, as alcohol consumption was self-reported there is a possibility of bias due to recall and deliberate under-reporting. Ernhart *et al.* (1987) in their study found that the prevalence of craniofacial anomalies in infants (N = 359) was related ($p < 0.001$) in a clear dose response manner to prenatal alcohol exposure in the embryonic period. This was a large prospective observational cohort study. Chronic alcohol problems and maternal drinking were assessed during pregnancy and standardized neonatal examinations were conducted blinded for prenatal information Eight confounding factors namely maternal age, race, parity, nutrition, cigarette smoking, use of marijuana and other illicit drugs were selected a priori and were controlled for in the multivariate analysis performed. Day *et al.* (1989) in their prospective study of 461 women found an increased prevalence of physical anomalies in infants prenatally exposed to a dose of one drink or 0.5 ounce (15g) of absolute alcohol a day in the first two months of pregnancy. However, one major drawback of this study would be the use of average number of drinks per day, which does not take into consideration the pattern of alcohol consumption. Literature (Schenker *et al.*, 1990; Bonthius and West, 1990, Pierce and West, 1986) has reported peak blood alcohol concentrations as a crucial factor for deleterious effects on the outcomes of pregnancy. Hence, in the above study it is possible that the outcomes observed may actually be the result of a higher intake of alcohol in pregnancy.

The Seattle longitudinal study (Streissguth *et al.*, 1981) is one of the earliest longitudinal studies on the effects of maternal alcohol consumption and infant outcomes. This study was done on a predominantly white, middle class, unselected group of pregnant mothers (N = 1529). Alcohol consumption prior to and during pregnancy was self-reported. Sub-samples of this study have been evaluated periodically for various parameters. From the total sample of 1529, a sub-sample of 493 offspring was chosen for detailed follow-up; the experimental group comprised of 227 infants born to heavy drinking[4] mothers and the control group comprised of 266 infants born to randomly selected mothers who were abstainers (N = 109) and light drinkers[5] (N = 157). In this study, minor physical anomalies were prevalent in children (N = 465) born to mothers who drank heavily only during the periconceptional period (Graham *et al.*, 1988). Drinking in the periconceptional period was also found to be a strong predictor of later neurobehavioural deficits (Streissguth *et al.*, 1989). A more recent case-control study (N = 1465)[6] found an increased risk (Odds ratio = 3.4; 95% CI 1.1 to 9.7) for cleft lip with or without cleft palate among infants born to women consuming five or more drinks per occasion in the periconceptional period (Shaw & Lammer, 1999). This was a population based case-control study and information on maternal alcohol consumption was collected via a telephone interview. Adjustments for maternal cigarette smoking, race, education, and vitamin use did not substantially change the observed risks.

Another recent study (Denkins *et al.*, 2000) investigated the effects of maternal periconceptional drinking on the fatty acid concentrations in a small sample of infants (N = 21)[7]. Maternal periconceptional consumption of 30 ml or more of absolute alcohol per day resulted in increased serum concentrations of polyunsaturated fatty acids in the neonates. The authors of this study have postulated that serum increase in the concentrations of polyunsaturated fatty acids may in effect reflect the inability of the organs, specifically the brain, to accumulate these fatty acids for its functions. This in part may explain the neurobehavioural and sensory dysfunction manifested in the disorders associated with maternal drinking. However, as the study was conducted on a small sample, the results of the above study may need further testing. On the positive side, this study highlights the need for further research to examine interactions between

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[4] **High priority heavy drinkers (N=177):** Average consumption of 2 or more drinks per day / 45 or more drinks per month and ≥ 5 drinks on at least one occasion **or** 17.6 to 44.9 drinks per month and ≥ 5 drinks on at least one occasion prior to and/ or during pregnancy.
Low priority heavy drinkers (N=50): 45 or more drinks/month and never more than 2 drinks on any occasion **or** 45 or more drinks/month and a maximum of 3-4 drinks on at least one occasion **or** 5 or more drinks per occasion at least 4 times a month prior to and/or during pregnancy **or** any intoxication during pregnancy.
[5] 89 infrequent drinkers and 68 light to moderate drinkers who could not be categorised as "heavy drinkers".
[6] 731 cases and 734 controls.
[7] 9 cases of infants born to mothers who consumed ≥ 30 ml of absolute alcohol per day and 12 control infants born to mothers who consumed < 2 ml of absolute alcohol per day in pregnancy.

maternal alcohol intake and maternal nutritional status and the associated infant outcomes.

The first trimester of pregnancy has been recognised as a vulnerable period for the foetus to the effects of alcohol. Windham *et al.* (1997) in their prospective cohort study of a large population of pregnant women (N = 5142) found an increased risk for spontaneous abortion in women who drank more than three drinks per week in the first trimester (N = 50). This was a prospective cohort study and information on alcohol consumption was self reported and collected using a telephone interview. Efforts were made by the authors of the study to reduce recall bias by conducting the telephone interview within 1-2 weeks of initial contact, which was before the 10^{th} week of pregnancy. Confounding factors such as, prior foetal loss, maternal race, education, age, income, marital status, caffeine intake, cigarette use, employment status and gestational age at interview were statistically controlled. However, the number of drinks consumed per week was computed from frequency of drinking per week and number of drinks on the drinking days and hence, this group of moderate drinkers also comprised of binge drinkers. In comparison with women who were abstainers in the first trimester (N = 4745), the adjusted odds ratio for spontaneous abortion among women (N = 50) who consumed more than 3 drinks per week was highest in week 9 (OR = 2.2; 95% CI = 1.1 - 4.3). Kesmodel *et al.* (2002) found an increased risk for spontaneous abortion among women who consumed five or more drinks per week (N = 578) in the first trimester of their pregnancy. This was a prospective cohort study and of the 24679 pregnancies studied, 321 ended in spontaneous abortions and 98 in induced abortions. Nearly 68% of the study women (N = 16680) consumed only less than 1 drink per week, 23% (N = 5614) consumed 1-2 drinks per week, 7.2% (N = 1767) consumed 3-4 drinks per week and 2.5% (N = 578) consumed more than or equal to 5 drinks per week. Information on alcohol consumption was collected using a self-administered questionnaire. Among women drinking les than 1 drink per week the prevalence of spontaneous abortion in the first trimester was 1.4% in comparison to the 8.9% among women who drank more than or equal to 5 drinks per week. Accounting for confounding factors such as, maternal smoking habits, caffeine intake, age, pre-pregnant body mass index, marital status, occupational status, education and parity did not change the conclusions of this research. The major drawback in the above study would again be the averaging of drinks for a week and hence the effect of pattern of drinking is not identified.

Autti-Ramo *et al.,* (1992a) on studying 52 infants who were exposed to various levels of alcohol during various trimesters of pregnancy found that manifestations of major dysmorphic features were more likely to arise due to chronic alcohol exposure in the first trimester. Rosett and colleagues found that congenital anomalies were more frequently seen among infants born to heavy drinkers (Total N = 469) in the first trimester (Rosett *et al.,* 1983). This study aimed at investigating the effects of heavy, moderate and rare alcohol consumption on foetal development in a prospective study of 469 mother-infant pairs. A study using a nonhuman primate model (N = 54 gravid pigtailed Macaques) also found that exposure to alcohol during the early stages of pregnancy resulted in behavioural problems in the absence of any other physical anomalies (Clarren *et al*., 1988).

Jacobson *et al.* (1993) in their prospective human study have also documented a strong association of maternal drinking in the second and third trimester with lowered Bayley's scores in exposed infants (N = 382). The above (Detroit study) is part of a longitudinal study on the effects of prenatal alcohol exposure on infant cognition executed on a cohort of 480 African-American infants. Information on alcohol consumption was prospectively collected from the participating mothers by an oral interview on a day-to-day basis for a typical week around the time of conception and in pregnancy. Demographic variables such as, maternal age, years of education and marital status, whether the family was on welfare, infant parity and sex, prenatal variables such as, smoking, illicit drug use, quality of prenatal care and situational variables such as, examiner and age of the infant at the time of administering the Bayley's test were all controlled for in the analysis performed. Day *et al.* (1990; 1991) found that children prenatally exposed to frequent heavy maternal drinking in the second and third trimesters were significantly more likely than infants born to abstainers to be smaller in weight, height and head circumference at 8 months (N = 461) and 18 months (N = 505) of age. An average daily volume of one drink per day in pregnancy predicted a decrease of 350 grams in infant weight at 8 months of age. Similar intake in the second and third trimesters was associated with a reduction in infant length by 5 and 10 mm respectively. Maternal alcohol consumption in the third trimester was significantly correlated to infant head circumference with a reduction of 5 mm for each drink per day (Day *et al*., 1990). Follow-up on the same sample of children (N = 522) at six years revealed that third trimester drinking predicted deficits in achievement scores assessed by spelling tests (WART-R). An increase of one drink a day in this period of pregnancy was associated with a decrease of 2.7 points ($p = 0.03$) on the spelling tests (Goldschmidt *et al*., 1996). However, one major drawback of the above studies (Maternal Health Practices and Child Development Project, Pittsburgh) would be the use of average daily volume score to indicate maternal alcohol consumption. This score was computed from usual, minimum and maximum volume of alcohol consumed and the frequency of alcohol consumption for a defined period and then averaged to daily intakes. This procedure implies a precision that does not exist and hence many of the outcomes seen may actually be those associated with higher levels of alcohol consumption than those reported.

The third trimester is a period of rapid physical growth including the brain. Animal experiments have shown that drinking even only in this period can have detrimental effects on the central nervous system of the foetus. West and Goodlett (1990), using a rat model, have demonstrated that alcohol exposure during this period may lead to reduction in brain weight and head circumference affecting learning, memory and motor ability in later life. They observed hyperactivity and learning deficits in the absence of any physical anomalies in animals exposed to alcohol during this period. Another study using the rat model has demonstrated the vulnerability of the brain during its growth spurt in the third trimester of human pregnancy. Exposure to alcohol in this period reduces the number of neurons in the inferior olive of the brain resulting in permanent cerebellar dysfunction (Napper & West, 1995). Animal experiments have also shown that alcohol exposure resulted in delaying the timing and pattern of nerve cell generation and migration (Miller, 1992). A more recent study (Ikonomidou *et al*., 2000) reported that during synaptogenesis (which occurs in humans in the third trimester) ethanol acts by a dual mechanism resulting in widespread apoptotic[8] neurodegeneration in the forebrain of the experimental rat. Binge drinking was considered to be the equivalent pattern of drinking that might trigger this effect in the human foetus.

A prospective study by Coles *et al.* (1985) on the effect of maternal alcohol consumption during various periods of gestation and neurobehavioural characteristics of infants (N = 103) also echoes the vulnerability of the foetal brain to alcohol. This study

[8] Cell suicide.

was done on infants born to a self-selected sample of predominantly black women of lower socio-economic status. Alcohol consumption data was collected prospectively using an interview schedule. Alcohol consumption per week was computed by multiplying the usual amount consumed by the frequency of drinking occasions each week. Infants of the study participants were given medical and neurobehavioural examinations in the first 3 days of life by trained staff who were unaware of the mother's alcohol consumption pattern. Confounding factors such as, cigarette smoking and use of other illicit drugs were accounted for in the analysis performed. The results of the above study indicated that the teratogenic effects of alcohol varied with the degree of exposure. Infants exposed to alcohol throughout pregnancy were significantly more hypotonic, physically active, showed signs of CNS instability like tremors, less mature in their motor behaviour, less able to cope with stimulation and did not respond normally to auditory stimuli. Infants exposed *in utero* to alcohol during any period of gestation were found to have significant alterations in reflexive behaviour, less mature motor behaviour and an increased level of activity when compared with non-exposed infants. These infants were full term, otherwise healthy and were free from other features of foetal alcohol effects.

Another prospective study (Larsson *et al.,* 1985) during the same time period in Sweden found a similar relationship between time of exposure in pregnancy, amount of alcohol consumed and infant outcomes (N = 80)[9]. Intrauterine growth retardation, psychological and behavioural disturbances were seen more among infants exposed heavily to alcohol throughout pregnancy. Mothers who reduced their excessive drinking after the first trimester had infants who did not differ in behaviour and physical development from those born to mothers who were not heavy drinkers, but many of these children were retarded in their speech.

On assessing the psychomotor developments of 12-month-old infants (N = 60)[10] exposed to alcohol prenatally for various durations, Autti-Ramo and Granstrom (1991a) found that continuous heavy alcohol consumption had the most debilitating effect on

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[9] 40 exposed infants born to mothers who consumed more than 30 g of absolute alcohol per day prior to their first antenatal visit. 40 control infants born to mothers who abstained or consumed less than 30g of absolute alcohol per day prior to their first antenatal visit after which they minimised or abstained.

[10] 20 infants exposed in the first trimester, 20 in the first and second trimester and 20 prenatally exposed continuously to alcohol.

motor and cognitive development. Reduction in maternal alcohol consumption by the second trimester resulted in only a slight abnormality of motor development in the infant by 12 months of age. In a further study (N = 108)[11], Autti-Ramo and Granstrom (1991b) found that when compared to non-exposed infants, only infants (18-19 months) prenatally exposed continuously to alcohol showed deficits in language developments. However, with respect to fine and gross motor development, infants prenatally exposed to heavy alcohol in the first and second trimester and throughout pregnancy showed significant differences when compared with non-exposed infants. Follow-up of these infants at 2 years of age confirmed that the severity of the effects on mental and language development increased proportionately with duration of exposure (Autti-Ramo *et al.*, 1992b).

The known effects of foetal alcohol exposure in various stages of pregnancy have been well summarised using a diagrammatic illustration by Moore and Prasaud (1993) in the report to the US Congress (1997). In this illustration maternal alcohol consumption during the period of the ovum or the first two weeks of conception is not associated with any detrimental effects on the foetus. However, as already stated studies have shown that heavy drinking in this period can cause spontaneous abortion. Detrimental effects of maternal drinking on the central nervous system begin at week three (embryonic period) and extend nearly to the end of term. Congenital defects of the heart, arms and legs occur due to exposure in the embryonic period whilst those of the palate and ears start in the embryonic period and extend into the foetal period. As in the case of the CNS, the vulnerability of the formation of the eye to alcohol exposure starts in the early embryonic period and extends until term. Defects in the formation of the teeth and external genitalia are due to exposure to alcohol in the late embryonic period and extend until term.

The longer the exposure to alcohol *in utero* the more severe the neuro-developmental delays seen in the offspring (Autti-Ramo & Granstrom, 1991a, 1991b; Autti-Ramo *et al.*, 1992b; Rosett *et al.*, 1983). In the Seattle study (Streissguth *et al.*, 1981) maternal drinking patterns were measured in mid-pregnancy (~5 months). Dose-dependent

[11] 40 control or non-exposed infants, 20 infants exposed in the first trimester, 20 in the first and second trimester and 20 prenatally exposed continuously to alcohol.

neurodevelopmental disorders were seen at birth and these effects persisted into adolescence. It is clear from the literature reviewed that the central nervous system is vulnerable to the deleterious effects of alcohol throughout pregnancy.

2.5 Teratogenicity of Alcohol:

Alcohol freely crosses the placenta and its teratogenic effects on the foetus have been the subject of much research and topical discussion in the past three decades. However, it has been questioned whether alcohol has a direct effect or if lower nutritional status and other factors are equally responsible for the deleterious effects of alcohol in pregnancy on the foetus. Animal literature clarifies the nutritional issue to a certain extent by using pair fed controls. Such experiments have shown that alcohol itself and not poor nutrition is the prime teratogenic agent (Abel & Grezerstein, 1979; cited in Streissguth, 1983a). Human studies have also confirmed the direct effect of alcohol on infant development (Jones & Smith, 1973; Jones *et al.,* 1973; Jacobson *et al*., 1993). However, one question that has perplexed researchers in understanding the teratogenicity of alcohol is the amount of absolute alcohol per occasion and the pattern of drinking that is required to manifest an effect on the foetus.

Teratogenesis of alcohol has been postulated to affect the foetus in two ways. The first is the dose-response model (Streissguth *et al*., 1981; Streissguth *et al*., 1989; Little *et al*., 1990; Jacobson *et al.,* 1993; Streissguth *et al*., 1994a; Streissguth *et al*., 1994b) where the outcome manifested is proportional to the amount of absolute alcohol consumed and hence there exists some outcome for any alcohol consumed. The second model hypothesizes that there exists a threshold of alcohol exposure (Jacobson *et al*., 1998; Larroque & Kaminiski, 1998) below which no adverse outcomes are seen. In the study by Jacobson *et al.* (1998), there was no relationship between cognitive deficits and maternal drinking below 0.5 ounces (15g) of absolute alcohol per day. Some studies have observed certain specific outcomes to have a linear relationship to the amount of absolute alcohol consumed and other specific outcomes to have a threshold relationship to the amount of absolute alcohol consumed in a day (Goldschmidt *et al*., 1996; Jacobson *et al*., 1993). However variations in outcome seen are also dependent on the period of pregnancy and the amount of absolute alcohol consumed on one occasion. The outcome of prenatal exposure to alcohol is also dependent on whether the pattern of exposure is acute or chronic. The acute exposures in humans could be related to binge drinking and the chronic exposure to regular, moderate and heavy drinking (Webster, 1989). In the following sections (2.5.1 - 2.5.3), an attempt has been made to review and document the effects of heavy, moderate and binge drinking in pregnancy on infant development.

2.5.1 Effects of heavy maternal drinking on infant outcome:

Heavy maternal drinking in pregnancy has the most debilitating foetal outcomes; the end result of these effects has been termed "Foetal alcohol syndrome" (Jones & Smith 1973). However, this disorder is only seen in 30-40% of infants born to mothers indulging in 2-2.5 ounces (30-45g) of absolute alcohol or more per day (Pietrantoni & Knuppel, 1991). Diagnosis at birth is possible only for the most severe cases while the period most suitable to diagnose less severe conditions, when the characteristics are most distinguishable, is considered to be between 8 months and 8 years of life (Streissguth, 1993). Children affected with foetal alcohol syndrome have been born to alcoholic women of all races (Streissguth, 1977; Abel & Hannigan, 1995). However, vulnerability to the manifestation of foetal alcohol syndrome among the offspring of heavy drinkers is dependent on maternal age of the mother, maternal health, genetic influences and environmental factors (Maier & West, 2001). Increased vulnerability to the manifestation of foetal alcohol syndrome and alcohol related deficits in physical growth, mental development and information processing speed associated with moderate to heavy prenatal drinking has been seen in infants born to mothers above thirty years of age (Jacobson *et al.*, 1996). Infants born to mothers above thirty years of age were 2-5 times more likely to be functionally impaired than those born to younger mothers (Jacobson *et al.*, 1998). The authors of these studies postulate that age related increases in the maternal fat to water ratio and a faster rate of metabolism of alcohol among alcoholics may be the reason for this increased vulnerability among infants born to older drinking women (Jacobson *et al.,* 1996).

Although foetal alcohol syndrome is not seen in all children born to mothers who drink heavily in pregnancy, the findings by Shaywitz *et al.* (1980) indicate that all children born to alcoholic women need to be evaluated in their school years for learning disabilities, as the effect of exposure to alcohol *in utero* on the central nervous system is a continuum. Such children may have normal intelligence but have learning and behavioural disabilities. All the children in this study with a history of heavy prenatal exposure (N = 15) had IQ levels in the normal range (82 – 113) but experienced persistent academic failure. In a study (N = 31)[12] by Rosett *et al.* (1979), infants (N = 14) born to mothers who were heavy drinkers, showed sleep disorders such as less sleep and greater restlessness in sleep than infants (N = 9) born to mothers who were not heavy drinkers. Not all infants who showed these symptoms were diagnosed with foetal alcohol syndrome. Sleep-awake state distribution of these infants was studied on the third day of life during inter-feed intervals over a 24-hour period by means of a continuous non-intrusive bassinet sleep monitor. However, as there are many other factors that can disturb sleep in newborn infants these observations need to be interpreted with caution.

Little *et al.* (1990) examined the under-diagnosis of foetal alcohol syndrome and foetal alcohol effects in a large hospital providing maternal and neonatal services and found an increased risk for shorter gestation, foetal growth retardation, smaller infant size at birth and lowered one minute apgar scores among the infants (N = 40) of heavy drinking women. Follow-up of these infants indicated increased prevalence of infant mortality, mental retardation and post-natal growth retardation. In this study there was a 100% non-diagnosis of foetal alcohol syndrome and foetal alcohol effects. However medical records of the infants contained many dysmorphic features associated with this syndrome. "Facies", a terminology used for peculiar faces in the hospital records, were found only in infants born to drinking mothers. In a retrospective study on New Zealand indigenous Maori women, current heavy drinkers had significantly more miscarriages, stillbirths and child deaths than moderate or occasional drinkers (Stanhope & Prior, 1982).

The studies by Jones *et al.* (1973) and Jones and Smith (1973) were one of the earliest reports on unrelated cases with a history of heavy foetal alcohol exposure. The pattern of malformation described by Jones *et al.*, (1973) in infants (N = 8) born to alcoholic women included developmental delay, microcephaly, prenatal growth deficiency,

[12] 14 infants were born to mothers who drank heavily in pregnancy, 8 infants were born to mothers who were heavy drinkers but minimised their drinking in pregnancy and 9 infants were born to mothers who never were heavy drinkers.

postnatal growth deficiency, craniofacial features like short palpebral fissures, maxillary hypoplasia, epicanthal folds, joint anomalies, altered palmar crease pattern and cardiac anomaly. Further study (Jones and Smith, 1973) of three other infants born to chronic alcoholic women showed the manifestation of problems in respiratory adaptations, biochemical adaptations such as hypoglycaemia, hypocalcaemia and hyperbilirubinaemia, microphthalmia[13], cardiac anomaly and growth deficiency. Jones *et al.* (1974) also found that among the offspring of chronic alcoholic mothers, perinatal mortality was observed in 17%, mental deficiency in 44% and abnormal features in 32% of infants. Although these observations were based on a small number of cases in America, many of these symptoms were also observed in bigger samples of infants (N = 52-80) born to alcoholic mothers in Finland (Auttio-Ramo and Granstrom, 1991a; 1991b; 1992a; 1992b). The details of these studies have been discussed in depth in Section 2.4.

A cardinal feature of foetal alcohol syndrome is mental retardation and this condition is now recognised in the United States as the most prevalent disorder in which mental deficiency is a feature (Abel & Sokol, 1986). A review on the neuroanatomical findings of children exposed to alcohol *in utero* indicates that the areas of the brain most susceptible to the teratogenic effects of alcohol seem to be the basal ganglia, corpus collosum and parts of the cerebellum (Roebuck *et al*., 1998). Neurobehavioural deficits associated with foetal alcohol syndrome are deficits in language, motor, learning and visuospatial functioning (Mattson & Riley, 1998).

A follow up of foetal alcohol syndrome patients showed that the degree of growth deficiency and intellectual handicap was directly related to the extent of craniofacial abnormalities. Other new features in these patients over time included dental malalignments, malocclusions[14] and eustachian tube dysfunction, which could embryologically be related to midface hypoplasia (Streissguth *et al*., 1985). Magnetic resonance imaging done on patients with foetal alcohol syndrome revealed that mid-line anomalies of the brain associated with facial anomalies were prevalent. The midline central nervous system was found to be particularly susceptible to the teratogenic effects

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[13] An unnatural smallness of the eyes occurring as the result of disease or imperfect development, Webster, 1998.
[14] Poor positioning or inappropriate contact between the teeth on closure.

of alcohol (Swayze *et al*., 1997). Both animal (Stromland & Pinazo-Duran, 1994) and human (Stromland & Hellstrom, 1996) studies have shown that prenatal exposure to alcohol can adversely affect the development of the optic nerve. Developmental delay in auditory maturation, sensorineural hearing loss, intermittent conductive hearing loss and central hearing loss are some of the hearing disorders seen in children with foetal alcohol syndrome (Church & Kaltenbach *et al*., 1997).

In a study by Ernhart *et al*. (1985) on 359 infants, exposure to heavy alcohol consumption in the first trimester was found to be a crucial factor in the determination of the increased occurrence of neonatal anomalies. A prospective study (N = 100)[15] in Finland identified 60 minor physical anomalies among offspring of alcoholic mothers. Apart from various dysmorphic features many anomalies of the limb like syndactyly were more commonly seen among infants of alcoholic mothers. The manifestation of symptoms associated with possible foetal alcohol effects and typical foetal alcohol syndrome increased proportionately with duration of exposure (Autti-Ramo *et al*., 1992a).

In the Seattle longitudinal study, the outcomes associated with heavy maternal alcohol consumption at birth were smaller infant size as measured by birth weight, length and head circumference, lower apgar scores, poor neonatal habituation, decreased sucking pressure, increased tremulousness and head turns to left, decreased vigorous activity, higher frequency of minor dysmorphic characteristics and microcephaly. At eight months of age the infants of heavy drinking mothers had significantly lower mental and motor scores (Streissguth *et al*., 1981). Follow-up of these infants into childhood and adolescence indicated the persistence of these symptoms, which was reflected in poor academic achievements in these children (Streisguth *et al*., 1989; 1990; 1994a; 1994b).

A study in France found that the children (N = 160) of mothers who consumed 1.5 ounce (45g) of absolute alcohol/day, which is equivalent to 3 drinks per day during the first trimester of pregnancy, had significantly poorer psychomotor development than children of mothers who consumed less than 1.5 ounce (45g) of alcohol per day (Larroque *et al*., 1995). This level of consumption was also associated with higher

[15] 52 cases and 48 controls.

prevalence of physical defects such as minor neurological anomalies, lower height and facial features typical of foetal alcohol syndrome (Larroque & Kaminski, 1998).
Maternal alcohol abuse in pregnancy has also been documented to have deleterious effects on foetal growth parameters. Abel (1996) reviewed the relationship between alcohol consumption levels in pregnancy and mean birth weight from 30 prospective studies and found a decrease of about 200g in birth weight at levels of two or more drinks per day among smokers only. In the study by Wright *et al.* (1983) on 900 women, the risk for giving birth to a baby below the 10th centile among women who consumed above 50 grams of absolute alcohol per week was more than double in comparison to women drinking 50g or less a week. In this study, non-drinkers were also grouped with drinkers who consumed below 50g of absolute alcohol per week.

Larsson *et al.* (1985) found a significant reduction in intrauterine growth of infants (N = 15) prenatally exposed continuously to alcohol, in comparison with infants of the control group[16]. This study was done on a total sample of 80 infants with the objective of investigating the physical and psychological development and the family situation of the children in relation to the drinking habits of the mother during pregnancy. Compared to the proportion of heavy smokers in the control group (~18%) nearly 50% of the mothers were heavy smokers in the heavy drinking group. However, the mean birth weight among smokers in the control and heavy drinking group did not differ significantly. Moreover, among infants (N = 9) whose heavy drinking mothers had minimised or abstained prior to the third trimester, no differences in birth weight was found in comparison to the infants of the control group. Rosett *et al.* (1983) found similar results in a cohort study, where sustained heavy drinking[17] in pregnancy (N = 25) was associated with intrauterine growth deficiency and abnormalities. No changes were observed in the above outcomes of sustained heavy drinking after accounting for maternal smoking or substance use. Heavy drinking women who minimised their alcohol intake in mid-pregnancy (N = 18) had infants who had birth weights similar to those born to rare[18] (N = 264) and moderate[19] (N = 162) drinkers. However, infants born

[16] These infants (N = 40) were born to mothers who consumed less than 30g of absolute alcohol prior to their first antenatal visit and then minimised or abstained in pregnancy.
[17] Heavy drinkers consumed at least 5 drinks on some occasions and not less than 45 drinks a month.
[18] Rare drinkers abstained or consumed alcohol less than once a month.
[19]Moderate drinkers consumed alcohol more than once a month but did not meet the criteria for heavy drinking given in footnote 4.

to the reduced drinkers had more abnormalities than those born to moderate and rare drinkers. The above comparisons were made by matching the heavy and reduced drinking women (cases) to moderate and rare drinkers (controls) who were similar in eight variables thought to influence foetal growth.

The EUROMAC, a prospective study done on 8400 European women has associated a significant decrease in birth-weight and crown-heel length in infants with maternal alcohol consumption of above 120g/week of absolute alcohol (Kaminski, 1992). In the study by Day *et al.* (1990) on 461 women, heavy drinkers were defined as those who consumed more than 0.89 drinks per day. In this study, infants of drinkers exposed to alcohol at the rate of one or more drinks per day throughout pregnancy, had significantly lower birth weight and length in comparison to infants born to abstainers. Although the studies discussed above differ in the methodology adopted, it is clear that sustained heavy drinking throughout pregnancy can affect growth parameters including birth weight of the exposed infant. The studies by Larsson *et al.* (1985) and Rosett *et al.* (1983) indicate that cessation of heavy maternal drinking in the third trimester of pregnancy has a positive effect on birth weight. The literature reviewed in this section indicates that maternal alcohol abuse in pregnancy has far reaching long-term consequences on foetal growth and development.

2.5.2 Effects of moderate maternal drinking on infant outcome:

Literature on drinking habits of women seems to suggest that moderate drinkers represent the majority of the drinking population. However, the definition of "Moderate drinking" across studies is not consistent and hence in the current review, the definition given by the authors of the study has been stated as such. Literature documents various consequences of moderate drinking in pregnancy. Windham *et al.* (1997) in a prospective study found an increased risk of spontaneous abortion with increase in alcohol consumption. The risk among moderate drinkers (>3 drinks a week) in the first trimester almost doubled and was nearly four times in the first ten days after conception. No association was found between moderate drinking prior to pregnancy and spontaneous abortion and moderate drinking and second trimester spontaneous abortion. The methodology and the limitations of this study have already been discussed previously (see Section 2.4, page 16). A study by Armstrong *et al.* (1992) associated a risk factor of 1.26 to every drink for spontaneous abortion. Confounding factors such as, maternal age, educational level, ethnic group and employment during pregnancy were controlled for in the statistical analysis (logistic regression) performed in this study. However, this study has some major limitations. Although the study was done on a large sample (N = 47146) of women, alcohol consumption data was collected retrospectively after delivery or spontaneous abortion. This sample of women also included those that had previous pregnancies that ended in spontaneous abortion. The effect of recall bias may be high on the results of this study due to the methodology employed to collect alcohol consumption data, especially as some of the participants were asked to recall their pattern of alcohol consumption for their previous pregnancies that ended in spontaneous abortion.

The study by Kesmodel *et al.* (2002) found an increased risk for spontaneous abortion in the first trimester among women consuming more than or equal to five drinks a week. The methodology adopted in this study has already been discussed in detail previously (see Section 2.4, page 16). The major draw back of this study with respect to "Effects of moderate drinking" would be the categorisation of drinkers. The last category " more than or equal to 5 drinks per week" also included women who consumed 40 or more drinks per week. Moreover, the study did not consider the pattern of alcohol consumption in the analysis performed. Hence it is difficult to articulate whether the risk for spontaneous abortion was due to drinking 1 glass of alcohol per day for 5 days in a week or drinking 5 glasses of alcohol or more on one day of the week. This discrepancy was partly addressed by Kline *et al.* (1980) in their case-control study (N = 1248)[20]. In this study the cases were matched to the controls on age at the last menstrual period. Information on alcohol consumption was collected prospectively by using an interview schedule. Both frequency of drinking and the amount of absolute alcohol consumed on a typical occasion was recorded. Analysis was performed to separate the effects of frequency of drinking on the occurrence of spontaneous abortion from that produced due to the amount of absolute alcohol consumed on a typical occasion in pregnancy. The study found that women drinking 1 ounce (30g) of absolute alcohol twice per week doubled their risk for spontaneous abortion.

[20] 616 case and 632 control women.

The study by Parazzini *et al.* (1990) on the effect of maternal and paternal moderate alcohol consumption on unexplained miscarriages did not find a statistically significant association between maternal moderate drinking and spontaneous abortion. This was a case-control study with 97 cases and 176 controls. Cases were selected from those women who were referred to the Obstetric clinic for unexplained miscarriages. Alcohol consumption data were collected retrospectively for the first trimester of pregnancy for both cases and controls. Daily average volume of alcohol consumed was computed from the frequency of drinking and the number of drinks per week. There is a possibility that the results of this study may be affected by recall bias due to the methodology adopted to collect information on alcohol consumption. More importantly, as already discussed earlier average daily volume computed as above indicates a precision that does not exist in categorising moderate drinkers. From the above studies reviewed it is not clear if moderate alcohol consumption in pregnancy can result in spontaneous abortion.

Literature indicates that moderate maternal alcohol consumption has deleterious effects on foetal brain development. Further analysis of the data from the Seattle longitudinal study indicated that prenatal alcohol exposure was related to adolescent word attack (N = 462) and arithmetic performance (N = 191) in a dose dependent fashion. The magnitude of these effects was in the range of 1/3 of a standard deviation for each outcome at an average exposure level of 1.5 drinks per occasion. Socio-economic factors, nutrition, other drug exposures and a variety of potentially traumatic environmental events were statistically controlled and did not account for long term consequences of exposures of alcohol *in utero* (Streissguth *et al.*, 1994a). Four types of learning problems have been associated with moderate alcohol exposure *in utero*. These are performance in arithmetic and reading tests, teacher ratings of classroom behaviours indicating increased risk for learning disabilities, parent ratings of behaviours indicative of learning problems and parent rating of below average academic performance (Streissguth *et al.*, 1990).

The Detroit study (Jacobson *et al.*, 1993) assessed the offspring (N = 382) of mothers who were moderate drinkers. The incidence of very poor performance on the Bayley's mental developmental index almost doubled in children whose mothers averaged at least 0.5 ounce (15g) of absolute alcohol per day during pregnancy. The psychomotor developmental index assessed using Bayley's scale was lower in children of mothers consuming 1 ounce (30g) of absolute alcohol or more per day than in children of mothers consuming less than 1 ounce (30g) of absolute alcohol per day. Speed of central processing as reflected by reaction time was reduced in infants whose mothers averaged at least 0.5 ounces (15 grams) of absolute alcohol per day (Jacobson *et al*., 1994b).

The studies by Jacobson and colleagues (Detroit study) were done on a predominantly Black population but the results were similar to the Seattle study done on a predominantly White population (Streissguth *et al*., 1981). In contrast to the results from the Detroit and the Seattle study, the EUROMAC study did not see negative neurobehavioural effects of moderate *in utero* alcohol exposure in infants (N = 9700) at 18 months of age. After controlling for gestational age, birth weight, sex, parity, maternal age, smoking and level of maternal education, they observed a significant trend towards higher Bayley's scores among children of women who drank 120g/week of absolute alcohol or more (Kaminski, 1992). In another cohort (Danish) of the EUROMAC study the evaluation of infants (N = 326) at 18 and at 42 months found no association between moderate alcohol consumption including binge drinking and the various developmental indices of childhood (Olsen, 1994). In this study, from a total sample of 2880 pregnant women who consumed alcohol in early pregnancy, 164 women were selected as cases based on the criteria that they had drunk 5 or more drinks a week at 12 weeks of pregnancy. One hundred and sixty four controls were selected from the same drinking sample based on the criteria that these women did not drink 5 or more drinks per week at 12 weeks of gestation. Although the control group were not drinking 5 drinks or more per week at 12 weeks of gestation they were still drinkers, which is evident from the sample that they were selected from. As other studies have indicated a dose- dependent response of brain development to alcohol (Striessguth *et al.* 1990; 1994a; Jacobson *et al*., 1993), it may be possible that both groups of infants (study and control) had similar deficits in developmental indices and hence no differences were found. Moreover, the methodology adopted to collect alcohol consumption may not be robust as alcohol consumption was self-reported retrospectively for the entire pregnancy at 28 weeks of gestation, which is quite a long period. The evidence provided by this study to support the no-effect level of alcohol consumption up to 1-2 drinks per day needs further investigation by adopting a more robust methodology.

Further analysis of the data from the Pittsburgh study (Goldschmidt *et al*., 1996) comprising predominantly of light to moderate[21] drinking pregnant women (N = 512), showed a significant relationship between second trimester drinking and academic functioning in the exposed offspring at six years of age. The authors found a linear relationship between prenatal alcohol exposure and arithmetic performance at six years, and a threshold (1 drink a day) relationship between prenatal drinking and long-term poorer performance in reading and spelling. A recent review (Kodituwakku *et al*., 2001) has associated deficits in both cognitive and emotion-related executive functioning[22] to prenatal alcohol exposure. Such deficits were also seen in children of moderate drinking (7.0-13.9 drinks per week) mothers, and in children with and without the characteristics of foetal alcohol syndrome.

Acute effects of exposure to alcohol on the foetuses of moderate drinkers have also been investigated (McLeod *et al*., 1983; Mulder *et al*., 1998; Little, 1999, unpublished). The aim of the study by Mcleod and colleagues was to assess any immediate effect on the foetus from an occasional drink. On administrating 0.25g of ethanol/kg bodyweight (two glasses of wine) to healthy pregnant women (N = 11) who were usually moderate drinkers (consuming less than 40g of absolute alcohol per week) at near term, the authors found an immediate effect on foetal breathing movements. Foetal breathing was almost abolished within half an hour of administration and remained suppressed for 3 hours. The study by Mulder and colleagues (1998) was also done on near term foetuses of moderate drinking women (N = 28). Half the women were usual drinkers but abstained in pregnancy and the rest consumed less than 4 drinks per week. Only one woman in this study drank 1 glass per day. This study found an immediate effect of administering 0.25 g per kg body weight of ethanol to the mother on foetal brain function, which was reflected in reduced foetal eye movements and disorganised behavioural state organisation. As seen in the previous study foetal breathing was almost completely suppressed. A more recent less invasive study by Little (1999) found a lack in startle reaction to a buzzer among 25-week foetuses (N = 129) of drinkers. Only 42% of foetuses responded to the stimuli by the buzzer in comparison to 70% of

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[21] 0.4 to 0.89 drinks. Heavy drinking was defined as drinking above 0.89 drinks.

[22] Kodituwakku, *et al*., 2001 defines executive functioning as cognitive functions involved in planning and guiding behaviour in order to achieve a goal in an efficient manner.

foetuses of abstainers. The foetuses of women who smoked but did not drink fared better than those of the drinkers.

The evidence for the effect of moderate alcohol consumption on foetal growth is not consistent in the literature. Some studies have found a linear relationship between the amount of alcohol consumed and the effect on birth weight, but have failed to find statistically significant results between mean birth weights and various levels of drinking (Faden *et al.,* 1997). The EUROMAC study also failed to find any association with birth weight and drinking below 120g of absolute alcohol per week (Kaminski, 1992). However, further analysis of this data by Ogston and Parry (1992) using the "Offset threshold model"[23] showed a negative effect on birth weight by maternal intake of 60g[24] of absolute alcohol per week. The study by Rosett *et al.* (1983) also failed to find deficits in growth parameters in infants born to moderate drinkers in comparison to rare drinkers. In this study categorisation of heavy, moderate and rare drinkers was based on pattern of drinking rather than amount of absolute alcohol consumed per occasion. Other studies[25] (N = 144) have indicated that average daily consumption of 10g of ethanol in the week prior to recognition of pregnancy is associated with a reduction in infant birth weight by 225g (Little *et al.*, 1986). Similar intake later in pregnancy was related to decrease in birth weight for male but not female infants (Little *et al.*, 1986). In a more recent prospective study on 1413 pregnant women (Sokol *et al.*, 1999), drinking moderately two days a week throughout pregnancy in comparison to abstinence decreased birth weight by 200 grams. This decrease was accounted for by a decrease in duration of pregnancy (90g) and due to intra-uterine growth retardation (97g). Alcohol consumption had an equal impact on both the components that resulted in lower birth weight, namely shortened gestation and intra-uterine growth retardation. Reviewing the above literature it is clear that there is considerable evidence to support the suggestion that neurobehavioural outcomes of prenatal exposure to alcohol are dose dependent and the effects are produced at lower exposure levels than growth and morphogenic effects.

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[23] This model assumes a no effect of alcohol up to a threshold value and then a constant multiplicative effect at a high value.
[24] The confidence interval was wide ranging from 5 - 130g per week.
[25] This study was done prospectively on a non-random group of pregnant women who were white, aged 19-35 years and at 8-16 weeks of pregnancy. A questionnaire was used to collect detailed information about drinking patterns including each day's alcohol intake in the week prior to pregnancy recognition and in the week before the first prenatal visit.

In a majority of studies on maternal drinking, alcohol has been considered as such and not as different beverages. A prospective study done on 9236 pregnant women in Paris showed higher risks for stillbirth and intrauterine growth retardation to be associated with heavy beer drinkers in comparison to wine or wine/beer drinkers (Kaminski *et al.*, 1978). In a prospective study, for every ounce of beer drunk per month, a decrease of 8.4 grams in birth weight was observed (Kline *et al.*, 1987). A more recent review also showed that beer rather than wine or spirits was particularly associated with adverse outcomes in moderate and heavy drinkers (Florey and Taylor, 1992). Beer is a popular and highly acceptable drink especially among teenagers and young adults. In fact many may not even consider it as an alcoholic beverage and assume it to be safer to drink than wine and spirits. It has also been speculated that beer drinkers may be a different population compared to wine and spirit drinkers (Streissguth *et al.*, 1983b). These studies also raise the importance of assessing the interactive effect of the nutritional status of pregnant drinkers and the type of alcoholic beverage consumed on infant outcome.

2.5.3 Effects of maternal binge drinking on infant outcome:

Animal (Bonthius and West, 1990; Schenker *et al.*, 1990) and human studies (Jacobson & Jacobson, 1994a, Jacobson *et al.*, 1998) have shown that binge drinking produces high blood alcohol levels that may be more detrimental than other types of moderate intake, the exact nature of malformation seen being dependent on the time of gestation during exposure. Severe craniofacial abnormalities as a result of one or two heavy doses of ethanol as in binge drinking on days 7 and 9 have been shown in mice (corresponds to 3 weeks of gestation in humans) (Haddad & Dumas, 1982). The study by Bonthius and West (1988) using a rat model found that binge drinking in the third trimester resulted in microencephaly and cell loss. This effect of binge drinking is primarily attributed to the increased blood alcohol levels achieved by the binge style of drinking. A study by Pierce and West (1986) using a rat model compared the effect of binge and non-binge exposures on brain growth. Using artificial rearing methods, the researchers exposed two groups of neonatal rats to an alcohol dose of 6.6g/kg/day. The first group was administered this amount continuously and the second group was administered the same amount in a condensed pattern mimicking the binge pattern of drinking. The group receiving the continuous exposure achieved peak blood alcohol levels of 49 mg/dl and the group receiving the condensed exposure of alcohol achieved peak blood alcohol levels of 270 mg/dl. At the end of the experiment, the brain weights of rats in the condensed exposure groups were significantly lower than those of the continuous exposure group.

Bonthius and West (1990) observed similar results on exposing neonatal rats to different exposure patterns. Three groups of rats were exposed to a similar dose of alcohol (4.5g/kg/day) in a very condensed pattern (4 hours per day), condensed pattern (8 hours/ day) and in a continuous pattern (24 hours/day). The group exposed to alcohol in a very condensed pattern had the least brain weight and those exposed to alcohol in a continuous pattern had the highest brain weights. In another study (Clarren *et al*., 1992) that used a nonhuman primate model, the experimental animal was orally administered 1.8g/kg of alcohol in a binge-like pattern. In this study the pregnant monkeys were grouped into four. The first group was administered alcohol in a binge-like fashion for 3 weeks, the second group for 6 weeks, the third group for 24 weeks and the fourth group were the controls. Offspring of animals in the first group did not differ from the control group in their behaviour. However, offspring of animals in the second and third group showed abnormal behaviour in comparison with the control animals. As the abnormal behaviour seen among the offspring of group 2 and 3 were similar, the results of this study demonstrate that binge drinking even in the early stages of pregnancy (6-8 weeks) produces behavioural disorders similar to those seen with binge drinking later in pregnancy.

Human studies have also shown the deleterious effects of maternal binge drinking on foetal development. Further analysis of data from a sub-sample (N = 47) of infants in the Detroit [26]study indicated that infants born to mothers who engaged in intermittent binge drinking in pregnancy are at high risk for functionally significant developmental deficits (Jacobson *et al*., 1998). Eighty percent (N = 16) of all functionally impaired infants in this sub-sample were born to women who averaged at least 5 drinks per occasion in pregnancy. The Seattle longitudinal study also found that a "Binge ≥ 5"

[26] The Detroit study was done on a self-selected sample of 480 inner city African-American pregnant women who reported consuming at least 0.5 ounces (15g) of absolute alcohol a day around the time of conception. A 5% sample of lower drinkers and abstainers were also randomly selected. Data on alcohol consumption was collected at each prenatal visit for the preceding two weeks on a day -to-day basis. Volume of alcohol consumed derived from the interview at each prenatal visit was then averaged to provide a contemporaneous report of " Absolute alcohol per day in pregnancy" (Jacobson *et al*., 1998)

score was a good predictor of later infant outcomes (Streissguth *et al*., 1989). Learning problems in 7 year olds (N = 482) (Streissguth *et al*., 1990), specifically reading (N = 462) and numerical problem solving proficiency (N = 191) in 14 year olds (Streissguth *et al*., 1994a) and attentional deficits and short-term memory in 14 year olds (N = 462) (Streissguth *et al.,* 1994b), have been associated with binge pattern of exposure. Other infant outcomes associated with binge drinking in early pregnancy include orofacial cleft phenotypes (Shaw and Lammer, 1999).

The literature reviewed in this section indicates that binge style of drinking during any stage of pregnancy has deleterious effects on foetal development. Studies on the human population have shown that binge drinkers are not necessarily heavy drinkers and intermittent binge drinkers can also be classified as moderate drinkers (Jacobson & Jacobson, 1999). The studies reviewed highlight the danger of binge drinking, which is commonly seen among sexually active non-pregnant women, particularly of the younger childbearing years who may continue this drinking behaviour into early pregnancy.

2.6 Long term consequences of maternal drinking:

Research on foetal alcohol syndrome, characterised by growth deficiency, dysmorphic features and defects in the central nervous system, has reached adulthood in countries that are pioneers in the field of alcohol teratogenicity. Longitudinal studies (Seattle (N = ~ 500) and Berlin (N = 60)) on children affected with foetal alcohol syndrome have seen a persistence of growth deficiency and marked dysmorphic features in adolescence and adulthood (Streissguth, 1992, Sphor *et al*., 1993). However, persistence of poorer physical growth was more evident in males than in females at adolescence (Streissguth *et al*., 1991; Sphor *et al*., 1993).

Contrary to the lack of long term effects on growth and dysmorphic features, in both the above-cited longitudinal studies, mental retardation persisted into adolescence and adulthood. In the Seattle longitudinal study, the affected children were followed up to 14 years of age (N = 468). Effect of prenatal exposure on academic achievement was strongest for children born to mothers who abused alcohol in pregnancy, whilst negative effects on arithmetic and reading were also evident in moderately exposed infants

(Streissguth *et al.*, 1989) and persisted into childhood (Streissguth *et al.*, 1990) and adolescence (Streissguth *et al.*, 1994a; 1994b). Maladaptive behaviours such as attentional deficits, poor judgement, difficulties in perceiving social cues, and conduct problems such as lying and defiance, characterised the affected adolescent and adult (Streissguth *et al.*, 1991).

The Berlin-FAS study (Steinhausen & Sphor, 1998) followed up children (N = 33) affected with foetal alcohol syndrome into adolescence. Behaviour, intelligence and the prevalence of psychiatric syndromes were followed up and assessed during pre-school, middle school and late school periods. Psychiatric disorders such as hyperkinetic syndrome[27], emotional disorders, sleep disorders, and conduct disorders persisted into adulthood. As in the Seattle study, attention deficit and social relationship problems persisted well into adolescence. In both the Seattle (Streissguth *et al.*, 1991) and the Berlin study (Steinhausen & Sphor, 1998) of foetal alcohol syndrome patients, no improvement in intelligence over time was observed highlighting the long lasting deleterious effect of heavy intrauterine alcohol exposure on mental development of children.

In both the above studies attentional deficit and hyperactivity also persisted into adolescence. This is also echoed by another European study on infants (N = 24) born to alcoholic mothers (Aroson & Hagberg, 1998). Studies have compared children diagnosed with attention deficit hyperactivity disorder and alcohol affected children based on the premise that the causative factor may be exposure to alcohol *in utero*. Nanson and Hiscock (1990) found that in comparison with children with attention deficit disorder, alcohol affected children displayed similar attention deficits, but were more impaired intellectually. However, the above premise has been questioned by Coles *et al.* (1997) and their study has shown that alcohol affected children (N = 149) had different neurocognitive and behavioural characteristics from children with primary diagnosis of attention deficit hyperactivity disorder. In a more recent study, Coles compared children with foetal alcohol syndrome and attention deficit hyperactivity disorder (Coles, 2001). Both groups of children showed similar impairment on tests of global intelligence but differed in their pattern of responses and behavioural problems.

[27] A mental disorder characterised by grossly excessive level of activity, disruptive behaviour, impaired learning and attention deficit, (Harrison, 1986).

Children with attention deficit hyperactivity disorder performed least well on measures of focused and sustained attention and were impulsive and had more behavioural problems than children with foetal alcohol syndrome that performed least well in measures of encoding and shifting attention (Coles, 2001). More research is essential to throw light on any relationship between these two disorders, especially as attention deficit hyperactivity disorder is highly prevalent in the Western world.

Longitudinal studies like the Pittsburgh (Goldschmidt *et al.*, 1996), Detroit (Jacobson & Jacobson, 1999 Jacobson *et al.,* 1993) and Seattle (Streissguth *et al.*, 1981; 1989; 1990; 1994a; 1994b) have shown that neurodevelopmental deficits in infants exposed to moderate amounts of alcohol *in utero* persist long-term. The longitudinal follow up of the Seattle sample showed that the neurobehavioural or functional outcomes of prenatal alcohol exposure were clearly measurable at 14 years of age (N = 462) both in the laboratory and the classroom. The likelihood of ratings by classroom teachers as "Not persistent on tasks", "Slow to settle down", "In constant motion", "Distractible", increased in proportion to the magnitude of *in utero* exposure (Carmichael *et al.*, 1992). Prenatal exposure in a dose-dependent fashion has been found to affect learning, especially reading and arithmetic skills throughout early and late school years (Streissguth *et al.*, 1990, 1994a; Goldschmidt *et al.*, 1996). Other dose-dependent long-term consequences of prenatal exposure were short-term memory and attentional deficits (Streissguth *et al.*, 1994b). Further analysis of the data from the Detroit study has shown that children (N = 501) exposed to any alcohol were 3.2 times more likely to suffer from delinquent behaviour (Sood *et al.*, 2001).

The teratogenic effects of alcohol on the foetus are indisputable, but the differing results seen in various studies are probably due to the methodology employed. Comparison of different studies is difficult due to the varying definitions of alcohol consumption patterns. Moreover in the majority of studies reviewed, alcohol consumption pattern was self reported, which again could be a cause for differing results. Drinking pattern has been postulated as a critical factor in determining the potential dangers of alcohol (Abel, 1996). Despite these limitations, the extensive review of literature on the effects of maternal alcohol consumption indicates that manifestations of physical defects in exposed infants may be dependent on threshold and timing of exposure, but the effects on the central nervous system are most likely to be dose-dependent.

2.7 Incidence and prevalence of foetal alcohol syndrome and other alcohol related effects:

The prevalence of foetal alcohol syndrome and other alcohol related effects cannot be derived with the same precision as that possible for other common birth defects such as spina bifida and Down syndrome. One of the reasons for this lack of precision is that there exists no simple laboratory test for foetal alcohol syndrome and hence diagnosis has to be based on much less accurate diagnostic criteria (Report to the U.S. Congress, 1997). The reluctance to diagnose and lack of diagnostic expertise also contributes to the inaccurate estimation of the incidence of foetal alcohol syndrome (Little, 1990; Leversha & Marks, 1995a). For similar reasons to those stated above and the lack of consensus among medical professionals on diagnostic criteria, the estimation of the prevalence of other effects of alcohol teratogenicity is even more difficult. Hence, most of the studies reviewed deal with establishing the prevalence of foetal alcohol syndrome. However, researchers around the world have established vastly differing estimates for the prevalence of foetal alcohol syndrome. A review of these studies has implied that the estimates made were largely dependent on the site of the study, population studied, differences in defining drinking level, differences in diagnostic techniques and expertise and the methodology employed (Abel, 1995).

2.7.1 Incidence and prevalence of foetal alcohol syndrome and foetal alcohol effects around the world:

Researchers attempting to establish the occurrence of foetal alcohol syndrome and foetal alcohol effects have used both the terms "Incidence" and "Prevalence". Most researchers have used the term "Incidence" to report the occurrence of new cases of foetal alcohol syndrome within a period of time and the term "Prevalence" to report all new cases and existing cases during a particular period of time. In the following sections, the term used to report the occurrence of foetal alcohol syndrome and foetal alcohol effects by the authors of the studies reviewed are quoted as such.

Abel and Sokol (1987), in their review of major prospective and retrospective studies primarily from the Western world, estimated a worldwide incidence of foetal alcohol syndrome as 1.9/1000 live births. This estimate was later revised by considering only prospective studies and the overall rate for the Western world was fixed at 0.33 cases per 1000 live births (Abel & Sokol, 1991). A more recent review of 29 prospective studies has led to yet another revision of the incidence of foetal alcohol syndrome in the Western world to be 0.97 cases per 1000 live births (Abel, 1995).

The Seattle longitudinal study in the United States reported an incidence rate of foetal alcohol syndrome in the study population as 1 in 750 live births (Streissguth *et al.*, 1981). Other estimates reported in the United States were 1 in 1000 live births and 2 in 1000 live births for foetal alcohol syndrome and foetal alcohol effects respectively (Little *et al.*, 1990). A six-fold increase in the prevalence of foetal alcohol syndrome has also been reported in the United States for the period of 1979-1993 (CDC, 1995). In Saskatchewan (Canada), despite major initiatives in professional and public education, the incidence rate of foetal alcohol syndrome (0.5 per 1000 live births) did not appear to have changed for 20 years (Habbick *et al.*, 1996). It has also been reported that in the Manitoba reserve of Canada (An Indian reservation) the rate of foetal alcohol syndrome was 100/1000 live births (Square, 1997).

Higher prevalence rates of foetal alcohol syndrome have also been reported in France (1/100 live births) and in Sweden (1/600 live births) (cited in Little *et al.*, 1990). In other European countries the estimated incidence of foetal alcohol syndrome ranged from 1.6-2.5/1000 live births (Sampson *et al.*, 1997). A very high rate of prevalence (48/1000 live births) has been established for South Africa's Western Cape province (Baleta, 1998). A commentary on foetal alcohol syndrome in Australia reports the incidence of this syndrome in Australia to be 1-2/1000 live births (Lipson, 1994). For Western Australia, the incidence of foetal alcohol syndrome has been estimated to be 0.06 per 1000 live births (Temple *et al.*, 1992). However, Lipson and colleagues (1983) have commented that many cases of foetal alcohol syndrome in Australia are likely to be misdiagnosed and hence these estimates may be only a lower limit.

A higher incidence of foetal alcohol syndrome has also been reported in some indigenous groups. An epidemiological study done on a defined population comprising American Indians of the South-Western United States, found large variations in the incidence of foetal alcohol syndrome in different cultural groups ranging from 1.3/1000 live births to 10.3/1000 live births. This variation in the incidence of foetal alcohol syndrome was attributed to the differences in cultural norms for alcohol consumption adopted by the tribes (May *et al.*, 1983). Studies have also shown that low socio-economic levels and other associated risk factors like smoking, poor nutrition, poor health, increased stress and use of drugs have a greater influence on the incidence rates of foetal alcohol syndrome and foetal alcohol effects than racial factors. (May *et al.*, 1983; May, 1991; Abel, 1995; Abel, 1998). Population-based studies have also shown a greater increase of foetal alcohol syndrome within the same family. In this study, on average, a rate of 1.3 affected children per heavy drinking mother was observed. (May *et al.*, 1983). A similar study by Abel (1988) reported the incidence of foetal alcohol syndrome among older siblings to be 170/1000 live births and among younger siblings to be 771/1000 live births. In this study, later born siblings among alcoholics were at much greater risk for foetal alcohol syndrome than their older siblings (Abel, 1988).

From the literature reviewed on the outcomes of maternal drinking earlier in this Chapter, it is clear that establishing the incidence or prevalence rates of foetal alcohol syndrome alone does not in any way give the full picture of the prevalence of the outcomes of maternal drinking. Sampson and colleagues (1997) have reported a combined incidence of foetal alcohol syndrome and alcohol related neurodevelopmental disorder to be at 9.1/1000 live births. This rate was arrived at primarily from analysing two prospective longitudinal studies in the United States, and one in France. A more recent name coined for the combined effects of *in utero* exposure to alcohol is “Foetal Alcohol Spectrum Disorder” (FASD), the incidence of which has been estimated to be 1 in 100 live births (Striessguth & O’Malley, 2000).

2.7.2 Incidence and prevalence of foetal alcohol syndrome in New Zealand:

The under-recognition of foetal alcohol syndrome and the other alcohol related effects in New Zealand are reflected in the lack of diagnosis at birth. No publications of diagnosed cases of foetal alcohol embryopathy are maintained by the Ministry of Health, New Zealand (MOH, 1996). The first study to report the possible prevalence of foetal alcohol syndrome in New Zealand was the one done in 1993 by Leversha and Marks (1995a). Based on the responses of the paediatricians surveyed, Leversha and Marks reported 63 diagnosed cases of foetal alcohol syndrome. These diagnoses were based on maternal alcohol abuse in pregnancy and the presence of dysmorphic features in the child. An additional 78 children were diagnosed but were not under paediatric care. One hundred and thirty children with recognised alcohol related birth defects were also reported to be under paediatric care. Compared to the incidence rate of foetal alcohol syndrome reported in overseas studies, Leversha and Marks estimated the actual number of cases in New Zealand to be 200-3540/year. Morgan (1993) estimated a much lower rate (20-114) of babies affected by foetal alcohol syndrome every year in New Zealand. The above figures are estimates based on overseas incidence rates and hence the true incidence in New Zealand is still unknown.

In recent years there have been growing public concerns expressed over a series of issues relating to childhood and adolescent mental health and psychopathology in New Zealand. The trends reported from the two major longitudinal studies done in Dunedin and Christchurch have shown an increased prevalence of conduct problems, depression, substance use behaviours and youth suicide (Fergusson *et al.*, 1997).

The Dunedin Multidisciplinary Health and Development Study was commenced in 1972 and aimed at assessing health and development of 1037 babies. The study participants were assessed at birth, age three and then every two years until they were 15 years of age, then at 18, 21 and 26 years of age. Research into the mental health of the sample has been a central feature of this study and the participants were assessed periodically from the age of three using standardised techniques, parent reports, teacher reports and self reports (McGee *et al.*, 1996). From the age three assessments, 11% of the sample members were identified as exhibiting hyperactive behaviour, management problems or shy-inhibited behaviours. Assessments in the early school years from age five to nine, 23% of the boys and 12% of the girls exhibited significant mental health problems. Assessments at 11 and 13 years of age indicated 16% of the sample had mental disorders of which nearly half had been identified with mental disorders in their preschool or school going years. Follow-up of those children with metal disorders indicated that 44% continued to show mental health disorders at 15 years of age. Assessments at 15 years of age indicated a greater continuity from the preadolescent years of externalising disorders like inattention-hyperactivity and conduct disorders in boys and the reverse for internalising disorders like anxiety and depression in girls. Assessments at early adulthood (18 years of age) indicated that 37% of the sample had one or more mental health disorders namely, depression, social phobia, alcohol dependence, simple phobia, conduct disorder, substance dependence and suicidal ideation (McGee *et al*., 1997).

The Christchurch Health and Development Study is a longitudinal study of a birth cohort of 1265 children born in urban Christchurch in mid 1977. Assessments of these children in early adulthood (18 years) indicated that 42% of the participants had mental disorders such as anxiety disorders, mood disorders, conduct disorders and drug abuse/dependence. Female participants had higher incidence of anxiety and mood disorders and male participants had higher incidence of conduct disorder and alcohol and drug abuse or dependence (Fergusson and Horwood, 2001).

A recent overseas study has shown the prevalence of similar psychiatric problems in individuals with foetal alcohol syndrome and foetal alcohol effects (Famy *et al*., 1998). How many of the children in New Zealand showing such psychiatric problems were exposed to alcohol *in utero*? At this stage the answer to this question must be left to speculation.

Alcohol consumption is an integral part of New Zealand culture. Hence, to establish the prevalence of the adverse outcomes of maternal alcohol consumption in New Zealand is an important, albeit a very difficult, task especially as diagnosis of alcohol related effects at birth is probably only done randomly. Moreover, there are no prospective or retrospective studies that have investigated the prevalence of alcohol related effects in New Zealand. In view of the lack of prospective studies and the random and infrequent occurrence of accurate diagnoses by trained specialists in New Zealand, it may be more relevant to establish the risk for the prevalence of alcohol related effects as a basis to develop and execute preventive strategies.

Chapter - 3

Women and Alcohol: Prevalence and Prevention

3.1 Prevalence of drinking:

Historically, studies on alcohol tended to focus on alcohol related health problems faced by the individual. Hence men, with greater drinking intensity than women, globally attracted attention in terms of prevention and treatment. One of the major issues that brought the drinking of women into focus worldwide was the recognition of the immediate as well as the long-term effects of alcohol on the outcome of pregnancy. A detailed review of these outcomes has been well documented in the previous chapter.

Generally, women who are usual drinkers seem to have a natural tendency to reduce alcohol intake during pregnancy. This decrease in consumption appears to be related primarily to the adverse physiological effects of alcohol during pregnancy and only secondarily to concern about foetal welfare (Little & Streissguth, 1978; Little *et al.*, 1976). In an Australian study (Hilton *et al.*, 1989) 66% of women reduced their alcohol consumption during pregnancy, compared to only 29% of women who were able to reduce smoking, in the same sample (N = 40). Streissguth *et al.* (1983b) investigated (N = 1413) whether there was any association between the type of alcohol usually consumed and cessation of drinking on recognising pregnancy. They found that the use of liquor had dropped by 50% after knowledge of pregnancy, the use of wine had dropped by 40% after the knowledge of pregnancy but only 30% dropped the use of beer after the knowledge of pregnancy. Decrease in drinking during pregnancy was observed more among older pregnant women of a higher socio-economic status (Streissguth *et al.*, 1983b).

Attempts have been made in overseas studies to draw out the demographic characteristic of women most at risk for drinking in pregnancy. A recent study that aimed at characterising women at risk for any alcohol use in pregnancy found that those at high risk were unmarried, college educated, employed, of higher socio-economic status or students (Ebrahim *et al.*, 1998). However, a study in Spain (Bolumar *et al.*, 1994), failed to find any association of demographic factors of women (N = 1004) with drinking cessation in pregnancy. Number of cigarettes smoked per day and the amount of absolute alcohol consumed per week were the only predictors of drinking behaviour in pregnancy. Among women who usually drank, 37.3% quit drinking in pregnancy. Women who usually consumed 30g or more of absolute alcohol per week were more likely to continue to drink in pregnancy. In this study the risk for drinking in pregnancy increased with increase of absolute alcohol consumed per week. In the study by Ebrahim *et al.* (1999) smoking was a risk factor for usual drinking and for drinking in pregnancy. Reports by the Centres for Disease Control (CDC, 2002) have also indicated that usual heavy drinkers are at risk for continuing to drink in pregnancy. Understanding patterns of alcohol consumption among the usual drinkers of childbearing age (15-45 years) is important as many women are likely to continue this behaviour into early pregnancy or perhaps throughout pregnancy. Reviewing literature on the non-pregnant population is even more important for New Zealand, as literature on drinking during pregnancy by New Zealand women is very limited. In the following sections an attempt has been made to document the prevalence of drinking among women of childbearing age and in pregnancy in New Zealand and elsewhere.

3.1.1 Alcohol consumption among women of childbearing age in New Zealand:

Alcohol plays a very important role in the lives of most New Zealanders and women are no exception. The first experience with alcohol for most New Zealanders has been reported to start as early as nine years of age (Caswell *et al.*, 1983). Periodic surveys have been conducted to assess drinking patterns of New Zealanders. In the 1978 National Survey[28] nearly 62% of women (N = 3058) of childbearing age were drinkers and 8% of all women[29] in this study were heavy drinkers (Caswell, 1980). The results of this study indicated that women in the upper end of the childbearing years were more likely to be frequent drinkers than women in the lower end of the childbearing years. However younger women (18-23 years) were more likely to consume higher amounts of alcohol on a typical occasion than older women. In the childbearing years, more single women consumed 40 ml or more of absolute alcohol per occasion than married women. Women consuming large amounts of alcohol were also more likely to be

[28] This study was done on 10,000 respondents of which 5000 were women aged between 14-65 years.
[29] Aged 14 - 65 years.

involved in unskilled or semiskilled professions. The study also documents drinking among women of different ethnicity in New Zealand. Although a higher proportion of Maori (28%) and Pacific (57%) women were abstainers than women of European origin (12%), drinkers among women of these ethnic groups were more likely to binge drink than European women.

The results of the 1988 survey[30] (Wyllie & Caswell, 1989) show that nearly 84% of women of childbearing years (N = 539) were drinkers. Drinking women in the above study were categorised according to their usual drinking habits. The categories, which are discussed below are self-explanatory of the pattern of drinking exhibited by the women of each category. Proportions of "Light drinking" and "Frequent at home drinking" women across the age categories increased with increase in age. Although women of both these categories consumed lower amounts of absolute alcohol per occasion, women of the latter category were more frequent drinkers. Women of the "Light drinking" group had an average distribution with respect to their demographic profile, whilst "Frequent at home" drinking women tended to be older (~ 40 years), married (78%), and of a higher socio-economic status.

In the study by Wyllie & Caswell (1989), the proportion[31] of "Young heavy drinking" women was highest among the 24-29 year olds (33%) followed by the 18-23 year olds (26%). The latter age group also had the highest (69%) proportion of the "Very young heavy drinking" women. The "Young heavy drinking" group had fewer drinking occasions than the "Frequent at home" drinkers but consumed much larger quantities on a typical occasion, usually away from home. In accordance with their age they tended to be from a lower socio-economic status and were predominantly beer drinkers. The "Very young heavy drinking women" were largely single women with an average of two drinking occasions per week and consuming higher levels of absolute alcohol on a typical occasion than all other women drinkers in this study.

The proportion of women drinking wine in the study by Wyllie & Caswell (1989) had almost doubled (43%) when compared to the results (23%) of the 1980 study by Caswell (1980). Wine in the study by Wyllie and Caswell (1989) was popular among

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[30] This study was done on 1680 respondents of which 754 were women aged between 14-65 years.
[31] Proportions were estimated from the total number of women in each age category including abstainers.

the light-drinking women while the young, heavy drinking women favoured beer. Similar trends were also seen in a national survey (N = 3000) of 2nd, 4th and 6th formers (Routledge & Taylor, 1981). In the above study, 95% of all the respondents were drinkers and beer was the most popular drink followed by wine and spirits among female students.

In the 1995 national survey (N = 4232) on drinking in New Zealand (Wyllie *et al.*, 1996) 85% of all women said they had consumed some alcohol in the previous year. The study did not clearly state or have data for computing the prevalence of drinking only among women of childbearing age. However, it was stated that nearly 90% of 16-19 year olds had consumed some alcohol in the year prior to the study. As seen in the two previous studies the 16-24 year olds had the highest typical occasion quantities of alcohol, indicating a higher prevalence of binge drinking among this group of women. Forty-seven percent of women of this age group drank four or more drinks (each drink had 15 ml of absolute alcohol) on a typical occasion at least monthly and 20% at least weekly. However, the median frequency of drinking episodes was highest (peaked) for both the 20-24 year olds as well as the 40-49 year olds in comparison to other age groups. These results indicate high drinking frequency as well as high typical occasion quantities for the 20-24 year olds. The above 40 year olds had as high frequencies of drinking as the latter group, but had lower typical occasion quantities.

The results of the New Zealand Health Survey (Statistics NZ, 1998) (Table-3.1) indicate that about 81% of women of childbearing age had a drink containing alcohol in the year prior to the survey. As seen in the previous studies, the proportion of women drinking 1-2 drinks per day increased with increase in age and more than half of the above 35 year olds were drinking more than two times a week. These results are consistent with the previous studies indicating that the majority of older women were frequent but light drinkers. However, the proportion of women drinking 3 or 4 drinks per day was similar across the childbearing years, indicating that moderate to heavy drinkers are quite evenly distributed across the childbearing years.

Table: 3.1

Alcohol consumption patterns among women of childbearing age (15-45 yrs) from the 1997 New Zealand Health survey
N = 867,703

Criteria	Total N of drinkers	Total Percentage of drinkers	15-25 years %	26-35 years %	36-45 years %
Had a drink containing alcohol in the last year	703,988	81	33	35	33
Drinking Frequency	700,985				
monthly or less	249,667	36	33	37	31
2-4 times a month	244,727	35	39	35	27
2-3 times a week	152,775	22	31	44*	55*
4 or more times/week	53,816	8.0	NA	NA	NA
Number of drinks/day	626,566				
1 or 2 drinks/day	389,037	62	21	37	42
3 or 4 drinks/day	155,324	25	37	37	36
5 or more drinks/day	82,205	13	56	NA	NA
6 or more drinks/occasion	700,738				
Never	296,955	43	19	37	44
> Monthly	226,535	32	37	36	28
Monthly	128,476	18	46	36	18
Weekly	48,772	7	NA	NA	NA

Adapted from the data provided by Statistics New Zealand, 1998.
NA - Not Available; * Averaged estimate of 2 or more times a week and hence is not comparable

About 13 % of women had 5 or more drinks per day of which 56% were from the 15-25 year age group. The proportion of women to have never drunk 6 or more drinks per occasion also increased with increase in age, indicating that women at the upper end of the childbearing years were less likely to binge. However, nearly half (45%) of the 15-25 year olds binged at least once a month.

A more recent study in New Zealand (Watson and McDonald, 1999) also highlights findings similar to those from the New Zealand Health Survey. This study collected information about alcohol consumption prior to pregnancy and during pregnancy from a non-random sample (N = 504) of pregnant women. About 81% of pregnant women in this study were drinkers prior to pregnancy, which is similar to the proportion of drinkers in the New Zealand Health Survey. With respect to ethnicity 87.6% of New Zealand born Europeans, 79.2% of all indigenous Maori women and 45.5% of all Pacific women were drinkers prior to pregnancy. With respect to style of drinking as defined by the amount of absolute alcohol consumed on a typical occasion, 24% of all women habitually drank to intoxicating levels (≥ 45g of absolute alcohol per occasion) prior to pregnancy. Among women who drank to intoxicating levels a greater proportion were below 25 years of age. With respect to ethnicity, ~13 % of all New Zealand Europeans, ~65% of all Maori women and 33% of Pacific women were drinking 45 grams or above of absolute alcohol per occasion prior to pregnancy. These results are similar to trends observed by Caswell (1980).

In the study by Watson and McDonald (1999), among beer drinkers the median quantity consumed by Maori (N = 46) and Pacific (N = 9) women in one session far exceeded (2130 ml) that of New Zealand Europeans (N = 56), which was 690 ml. Although the number of wine drinkers among New Zealand Europeans (N = 227) was much higher than the Maori (N = 18) and Pacific (N = 9) women, the median volume (206 ml) of wine consumed did not differ by ethnicity. With respect to consumption of spirits, New Zealand Maori women (N = 36) consumed a median volume of 120 ml, Pacific women (N = 5) 90 ml and New Zealand European women (N = 65) 60 ml in one session. These results indicate that style of drinking varies with the type of beverage usually consumed and Maori and Pacific women drinking beer consumed very high quantities on a typical occasion in comparison to women drinking other beverages.

Similar results were seen in the 1995 national survey, which studied drinking among Maori men and women (N = 516) (Dacey, 1995). The median quantity consumed on a typical occasion among Maori women was as high as 50 ml of absolute alcohol with 31% reporting as monthly drinkers and 14% as weekly drinkers. The median typical occasion quantity among Maori women of 14 to 29 years of age was 71 ml of absolute alcohol and that of women above 30 years of age was 39 ml of absolute alcohol per occasion.

Martin *et al.* (1992) designed a study to identify different types of drinkers in New Zealand. Alcohol consumption and contextual data were collected from 894 women.

The authors identified ten types of female drinking clusters in their sample of recent drinkers. In this study a mean consumption of up to 26ml of absolute alcohol, equivalent to one and half glasses of a standard alcoholic drink, was considered as light drinking. The clusters of recent drinking women who consumed this mean amount were the “Infrequent light drinkers”, “Frequent early evening drinkers” and the “Daily family drinkers”. In this study, about 54% of all recent drinkers belonged to the “Infrequent light drinking” category. Nearly all of these women consumed alcohol on 1 to 3 occasions per week and had an average distribution with respect to their demographic profile. However, women belonging to the “Frequent early evening drinkers” and the “Daily family drinking” group had some distinct demographic features. A majority of these women were above thirty-five years of age, were predominantly white and were married. Women of the former group were from all strata of socio-economic status, whilst those from the latter group were more from the higher socio-economic status. With respect to their drinking frequency, women in both these groups drank on average six to seven occasions per week.

In the study by Martin *et al*., (1992), clusters with a mean absolute alcohol consumption ranging from 33 ml to 45 ml were categorised as “Moderate drinkers”. These clusters were the “Moderate social drinkers”, “Frequent social drinkers” and “Work place drinkers”. About 7% of the sample comprised of moderate social drinkers and these women on average drank on three occasions per week. This cluster was over-represented by women of middle socio-economic status and had more older, divorced and separated women. However, more women in the “Frequent social drinking” cluster were younger, had at least four drinking occasions in a week and a mean alcohol consumption of 45 ml of absolute alcohol per occasion. A majority of these women had higher levels of education and were employed. Women in the “Work place drinking” cluster were more likely to be single, employed with average drinking occasions similar to those of the former group. However, this cluster of moderate drinkers had the lowest mean amount of absolute alcohol consumption (33 ml) in comparison to both the other groups of moderate drinkers.

About 11% of the sample in the Martin *et al*. (1992) study comprised of heavy drinkers with a mean consumption of absolute alcohol greater than 100 ml on a typical occasion. The four clusters of heavy drinkers were the “Young heavy beer/wine drinkers” (7%), the "Frequent very heavy beer drinkers" (1%), "Sports club drinkers" (2%) and the "Liqueur drinkers" (1%). Women belonging to the first two clusters were more likely to be below thirty-five years of age, of a lower socio-economic status and single. However, they differed in their number of drinking occasions with the former group, averaging 1-2 occasions per week and the latter group averaging 4-6 occasions per week. The sports club drinkers were predominantly made up of women from the 20-24 year age group. However, women of this cluster who were above 35 years of age were preferentially spirit drinkers, with a mean absolute alcohol consumption of 51 ml per occasion, averaging two to three drinking occasions per week. The "Liqueur-drinking" cluster also had mean absolute alcohol intakes and drinking frequency similar to those of the sports club drinkers but comprised of women from all age groups (Martin *et al.*, 1992).

One factor that was quite consistent across all the above-cited studies is that women at the lower end of their childbearing years are more likely to drink less frequently in comparison to women at the upper end of their childbearing years. Exceptions to the above statement were the group of above 20 year olds in the 1995 survey (Wyllie *et al.*, 1996) and the group of "Frequent social drinkers" in the study by Martin and colleagues (1992). These groups of women had high drinking frequencies similar to the older women but also had higher typical occasion quantities similar to the teenagers. In a recent overseas study (CDC, 2002), non-pregnant women below 30 years of age were more likely to be frequent drinkers[32] and binge drinkers.

3.1.2 Alcohol consumption among women of childbearing age elsewhere:

Review of American literature indicates that a high proportion (68-76%) of women of childbearing age were drinkers with 8-12% drinking heavily (Celentano & McQueen, 1984; Wilsnack *et al.*, 1984; Dufor *et al.*, 1994). The study by Celentano and McQueen (1984) was done on women (N = 1078) aged 18-54 years. In this study 37% of women were light drinkers (< 7 drinks per week), 20% were moderate drinkers (7-13 drinks a week) and 8% were heavy drinkers (above 14 drinks a week). A majority of heavy drinkers were of the 35-44 years age group (11.0%) followed by the 18-24 year olds (9.0%). In the study (N = 917) by Wilsnack *et al.* (1984), 70% of the 21-34 year olds

[32] More than or equal to 7 drinks a week or binge.

and 72% of the 35-49 year olds were usual drinkers. On average 42% of women of childbearing age were light drinkers (less than 0.22 ounces (6.6g) of absolute alcohol per day), 22% were moderate drinkers (0.22-0.99 ounces (6.6 – 30g) of absolute alcohol per day) and 7.5% were heavy drinkers (1 or more ounces (≥ 30g) of absolute alcohol per day). The study by Dufour *et al.* (1994) reports data on the prevalence of drinking among women of all age groups from two studies. The data collected in 1985 (N = 10578) showed that 64% were current drinkers consuming 12 or more drinks a year and 12% were risky drinkers consuming more than one drink a day. The 1990 data (N = 13055) showed a decline with only 58% of women being current drinkers and 10% being risky drinkers.

In the United Kingdom, a study[33] (1994) on the drinking habits of women drinkers aged 16-54 (N = 8864) showed that 38% were light drinkers (1-7 units/week), 16% were moderate drinkers (7-14 drinks a week) and 13% were heavy drinkers consuming above 14 units per week. The proportions of heavy drinkers among the 16-24 year olds (16%), 25-34 year olds (15%) and 35-44 year olds (16%) were similar. A more recent publication of the CDC (2002) shows that the proportion of drinkers among women of childbearing age (N = 107141) had remained constant in the United States at around 50% from 1991-1999.

Overseas studies have also endeavoured to characterise usual binge drinkers. Binge drinkers were found to have started various transitional behaviours such as alcohol use, tobacco use and sexual intercourse at an earlier stage, (Cornelius *et al.,* 1993). Studies have also shown that binge drinkers are not necessarily heavy drinkers. Results from the Behavioural Risk Factor Surveillance System (Centres for Disease Control, 1994) show that among binge drinkers who comprised 21% of the total population studied (N = 26829), 69% were light drinkers, 21% were moderate drinkers and only 10% were heavy drinkers. Non-pregnant binge drinkers in the United States were more likely to be of non-black race, with college level education, single, employed or a student and a current smoker. The prevalence of binge drinking (Total N = 103923) remained constant at around 11% in the United States over a period of five years (Ebrahim *et al*., 1999). Other reports from CDC also echo similar findings over a decade. The

[33] http://www.eurocare.org/profiles/uk/ukconsumptions.htm

proportions of binge drinkers (Total N = 107141) were 11.2% in 1995, 10.8% in 1997 and 12.3% in 1999 (CDC 2002).

Drinking behaviour prior to pregnancy or usual drinking behaviour among women of childbearing age has been shown to be highly predictive of drinking in pregnancy (US Dept of Health and Human Services, 2000). Both New Zealand and overseas literature indicate that a high proportion of non-pregnant younger women are likely to be heavy and / or binge drinkers. Studies have also shown that by fifteen years of age, a high proportion of New Zealand girls exhibit adult patterns of drinking (Caswell *et al.*, 1991). A recent overseas study has shown that nearly 35% of teenagers are sexually active by the age of 15 without using any form of contraceptives (Allard-Hendren, 2000). Similar trends are likely to prevail in New Zealand and having the second highest rate of teenage pregnancy in the world (Dickson *et al.*, 2000), there arises concern for the consequences of heavy and binge drinking among younger women especially if they continue this behaviour prior to pregnancy recognition or perhaps well into pregnancy.

3.1.3 Periconceptional drinking in New Zealand and elsewhere:

Women who regularly consume alcohol are vulnerable to drinking in the periconception period, as many may be unaware of their pregnancy, particularly if the pregnancy was unplanned. A study by Forrest (1994) in the United States showed that 54% of all pregnancies were unplanned. It is likely that similar trends are prevalent in New Zealand and a large proportion of New Zealand women are at risk of causing some damage to the foetus during this period. A recent New Zealand study (Dickson *et al.*, 2002) on unwanted pregnancies involving young women and men found that of the 477 women studied, 36% (173) had been pregnant before the age of 25. Of the 289 pregnancies experienced by these women during this time, 60% (173) were unwanted. These results indicate that a high proportion of pregnancies among women of 25 years and under are unplanned. Literature reviewed in the previous section (3.1.1) indicates that women of this age group are frequent heavy or binge drinkers. To accentuate the unknown, no studies have been done to estimate the prevalence of periconceptional drinking in New Zealand.

The study by Russel and Skinner (1988) on 531 obstetric patients has highlighted the need to document pre-pregnancy drinking behaviour. Streissguth and colleagues (1983b) reported that 65% of all pregnant women (N = 1413) in their study were drinking at the time of conception and on recognising pregnancy 42% continued to drink. Thirty-nine percent of all drinkers in this study were binge drinkers during the periconceptional period (Streissguth *et al*., 1994b). Bruce *et al*. (1993) found that among drinkers (Total N = 6319), alcohol consumption in the last three months of pregnancy was rare, but was highly prevalent around the time of conception. Results of the 1988 National Maternal and Infant Health Survey showed that 45.4 % of pregnant women (N = 9953) were periconceptional drinkers (CDC, 1995).

Recent analysis on data from the same study highlighted the risk factors for frequent drinking prior to pregnancy recognition (Floyd *et al*., 1999). These factors included being unmarried, current smoker, white, twenty-five years of age or older and college educated. Periconceptional drinking was also more common among women having their first child. At six weeks of gestation one in three drinkers was unaware of their pregnancy. Style of drinking in the periconceptional period was also found to be a strong predictor for alcohol consumption in pregnancy. Moderate drinkers in the periconceptional period were four times more likely and heavy drinkers six times more likely to consume alcohol in pregnancy. In this study the demographic features of women drinking in the periconceptional period closely resembled those of the drinking non-pregnant women. A study on heavy drinking women (N = 183) has also found that change in drinking behaviour in pregnancy was proportional to pre-pregnancy drinking behaviour (Little *et al*., 1976). Women who usually were heavy drinkers did not stop drinking in pregnancy but continued to drink at lower levels. Review of overseas studies indicate that it is imperative to ascertain the risk for periconceptional drinking in New Zealand, given that nearly all women of childbearing age in New Zealand are drinkers prior to pregnancy.

3.1.4 Alcohol consumption by pregnant women of New Zealand:

Literature on alcohol intake among pregnant women in New Zealand is limited in comparison to studies done overseas. The Life Style Behaviours during Pregnancy study, carried out in Dunedin had a sample size of 183 women from one maternity hospital. Before pregnancy 58% of the women drank alcohol consuming an average of 4.0 glasses per week. At full term 19% of the sample was still drinking alcohol consuming an average of 1.7 glasses per week. Only 1% of the sample was drinking more than 5 glasses a week at full term (Clissold *et al.*, 1991). In this study, alcohol was treated as a nutrient and hence details like frequency of drinking, type of alcohol and the mean/median of absolute alcohol intake during pregnancy were not recorded.

The "*Nutrition in pregnancy*" study (Benny *et al.*, 1991) conducted in the Wellington region (N = 115) reported a low proportion of drinking pregnant women. A similar proportion of women in this sample were drinking in the second (14.8%) and third (13.7%) trimester. The proportion of drinking women among Europeans and Maori was similar for the first trimester but a lower proportion of Maori women drank in the second trimester. However, as was seen among the non-pregnant Maori women of New Zealand (Caswell, 1980; Dacey, 1995) the mean weekly intakes of absolute alcohol in the first and second trimester among the Maori women (54 and 42 grams) were markedly higher than the European women (19 and 20 grams). The proportion of Pacific women drinking in this study was almost negligible.

The study by McKenzie-Parnell and colleagues (1993) highlighted the difference in drinking patterns among primiparous (N = 63) and multiparous (N = 32) pregnant women. Among primiparous pregnant women, 23% had consumed some alcohol in the 1st trimester and 32% in the 2nd trimester. Among multiparous pregnant women, less than 20% consumed any alcohol at all. Drinking pregnant women in this study had a mean absolute alcohol intake of 4 to 6 g/day.

In contrast to other New Zealand studies discussed above, data from the Plunket National Child Health Survey (Counsell *et al*, 1994) provides a nation-wide picture of maternal drinking behaviour (N = 4286) in New Zealand. This study was done on an ethnically and geographically stratified random sample of mothers from around New Zealand. Information on maternal drinking patterns was collected retrospectively at six weeks postpartum. However, the study is limited in having collected data only on frequency of alcohol consumption. Style of drinking as reflected by the amount of absolute alcohol consumed on a typical occasion was not recorded. In this study 41.6% of pregnant women consumed alcohol. Nearly 19% of this drinking sample drank more than once a week during pregnancy and 67.7% drank less than weekly. In comparison with abstainers in this study, women who drank in pregnancy were older, of higher socio-economic status, had higher educational qualifications, lower parity and were European or Maori. More frequent drinkers were of a high socio-economic status and were better educated ($p \leq 0.025$). The study did not compare the proportion of women who drank in pregnancy according to their age group for the purpose of evaluating the age group most at risk for drinking in pregnancy. No differences were found in the frequency of drinking among the different age groups. The conclusions made in this study that the women "At risk for adverse outcome due to alcohol consumption" were of a high socio-economic status, falls short due to the lack of information on drinking style exhibited in pregnancy. Literature reviewed on drinking behaviour of non-pregnant New Zealand women (Section 3.1.1) indicates that women of a higher socio-economic status are frequent drinkers but are more likely to be light drinkers (Martin *et al.*, 1992).

In a more recent study "*Nutrition during Pregnancy*" (Watson & McDonald, 1999), 29% of pregnant women (N = 504) continued to drink in pregnancy. Among all drinkers, 65% were less frequent drinkers, 12.5% drank 2-3 times weekly and 22% drank once a week. Wine was the most popular drink followed by beer. However the maximum volume of beer consumed in one session far exceeded wine and spirits. More than 10% of pregnant drinkers in this sample were drinking to intoxicating levels. Higher proportions of heavy drinkers in this study were indigenous Maori women from a lower socio economic status. As was seen in assessing pre-pregnancy drinking behaviour of this sample (Section 3.1.1), more women of 25 years or younger drank heavily in pregnancy.

3.1.5 Alcohol consumption among overseas pregnant women:

The most recent study of the Centres for Disease Control and Prevention indicates that the current prevalence rate of drinking in pregnancy among American women is only 11% (CDC, 2002). In contrast to the American situation, studies done in other Western countries have reported higher prevalence rates of women drinking in pregnancy. Studies done in Australia report that 36-56% of pregnant women continue to drink during pregnancy (Bell & Lumley, 1989; Kwok *et al*., 1983). In the study by Kwok *et al.* (1983), data on alcohol consumption were collected prospectively by maternity caregivers from 5130 pregnant women. In this sample of pregnant women, 54% (N = 2775) were drinkers in pregnancy with the majority (90%) drinking socially or occasionally. In the Australian study by Bell and Lumley (1989), midwives collected data on alcohol consumption from 8884 pregnant women. About 36% (N = 3215) of pregnant women in this study consumed alcohol during pregnancy of which the majority (N = 2240) were occasional drinkers. A Canadian study in the early nineties reported 22% of pregnant women (Total N = 466) drinking regularly in the second half of pregnancy (Stewart and Striener, 1994). In the mid-nineties, the prevalence of drinking in pregnancy among Spanish women (N = 10430) was reported at 45.6% (Bolumar *et al*., 1994) among Australian women (N = 1000) at 45% (Temple *et al*., 1992) and among pregnant women (N = 900) in London at 41.2% (Wright *et al*., 1983) The prevalence rates reported above are very similar to that reported among New Zealand women (41.6%) by Counsell *et al.* (1994). The majority of drinkers across all these studies were light to moderate drinkers. Heavier drinkers comprised only a small proportion of the drinking sample and this proportion varied according to the methodology employed and the definition used for categorising heavy drinkers.

Review of literature on non-pregnant populations in the earlier section of this chapter indicated that "Age" is a demographic variable that clearly distinguishes drinking styles. In a recent publication of the Centres for Disease Control and Prevention (2002), age was one characteristic that distinguished heavy drinking pregnant and non-pregnant women. In this study binge drinking and frequent drinking among pregnant women were more common among women above thirty years of age while the same drinking behaviour among non-pregnant women was more common among women less than thirty years of age. In the study by Bell and Lumley (1989), among non-smokers (Total N = 10430), older women were more likely to be drinkers but less likely to be binge drinkers than younger women. Weiner *et al.* (1983) found that heavy drinkers (Total N = 1711) were more likely to be unmarried older women with higher parity but from a lower socio-economic status. Kaminski *et al.* (1978) (N = 9236) and Larroque & Kaminski (1998) (N = 782) found similar results in their studies, where heavier drinking pregnant women were more likely to be older but with lower education, lower socio-economic status and higher parity. Perham-Hester & Gessner (1997), found that women

(N = 6973) with demographic characteristics similar to those stated above and who were current smokers and drug users were found to be at risk for heavy third trimester drinking. In a study by Lodewijckx and Groof (1990) in Flanders on women aged 20-44 years (N = 3101), older pregnant women were more likely to consume beer, wine and liquor than younger women and were likely to continue similar drinking behaviour into their subsequent pregnancies. However, some studies have found no difference in the proportion of heavy drinkers in pregnancy across age groups. The study by Rosett and colleagues (1983) (N = 469) found heavy drinkers in pregnancy evenly distributed across all age groups.

In contrast, other studies (Stewart and Streiner, 1994; Jonathan *et al.*, 1997; Cornelius *et al.*, 1994) have documented younger women to be at risk for heavy or binge drinking in pregnancy. In the study (N = 466) by Stewart and Streiner (1994), the older educated women of higher socio-economic status were more likely to consume less than seven standard drinks per week while the less educated younger pregnant women were more likely to consume more than seven standard drinks per week. The studies by Cornelius *et al.* (1993; 1994) and Jonathan *et al.* (1997) show that younger women, particularly teenagers, were at risk for binge drinking in early pregnancy. In the first study of Cornelius *et al.* (1993), the drinking patterns of 124 pregnant teenagers were studied. The alcoholic beverage preferred by the teenagers was beer, followed by wine coolers and beer coolers Eighty two percent of teenagers were drinkers prior to pregnancy and 54%, 19% and 15% drank in the first, second and third trimesters of pregnancy respectively. In this study 31% of teenagers were binge drinkers prior to pregnancy and 35% were binge drinkers in the first trimester of pregnancy (Cornelius *et al.*, 1993). The reasons for the increase in first trimester binge drinking among teenagers are not clear. However, as teenagers are more at risk for unplanned pregnancy, it is possible that they were unaware of their pregnant state and continued their pre-pregnancy drinking behaviour.

In a further study (N = 391) pre-pregnancy, first trimester and third trimester drinking comparisons were made between the adult (N = 267) and teenage cohorts (N = 124) using average daily volume of alcohol consumption (Cornelius *et al.*, 1994). Table 3.2 shows the results of this comparison. More adults were drinking moderate to heavy amounts of alcohol than teenagers across the three periods investigated (Cornelius *et al.*, 1994). However, it is important to mention the drawback of using average daily volume for categorising drinkers to assess the usefulness of this information. Comparisons made using average daily volume do not take into account the frequency of drinking and hence the total volume of alcohol consumed over a week is averaged to give daily intake. Literature reviewed in the earlier section of this chapter indicates that teenagers are less likely than adults to be frequent drinkers but are more likely to consume a higher amount of alcohol on one occasion. Hence a heavy drinking teenager drinking once a week can be wrongly classified as a light or moderate drinker.

Table 3.2

Drinking in Teenage and Adult Cohorts (%)

(Cornelius *et al.*, 1994)

N= 391

Cohort	**Period**	**None**	**Light > 0 - < 0.4 drinks /day**	**Moderate 0.4 - < 0.89 drinks /day**	**Heavy 0.89 + drinks /day**
Teenage	Pre-pregnancy	18	40	13	30
	First trimester	46	34	7	13
	Third trimester	85	13	0	2
Adults	Pre-pregnancy	14	34	13	39
	First trimester	40	33	8	19
	Third trimester	66	30	1	3

On further comparison of drinking habits of pregnant teenagers and adults in this study, it was found that binge drinking prior to pregnancy in both the adult and teenage cohorts was similar. However in the first trimester of pregnancy the rate of binge drinking among pregnant adults dropped whilst binge drinking among teenagers increased from 27-31%. In the third trimester binge drinking in the two cohorts was again similar (Cornelius *et al.*, 1994).

On further assessing the attitudes and knowledge of the teenagers (N = 415) on the outcomes of maternal drinking, Cornelius *et al.* (1997) found that teenagers with specific knowledge about the effects of maternal drinking on the foetus were likely to drink less prior to pregnancy, in the first trimester and less likely to drink to intoxication.

Studies on non-pregnant populations have found that binge drinkers are not necessarily heavy drinkers (CDC, 1994). Similar results have also been found in pregnant populations (Bell & Lumley, 1989; Jonathan *et al*., 1997). However, some pregnant women who reported binge alcohol consumption often also reported the use of cigarettes, cocaine, marijuana and other illicit drugs (Jonathan *et al*., 1997, Cornelius *et al*., 1993). In the study by Jonathan *et al*. (1997), done in Canada, none of the binge drinkers (N = 272) were alcoholic. This was an observational study based on retrospective review of records from a telephone and outpatient counselling service in Toronto. Students had a mean volume of 8.6 drinks per binge and illicit drug users had a mean of 10.2 drinks. More than 34% of women had 8 or more drinks per binge. Teenagers were also more likely to be sporadic binge drinkers in pregnancy (Table 3.3). Eighty-four percent of teenagers in this study had binged once early in pregnancy.

Table 3.3

Binge drinking among pregnant teenagers[34] (%)

(Adapted from Jonathan *et al*., 1997)

Total N	**Binge drinkers N (%)**	**Occasions of binge drinking in pregnancy**				
		Isolated Instances	**Once early in pregnancy**	**≤ 3 times**	**< 10 times**	**1-2 per week**
23791	272 (0.01)	68	84	62	83	21

In a study (Ebrahim *et al*., 1999) that compared binge drinking among pregnant and non-pregnant women, smoking was a risk factor for binge drinking both prior to and during pregnancy. Although drinking during pregnancy had decreased during the time period (1991-1995) of this study, the prevalence of binge drinking had increased from 0.7 to 2.9%. Pregnancy related decrease in binge drinking was smallest among black women and highest in women above thirty years of age. Women who continue binge drinking in pregnancy most likely were unmarried, employed or current smokers

[34] This table comprises of pooled data from 2 samples. One sample comprised of teenagers (N =3800) attending the clinic and the second sample comprised of teenagers (N = 19,991) counselled over the telephone.

(Ebrahim *et al*., 1999). The prevalence of binge drinking among American pregnant women in 1999 was 2.7% (CDC, 2002).

With respect to frequency of drinking in pregnancy, Bell and Lumley (1989) have reported that older women of higher socio-economic status were most at risk for drinking frequently during pregnancy. In New Zealand, the study by Counsell *et al.* (1994) indicated that women of higher socio-economic status were most at risk for frequent drinking in pregnancy. Other demographic and life-style characteristics associated with frequent drinking in a recent study were being unmarried or a smoker (Ebrahim *et al*., 1998).

Evidence in the literature for "Race" as a characteristic that differentiates drinking styles in pregnancy is not very strong probably due to the confounding effects of socio-economic status. In the study by Rosett *et al.* (1983), heavy drinking women were similarly distributed across all races. A more recent study has also found that race of the pregnant women was not a risk factor for binge drinking in pregnancy (Ebrahim *et al*., 1999). In the study by Serdula *et al.* (1991), black pregnant women reported the highest number of drinks per month. However, the proportion of women drinking any alcohol in pregnancy was almost identical among the black and white populations. In a recent CDC study the proportion of frequent drinkers was highest among older ethnic women increasing more than three fold among women receiving no prenatal care (CDC, 1995). In the United States, among the general population only 1.5% of all women have no prenatal care as against 6% of women from ethnic minorities. Women with no prenatal care were likely to be heavy drinkers and are at risk for foetal deaths, infant deaths and having low birth-weight live births (Faden *et al*., 1997).

In a New Zealand report on social aspects of alcohol consumption, race emerged as the weakest social category and sex as the strongest (Stacey & Absalom, 1980). Other social factors such as different age groups, educational qualifications, religious affiliations, marital status, and groups living in different areas of the country or in places with different population sizes were not strongly associated with alcohol consumption, (Stacey & Absalom, 1980). A study (Stanhope & Prior, 1982) on the indigenous Maori women of childbearing age in New Zealand, reported similar characteristics of heavy drinkers as reported by Weiner and colleagues (1983). The study by Counsell *et al.* (1994), on an ethnically stratified random sample, found no difference in the proportion of Maori (44%) and European (45%) drinkers and in the proportion of frequent drinkers among Maori and Europeans. However as this study did not record the drinking style of their sample, no information is available on the drinking style of European and Maori women. In contrast to the above study and in agreement with the results of studies on non-pregnant Maori women, Watson and McDonald (1999) reported a high incidence of heavy drinking among Maori pregnant women of their sample. No data are available in New Zealand on the drinking behaviour and ethnicity of the women who do not want prenatal care in pregnancy. However, anecdotal evidence suggests that many of these women are heavy drinkers.

3.1.6 Decline in drinking among pregnant women in New Zealand and elsewhere:

The prevalence of drinking in pregnancy in the United States and some European countries has steadily declined over the years since foetal alcohol syndrome was first recognised in 1973 by Jones and colleagues. In the early 1970s, studies reported nearly 80% of pregnant women were drinkers in pregnancy (Streissguth *et al.*, 1983a, Weiner *et al.*, 1983). Over the next decade, the prevalence of drinking among pregnant women in the United States had dropped steadily to 42% in 1980/1981 (Streissguth *et al.*, 1983b). Serdula *et al.* (1991) reported a further decrease in alcohol consumption among pregnant women (N = 1712) from 32% in 1985 to 20% in 1988. However, in observing the trends in drinking among pregnant women over a three-year period no decline in drinking was found among younger women in contrast to drinking among older women (Serdula *et al.*, 1991). Over the next decade (1991-2002) drinking in pregnancy in the United States declined from 12.4% in 1991 rose again to 16.3% in 1995, and declined to 11.4% in 1999 (CDC, 2002). A study in Norway (N = 3010) found a reduction in the number of women drinking in pregnancy by 50% over a five-year period (Ihlen *et al.*, 1993). Although in the United States, a decline was observed across time in the total prevalence of alcohol consumption among pregnant women the proportion of heavier drinkers and binge drinkers around the time of conception had not changed (Streissguth *et al.*, 1983b; Serdula *et al.*, 1991; Bruce *et al.*, 1993). In New Zealand, the more recent study (Watson and McDonald, 1999) on drinking in pregnancy has recorded a lower proportion (29%) of drinking women than the earlier study (42%) (Counsell *et al.*, 1994). However, the 1999 study was more localised to the upper end of the North island of New Zealand in contrast to the nation-wide study of 1994 (executed in 1990). Moreover the methodology adopted by the two studies differs considerably and hence it is difficult to ascertain whether there was a true reduction in drinking among pregnant New Zealand women between 1990 and 1999.

3.2 Prevention of drinking in pregnancy:

The level of drinking among women of childbearing age, particularly in pregnancy, and the associated foetal outcomes highlight the need to address this issue as part of public health promotion. The process of health promotion involves three overlapping activities namely health education, prevention and health protection (Tones, 1986). Risk reduction and education have been cited[35] as major components of prenatal care. Overseas studies have also identified interventions by primary maternity caregivers as effective in reducing the prevalence of drinking in pregnancy (Jones-Webb *et al*., 1999; Ihlen *et al*., 1993; Hilton and Condon, 1989). Moreover, pregnancy is also a period when women have sustained contact with the health care provider. Literature also indicates that pregnancy may be an ideal time to provide intervention for heavy maternal drinking (Rosett *et al*., 1983; Little & Streissguth, 1978; Morse & Hutchins, 2000). This is extremely important as studies have shown that reduction in the level of alcohol consumption or abstinence among usual drinkers in pregnancy can improve infant outcomes (Rosett *et al*., 1983; Larsson *et al*., 1985). Hence, it is imperative that primary maternity caregivers play a pivotal role in providing education on the adverse effects of alcohol consumption during pregnancy. In the following sections, literature on the role of primary maternity care givers in providing education on alcohol consumption in pregnancy and studies that have assessed their attitudes and knowledge on this issue will be reviewed and documented.

3.2.1 Role of primary maternity caregivers in providing education on alcohol consumption in pregnancy:

Primary maternity caregivers as frontline health providers can play a pivotal role in educating pregnant women on the effects of alcohol consumption in pregnancy.

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[35] http://www.health.gov/healthypeople/document/html/volume2/16mich.htm

However, prenatal care providers can be reluctant to discuss alcohol use (Morse & Hutchins, 2000) for reasons including lack of time, lack of training and resources as well as resistance by patients (Handmaker & Wilbourne, 2001). A survey of a large sample (N = 1000) of pregnant women in Australia found that only 30% of women received any advice on alcohol intake in pregnancy from their primary maternity caregiver (Temple *et al.*, 1992). Some of the barriers affecting alcohol use assessment of pregnant women among a group of obstetricians-gynaecologists were time limitations (70%), patient sensitivity (65%), need for additional training to enhance ascertainment skills (65%) and others (Diekman *et al.*, 2000). However, the study by Morse and Hutchins (2000) provides evidence for women being receptive to alcohol counselling as part of their prenatal care. To overcome the obstacles faced commonly by prenatal care providers, Handmaker and Wilbourne (2001) recommend two methods, brief interventions and motivational interviewing for effective alcohol intervention especially among heavy drinkers. According to Handmaker and Wilbourne, the method of brief intervention involves providing 1-3 brief alcohol counselling consultations on the effect of alcohol on the foetus. This method was used by Chang *et al.* (1999) and was found to be effective in reducing the level of drinking among heavy drinkers and also maintaining abstinence among usual drinkers who were keen to abstain in pregnancy (N = 250). Motivational interviewing involves providing a patient-centred empathic counselling for increasing readiness by resolving ambivalence about behaviour change (cited in Handmaker and Wilbourne, 2001). However, the effectiveness of this method is largely dependent on the skills of the interviewer to provide an optimistic and empathic environment during the process of counselling.

Studies have also endeavoured to assess the relationship between physician's advice and the use of alcohol in pregnancy. The study by Jones-Webb *et al.* (1999) on pregnant women (N = 683) has found that the advice given by the physician providing maternity care was protective against drinking in pregnancy. Hilton and Condon (1989) found similar results in a small sample (N = 40) of pregnant women. Thirty-one percent of women had changed their drinking habits after receiving advice from the doctor providing maternity care. An evaluation report of the health campaign "Intoxication and pregnancy" in Norway found that education of health personnel on the issue of alcohol and pregnancy made them more knowledgeable on the effects of alcohol on foetal development and more aware of their patients' practice with respect to this issue (cited in Ihlen *et al*., 1993). On comparison of two populations of pregnant women prior to the education campaign and after the education campaign (a period of five years) Ihlen *et al*. (1993) found a 50% reduction in the prevalence of drinking in pregnancy. This change was primarily attributed to the involvement of health personnel in educating their clients on the issue of drinking in pregnancy.

3.2.2 Attitudes and knowledge of primary maternity care givers on drinking during pregnancy:

Studies have also endeavoured to assess the attitudes and knowledge of primary maternity caregivers towards drinking in pregnancy. One of the objectives of the study by Nanson *et al*. (1995) was to determine the knowledge of physicians (N = 273) on foetal alcohol syndrome and alcohol related birth defects. The physicians who responded to the study were knowledgeable of foetal alcohol syndrome but expressed a desire for continuing education on the issue. A majority of the physicians who participated in this study were of the opinion that counselling their clients on the issue of drinking in pregnancy could reduce the prevalence of foetal alcohol syndrome and foetal alcohol effects.

A more recent study (Diekman *et al*., 2000) surveyed obstetricians – gynaecologists (N = 604) to examine their knowledge, attitudes and current clinical practices on alcohol consumption in pregnancy. Nearly all respondents of this study enquired about alcohol use of their patients, at least once in pregnancy. Eighty-three percent of respondents wanted information on thresholds for adverse outcomes and 44% wanted training and consultation in assessment and counselling for improving assessment of alcohol use in their clinical practice. In this study respondents were more likely to provide recommendations to heavy drinkers than moderate drinkers.

In New Zealand health professionals providing primary maternity care are obstetricians, general practitioners and midwives. Their role in providing education to pregnant mothers of New Zealand on alcohol during pregnancy has been recommended since the early eighties (Dowdell, 1981; Curtis, 1994). Leversha and Marks (1995b) assessed the attitudes, knowledge and clinical practice of obstetricians and general practitioners of New Zealand (N = 396) on the issue of alcohol during pregnancy. In this study although a majority (86.5%) of the participants perceived themselves to be sufficiently knowledgeable on the issue of drinking in pregnancy, on average only half of those surveyed routinely enquired about alcohol consumption of their clients, and 46% recommended abstinence. A similar proportion of obstetricians and general practitioners routinely provided advice to their patients on alcohol consumption in pregnancy. However, obstetricians were significantly more likely than general practitioners to not advice their patients of the adverse effects of alcohol consumption. This may be due to the type of clientele that generally use the services of obstetricians in New Zealand. Many of them are of upper socio-economic status and are more likely to be moderate drinkers. Studies have also shown that women of the upper socio-economic status are at high risk to be undetected by their physician for drinking in pregnancy (Moore *et al*., 1989; CDC, 1995). The lack of advice on adverse effects from obstetricians may indicate that they are more likely to perceive moderate drinking as responsible and not harmful for the foetus. These results may be a reflection of the views held by the Royal College of Obstetricians and Gynaecologists, United Kingdom[36] (RCOG) at the time of the study. According to the RCOG, there is no scientific evidence for any adverse effects of maternal alcohol consumption at 120g of absolute alcohol per week or 15 units per week (Guerri *et al*., 1999).

For primary maternity caregivers to be effective in providing intervention for alcohol use in pregnancy, regular and routine screening of pregnant women about their alcohol use may be important. A recent study has shown that the risk of antepartum[37] alcohol consumption was threefold higher for women who drank any alcohol while pregnant (Chang *et al*., 1999). Moreover, the literature reviewed in Chapter 2 indicates that neurobehavioural foetal insults are dose-dependent on the amount of alcohol consumed by the pregnant mother and hence moderate drinkers may also be at risk of causing foetal damage. Other studies (McLeod *et al*., 1983; Mudler *et al*., 1998) that have investigated the acute effects of alcohol also demonstrate the need for primary maternity caregivers to record any alcohol consumption during pregnancy and provide advice on adverse effects of alcohol to all women drinking in pregnancy.

[36] The Royal Australian New Zealand College of Obstetricians and Gynaecologists do not have any statement on alcohol consumption in pregnancy and hence the recommendations of the RCOG, United Kingdom have been used for the purpose of comparison in the current research.

[37] The entire period of pregnancy.

A factor that may influence the primary maternity caregiver to enquire about any alcohol use and provide advice would be their attitude towards this issue. This has been found true with physicians managing other health problems of their clients (Green *et al*., 1988). One way of overcoming the problem that some maternity caregivers might avoid asking questions or offering advice about alcohol use would be a mandatory recommendation for all maternity caregivers to ask standard questions of their clients about past and present alcohol use. In the United States, the American College of Obstetricians and Gynaecologists and the American Academy of Paediatrics released a joint statement advising all clinicians to question pregnant women on their past and present alcohol use and in another report recommended the use of T-ACE[38] to screen pregnant women (cited in Diekman *et al*., 2000).

In New Zealand midwives are the most popular lead maternity caregivers providing care for more than half of all pregnancies (Guilliland, 1998). Their non-clinical style of practice may enable them to play an effective role in helping to prevent the occurrence of alcohol related effects in New Zealand. However their attitudes and knowledge on the issue of alcohol in pregnancy have not been assessed. Gaining such information is important in developing strategies to equip midwives to play an effective role in helping to prevent maternal drinking that could lead to alcohol related effects in New Zealand.

[38]The T-ACE is a four-item questionnaire usable in assessing pregnant women for risk drinking in a clinical practice setting. The T-ACE was developed in 1989 using data from pregnant American women.

Chapter - 4

Objectives and Methodology- Survey of Midwives

4.1 Introduction:

In New Zealand, general practitioners, obstetricians and midwives provide care during pregnancy. Midwifery profession in New Zealand attained autonomous status in 1990 and currently (2002) more than 70% of New Zealand women have a midwife as their lead maternity caregiver[39]. In 1999 (the year of the survey), 66% of pregnant women were cared for by a midwife, 20% were cared for by a general practitioner and 14% were cared for by an obstetrician in New Zealand (MOH, 2001). This information was reported by the newly established Maternal and Newborn Information System in New Zealand and the statistics given are based on 58% (N = 33, 486) of the total (N = 57, 421) pregnancies in the year 1999. No such data were available for 42% of pregnancies in the year 1999.

Midwives specialise in normal pregnancy and birth (Cole, 1996), hold appropriate qualification and training and are reputed for building a strong relationship with each of their clients by one to one midwifery care throughout pregnancy, labour and in the post-natal period (Guilliland, 1998). The midwifery profession involves providing various types of antenatal, intranatal and postnatal care. Independent or Domiciliary midwives can practice independently or as part of a team, providing continuity of care and have their own client load. Shared-care midwives also provide similar care to their clients but work along with a general practitioner or an obstetrician and also have their own client load. Many midwives with their own client load provide maternity care within the home environment of their clients. Some hospital-based midwives have their own client load, while others who don't have their own client load provide care only during labour and a few days postnatally. Still other hospital-based midwives are involved only in providing education for pregnant mothers in the antenatal classes held at public hospitals.

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[39] http://www.midwife.org.nz/index.cfm/practice

Asking primary maternity caregivers about the drinking habits of their clients is not unusual. Abel and Kruger (1998) asked physicians to indicate the proportion of their clients who they believed were heavy drinkers. In the studies by Bell and Lumley (1989) and Kwok *et al.* (1983), alcohol consumption data were prospectively collected from Australian pregnant women by midwives and other maternity caregivers. Midwives are the most preferred lead maternity caregivers in New Zealand and their non-clinical style of practice enables them to develop a good rapport with their clientele. Evidence from the booking forms[40] used by midwives of New Zealand indicates that information on alcohol consumption during pregnancy is recorded at the first antenatal visit of their client. In the current research, an attempt was made to assess the prevalence of drinking in pregnancy among the clientele of a random sample (national) of midwives.

Overseas studies have attributed a decline observed in the prevalence of drinking in pregnancy to education on the harmful effects of alcohol on the foetus imparted by primarily maternity caregivers[41] (Jones-Webb *et al*., 1999; Hilton & Condon, 1989; Ihlen *et al*., 1993). Most primary maternity caregivers ask their clients about their drinking habits in pregnancy at least at the first antenatal visit (Diekman *et al*., 2000; Leversha and Marks, 1995). However, their clinical practice with respect to imparting education on the issue may be influenced by their own attitudes towards drinking in pregnancy. Since midwives care for a majority of pregnancies in New Zealand, it is crucial to assess the attitudes and knowledge of midwives on drinking in pregnancy, which was attempted in the current research.

Literature reviewed has documented various infant outcomes associated with heavy drinking in pregnancy (Chapter 2, Sections 2.4 & 2.5.2). As all midwives provide post-natal care for the majority of infants born in New Zealand, this opportunity was used to also assess the encounter of midwives with some of the outcomes associated with heavy alcohol consumption in pregnancy.

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[40] Copy of booking forms used by maternity care providers in two hospitals in New Zealand, one from the North Island and one from the South Island are in Appendix 1.

[41] In the context of this research the term primary maternity caregiver is used for physicians, general practitioners, obstetricians, gynaecologists and midwives who provide care during pregnancy.

4.2 Objectives of the survey of midwives:

Objective 1: To assess the prevalence of drinking among the clientele of midwives of New Zealand.

Specific issues to be addressed within this objective were to assess:

i. Prevalence of drinking among all the clientele of midwives and according to various age groups.
ii. Whether there were any differences in the prevalence of drinking between the different age groups of pregnant women.
iii. Prevalence of drinking among the clientele of midwives in the major regions and in the metropolitan and provincial regions of New Zealand.
iv. Prevalence of drinking among the clientele of midwives in the two different practices of midwives.
v. Prevalence of drinking among the clientele of midwives according to their personal opinion on alcohol consumption in pregnancy.
vi. Prevalence of various styles of drinking among the clientele of midwives.
vii. Prevalence of various styles of drinking in the major regions and in the metropolitan and provincial regions of New Zealand.
viii. Prevalence of various styles of drinking in the two different practices of midwives.
ix. Prevalence of various styles of drinking among the clientele of midwives according to their personal opinion on alcohol consumption in pregnancy.
x. Prevalence of denial of drinking among the practices of midwives.
xi. Prevalence of denial of drinking in the major regions and in the metropolitan and provincial regions of New Zealand.
xii. Prevalence of denial of drinking in the two practices of midwives.
xiii. Prevalence of denial of drinking according to their personal opinion on alcohol consumption in pregnancy.
xiv. Prevalence of clients reporting having drunk some alcohol prior to recognition of pregnancy.

xv. The encounter of midwives with women giving birth under the influence of alcohol.

Objective 2: To assess the attitudes and knowledge of midwives on alcohol consumption in pregnancy.

Specific issues to be addressed within this objective were to assess:

i. The awareness of foetal alcohol syndrome and other alcohol related effects among midwives.
ii. The personal and professional opinions of midwives on the issue of drinking in pregnancy.
iii. The effect of personal opinions of midwives on their professional opinions towards drinking in pregnancy.
iv. The perceptions of midwives on a "Safe type of alcohol" in pregnancy.
iv. The effect of personal opinions of midwives on drinking in pregnancy on their perception of a "Safe type of alcohol" in pregnancy.
v. The usefulness of certain tools for the purpose of effective intervention.

Objective 3: To assess the prevalence of outcomes associated with heavy maternal drinking in the clientele of midwives.

Special issues addressed within this objective were to assess:

i. The level of concern caused by alcohol consumption in comparison to other common issues faced in the practices of midwives.
ii. Prevalence of miscarriage among the clientele of midwives.
iii. Probable estimates of infants that the midwives perceived to be affected by *in utero* exposure to alcohol.
iv. Encounter of midwives with common symptoms in infants associated with heavy maternal drinking in the practices of midwives.
v. Encounter of midwives with noticeable birth defects in the practices of midwives.

4.3 Research design and tools:

This base-line study was designed to be a cost effective method of achieving the objectives listed in section 4.2. The objectives of this study were primarily set from a defined need in New Zealand to identify the risk for the prevalence of disorders associated with *in utero* exposure to alcohol. To suit this purpose, the design of the survey was descriptive and cross-sectional.

4.3.1 Survey instrument:

A mailed questionnaire was chosen as the survey instrument as it has been successfully used to collect information from a large geographical area and to survey health professionals on the issue of alcohol consumption in pregnancy (Abel and Kruger, 1998; Nanson *et al*., 1995; Lerversha and Marks, 1995b; Diekman *et al*., 2000). The study by Abel and Kruger (1998) had a response of 30% to a mailed questionnaire, designed to collect information ranging from demographic details such as "Year of graduation", "Age", "Gender" to what they thought was the threshold number of drinks for the expression of foetal alcohol syndrome. The survey by Nanson *et al*. (1995) aimed to assess the knowledge of physicians on foetal alcohol syndrome and alcohol related birth defects using a mailed questionnaire. This study achieved a response rate of 62%. More recently, Diekman *et al*. (2000) surveyed 1000 practising fellows of the American college of Obstetricians and Gynaecologists, to examine their knowledge, attitudes and current clinical practices on alcohol consumption in pregnancy. They used a mailed questionnaire and achieved a response rate of 60%. Leversha and Marks (1995) surveyed all obstetricians and a random sample of general practitioners of New Zealand using a mailed questionnaire, to assess their perceptions on alcohol consumption in pregnancy. This study achieved an overall response rate of 87% and had specific objectives similar to those of the study by Diekman and colleagues (2000).

The questionnaire used in the current research was constructed for ease of participation requiring the respondent only to tick in appropriate boxes. The respondents also had the opportunity to write their comments on the study or any other related issues if they wished on the last page of the questionnaire. Details of piloting and construction of the questionnaire are discussed in-depth in section 4.3.4.

4.3.2 Personal discussions:

At the onset of the development of the questionnaire, the researcher met with practising midwives for one to one discussions on the objectives of the study and how they could be met by surveying midwives. Such discussions were held with four midwives on a one to one basis primarily held at the home of the midwife. These discussions covered issues such as what the midwife understood by terms associated with drinking, such as light, moderate, heavy, binge, frequent, infrequent, regular and occasional to help decide on terminology to be used in the questionnaire. Discussions were also held on the practice of midwives, services offered by them and problems encountered by them with regard to alcohol consumption in pregnancy.

4.3.3 Definition of "Drinking" set for the current research:

Drinking in the context of this research was defined as having consumed any alcohol during pregnancy. This criterion was based on the fact that literature to-date does not report a safe level of alcohol that can be consumed during pregnancy. A recent study has also indicated that the risk of antepartum alcohol consumption was threefold higher for women who drank any alcohol while pregnant (Chang *et al.*, 1999). Perusal of the booking forms (Appendix 1) used by midwives of New Zealand also indicated that they asked information of current alcohol consumption at the first antenatal visit of all their clients. Personal discussions with midwives indicated that further questioning on this issue was dependent on the individual midwife and her own conviction about alcohol consumption in pregnancy. If the midwife suspected that her client was abusing alcohol they were usually referred to a high-risk treatment clinic. However in the case of usual drinkers who were not necessarily alcohol abusers, not all midwives were likely to follow-up on this issue while providing maternity care to their clients. This situation in New Zealand is likely to be true across all maternity caregivers and may not be peculiar only to midwives of New Zealand. The recommendations (Appendix 2) by the Royal College of Obstetricians and Gynaecologists (UK), at the time of executing this study may also have contributed to the lack of serious interest among many health professionals of New Zealand in addressing the issue of drinking in pregnancy. As there were no set recommendation by the Royal Australian and New Zealand College of Obstetricians and Gynaecologists, the recommendation by the Royal College of

Obstetricians and Gynaecologists (RCOG) of the United Kingdom is used for comparison and discussion in the current research. This recommendation states that there is no conclusive evidence on the adverse effects of maternal alcohol consumption below 120g of absolute alcohol or 15 drinks per week. Hence it was necessary to establish the definition for "Drinking" as having consumed "Any alcohol" in pregnancy, in the context of the current research.

4.3.4 Ethical approval:

The outcome of the personal discussions with midwives enabled the researcher to develop a preliminary questionnaire (Appendix 3a) that was submitted for approval from the Massey University Human Ethics Committee for the purpose of piloting the questionnaire. The information sheet (Appendix 3b) and consent form (Appendix 3c) to be used for piloting the questionnaire were also submitted to the human ethics committee for approval. Changes were made as suggested by the committee members and ethical clearance was obtained to conduct the pilot studies. Changes were made to the questionnaire following feedback from the pilot studies and the final questionnaire (Appendix 4a) and information sheet (Appendix 4b) were once again submitted for approval to the human ethics committee. The application submitted to the Massey University Ethics Committee and the letter of approval for executing the study from the committee is in Appendix 5a and 5b respectively. In the application submitted for ethical clearance, it was stated that the survey was to be executed on the members of the New Zealand College of Midwives. However on understanding the limitations of a self-selected sample, it was decided to use the electoral roll as the sampling frame and a letter stating this change was submitted to the ethics committee, which was subsequently approved.

4.3.5 Piloting and construction of the questionnaire:

The questionnaire was piloted with 2 self-selected samples of midwives. The objectives of the pilot studies were as follows:

i. To evaluate the clarity and precision of the questions and instructions in the questionnaire.

ii. To estimate the approximate time taken to complete the questionnaire.
iii. To make relevant changes to the questionnaire based on the responses from the pilot study
iv. To get first hand experience of issues faced by participants when completing the questionnaire.

The first group who participated in the pilot study were midwives doing higher degrees at Massey University. The second group comprised of practising midwives from the local midwifery clinic. In the case of midwives at the University, an information sheet stating the objectives of the pilot study and a consent form was mailed to all the students who were to attend a specific contact class scheduled at the University. Midwives who consented to participate (N = 8) in the pilot study remained in the lecture room after the scheduled class. The researcher gave a brief talk on alcohol consumption during pregnancy after which the preliminary questionnaire was distributed for participation.

Each participant noted the time taken to complete the questionnaire. During participation individual queries were answered on a one-to-one basis and active discussions followed after all the midwives completed the questionnaire. However, the second pilot study was not done in a similar manner. A brief talk on alcohol during pregnancy was arranged during the lunch hour at the local midwifery clinic. Following this talk the information sheet, consent form and the questionnaire were distributed to all the midwives present. There was no opportunity for the midwives to participate on the spot due to time constraints. Midwives were advised to note down the time taken to complete the questionnaire. They were also asked to note their comments with regard to availability of information and clarity of the questions and instructions, against any question that posed a problem. Arrangements were made to collect the completed forms in a week's time, at the end of which 10 midwives participated in this pilot study.

The changes made to the preliminary questionnaire as a result of the pilot studies and the construction of the final questionnaire are discussed below. Please note that reference to questions in the preliminary questionnaire will be hereafter denoted with a small "q" and that referring to the final questionnaire will be denoted with a capital "Q".

Question 1: This question comprising of two sub-questions (Q la and 1b) was designed to collect information on the type of current practice and the number of years of experience, in the current practice of midwives.

1.a. Type of midwife:

Please circle the number beside one option that best describes your current practice as a midwife.

1. Independent midwife.
2. Shared care.
3. Hospital-based midwifery care.
4. Labour-only care
5. Antenatal care
6. Post-natal care.
7. Any other. Please specify ____________

88. Not Applicable.
99. Don't Know.

1.b. Experience:

You have been working as the above said midwife in ***New Zealand*** for:

Please include only the number of years of your current type of practice and circle the most appropriate option.

1. Less than 2 years.
2. 2-5 years.
3. 5-10 years.
4. More than 10 years.

88. Not applicable.
99. Don't know.

Question 1a of the preliminary questionnaire was tested and adopted as such in the final questionnaire. With respect to experience (q 1b and Q 1b), the pilot studies revealed that midwives were prone to change their type of practice over a period of time. Hence, in the final questionnaire the term “Current” was introduced to overcome this problem.

Question 2: This question comprising of 4 sub-questions (2 a, b, c and d) was designed to collect background information of the clientele of midwives.

2.a. How many clients have you had in the ***past year***?

Please tick (✓) in the appropriate box.

Number of Clients

Below 10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	> 90
1	2	3	4	5	6	7	8	9	10

2.b. What *number* of your clients in the ***past year*** was categorised as follows?

Please tick (✓) in the appropriate box.

Number of Clients

Age Group ↓	None	1-5	6-10	11-20	21-40	41-60	61-80	81-100	Above 100
Teenage 14-19 years	1	2	3	4	5	6	7	8	9
Young adults 20-25 years	1	2	3	4	5	6	7	8	9
Adults 26-35 years	1	2	3	4	5	6	7	8	9
Older adults > 35 years	1	2	3	4	5	6	7	8	9

2.c. What number of your clients in the ***past year*** was categorised as follows?

Please tick (✓) in the appropriate box.

Number of Clients

Income Group ↓	None	1-5	6-10	11-20	21-40	41-60	61-80	81-100	Above 100
Benefit only	1	2	3	4	5	6	7	8	9
Middle Income	1	2	3	4	5	6	7	8	9
High Income	1	2	3	4	5	6	7	8	9

2.d. What number of clients in the ***past year*** was categorised as follows?

Please tick (✓) in the appropriate box.

Marital Status ↓	Number of Clients None	1-5	6-10	11-20	21-40	41-60	61-80	81-100	Above 100
Married	1	2	3	4	5	6	7	8	9
Partnered	1	2	3	4	5	6	7	8	9
Single	1	2	3	4	5	6	7	8	9

Question 2a specifically aimed at collecting information on the total number of clients of midwives in the year preceding the survey. Questions 2b, 2c and 2d aimed at collecting information on the number of clients according to age, income group and marital status.

In the pilot studies, information on total number of clients was collected for two time periods, "Past year" (q 1c) and "Past month" (q 1d). The pilot study revealed that setting the time frame for the "Past year" provided information from a larger number of clients and also enabled the comparison of the proportions of clients of midwives according to various age groups, to the actual pregnant population of New Zealand for the year 1999. Hence the time period of a year preceding the survey was adopted in the final questionnaire and all questions relating to the past month of practice (q 1d, 1f, 5b, 5d & 5f) were abandoned.

In the preliminary questionnaire q 1c (number of clients in the past year) and 1d (number of clients in the past month) were open-ended and no ranges were provided. Personal discussions with midwives indicated that midwives with client load could give information on the number of total clients in their practice with ease and hence this format was used in the preliminary questionnaire. With respect to number of clients of various age groups (q 1e and 1f), close-ended questions were used and an option was provided for the midwives to either stipulate the actual number or use the ranges provided. The pilot studies showed that most midwives preferred using ranges and hence this format was consistently adopted in the final questionnaire (Q 2a, 2b).

In the pilot studies, the objective of question 1e was to ascertain the number of clients of the midwives according to "Age group" for the year preceding the survey. With respect to demographic characteristics of the clients of midwives the research gave more emphasis on "Age", as literature reviewed on drinking habits of women of childbearing age indicated "Age" as a factor that clearly demarcated drinking styles. However, based on further discussions with the supervisors and the Research Officer of the Alcohol Advisory Council, in the final questionnaire, questions on the number of clients of various income (Q 2c) and marital status (Q 2d) were also included in the final questionnaire. These two questions were not further piloted but a format similar to other questions on numerical information was adopted in the final questionnaire. As data to achieve the first objective of the study was collected from a secondary source, (Midwives), it was perceived to be impractical to include questions on alcohol consumption for each of the demographic variable. Hence, based on the literature reviewed, the question on alcohol consumption was formulated only for the "Age" variable (Q 3a). The other demographic variables were included solely for the purpose of understanding the distribution of the clients of midwives according to their demographics.

Question 3: This question comprising of 6 sub-questions (3 a, b, c, d, e and f) was designed to meet the first objective of the study, which was to assess the prevalence of drinking among the clientele of midwives. The objective of question 3a was to collect information on the number of drinking clients among the clientele of midwives according to "Age group". This question in the preliminary questionnaire (q 5a and 5b) provided the option of either giving the actual number of clients or using the ranges. It also asked information for the "Past year" and "Past month". As already explained with respect to question 2, the use of ranges and the time period of "Past year" were adopted in the final questionnaire.

3.a. How many of your clients of various ages in the ***past year*** would have ***consumed any beverage alcohol*** during pregnancy?

Please tick (✓) in the appropriate box against each age category.

Age Group ↓	Number of Clients: None	1-5	6-10	11-20	21-30	31-40	41-50	Above 50
Teenage 14-19 years	1	2	3	4	5	6	7	8
Young adults 20-25 years	1	2	3	4	5	6	7	8
Adults 26-35 years	1	2	3	4	5	6	7	8
Older adults above 35 years	1	2	3	4	5	6	7	8

3.b. How many of your clients who ***consumed any beverage alcohol*** during pregnancy in the ***past year*** of your practice could be categorised as follows:

Please tick (✓) the appropriate box against each style of drinking.

Type of drinkers ↓	Number of Clients: None	1-5	6-10	11-20	21-30	31-40	41-50	Above 50
Occasional drinkers	1	2	3	4	5	6	7	8
Have one drink a day	1	2	3	4	5	6	7	8
Have more than 1 drink a day	1	2	3	4	5	6	7	8
Occasional binge drinkers	1	2	3	4	5	6	7	8
Regular binge drinkers	1	2	3	4	5	6	7	8
Deny drinking, but you believe they do	1	2	3	4	5	6	7	8

The objective of the above question was to collect information on the style of drinking exhibited by the clients of midwives. The terminologies used to define the type of drinkers were determined after personal discussions (see Section 4.3.2) with midwives on this issue. Discussion with midwives also revealed that they sometimes come across clients who denied any drinking when the midwife believed in fact they were drinking in pregnancy. Hence this question was also included. In the preliminary questionnaire (q

5c and q 5d) this question provided the option of either giving the actual figure or using the ranges. It also asked information for the "Past year" and "Past month". As seen above the use of ranges and the time period of "Past year" were adopted in the final questionnaire for reasons already stated earlier.

3.c. What number of your clients in the ***past year*** reported having ***consumed any beverage alcohol*** before realising they were pregnant?

Please tick (✓) in the appropriate box against each type of drinking.

Number of Clients

Type of drinking	None	1-4	5-7	8-10	11-13	14-16	17-19	20 and above
Occasional drinking	1	2	3	4	5	6	7	8
Regular drinking	1	2	3	4	5	6	7	8
Binge drinking	1	2	3	4	5	6	7	8

The objective of question 3c was to collect information on the number of clients who reported having consumed alcohol when pregnant, prior to recognition of pregnancy. However it should be mentioned that this is not a question routinely asked by the midwives. On discussing with midwives issues of drinking in pregnancy, they indicated that many pregnant women did confide in them if they had drunk any alcohol prior to recognition of pregnancy. This question was piloted (q 5e and 5f) and changes were made with respect to use of ranges and use of "Past year" as the time frame for which this information was to be collected.

3.d. Do you see women giving birth ***while heavily under the influence of alcohol***?

Please tick (✓) in the appropriate box.

1. Yes 2. No

If your answer is "NO" then please go to Q 4a.

3.e. If yes, how many such cases have you seen in the ***past year***?

Please tick (✓) in the appropriate box.

Number of Clients							
None	**1-4**	**5-7**	**8-10**	**11-13**	**14-16**	**17-19**	**20 and above**
1	2	3	4	5	6	7	8

3.f. From your knowledge, please comment on the ***most likely type of antenatal care*** these women would have received during their pregnancy:

Please tick (✓) in the appropriate box.

	Number of Clients				
Categories ↓	**None**	**Few**	**Some**	**Many**	**Nearly all**
No antenatal care	1	2	3	4	5
Some antenatal care	1	2	3	4	5
Full antenatal care	1	2	3	4	5
Others____________________	1	2	3	4	5

Another important issue addressed by the current study was to assess the prevalence of women who gave birth under the influence of alcohol. The research aimed to assess the frequency of such occurrences in the year prior to the survey and the most likely antenatal care of such women during pregnancy. This question (q 6a) was tested in the pilot studies, the outcome of which was to include questions 3d and 3f in the final questionnaire. Question 3d asked if the midwives saw such cases of women and were provided a "Yes" or "No" option. All midwives who answered, "Yes" were then asked how many such cases they had encountered in the past year. Discussion with the Research Officer of the Alcohol Advisory Council resulted in including question 3f in the final questionnaire, which aimed at assessing the most likely type of antenatal care received by such women.

Question 4: This question comprising of 5 sub-questions (4 a, b, c, d and e) was designed to achieve the second objective of the study and aimed at evaluating the attitudes and knowledge among midwives about the effects of alcohol intake in pregnancy.

4.a. Had you heard of ***foetal alcohol syndrome*** before receiving this survey?

Please circle the appropriate answer.

1. Yes 2. No

4.b. Had you heard of ***other alcohol-related effects*** before receiving this survey?

Please circle the appropriate answer.

1. Yes 2. No

Question 4a and 4b were designed to assess whether midwives had heard of foetal alcohol syndrome and other alcohol related effects. This question was tested in the pilot studies (q 2b and 2c) and adopted as such in the final questionnaire. However, in the preliminary questionnaire, q 2b and 2c were followed by a third question (q 2d).

q 2d. If yes (ie you have heard of foetal alcohol syndrome and other alcohol related effects), please give your comments on what you think are the symptoms of other alcohol related effects.

This question aimed to assess the knowledge of midwives on symptoms related to other alcohol related effects. Piloting this question revealed it did not produce any useful information and hence was abandoned from the final questionnaire.

4.c. Personally, during pregnancy would you:

Please circle the number beside the most appropriate option.

1. Abstain totally from alcohol.
2. Have a drink about *less than once a month.*
3. Have a drink about once *a month.*
4. Have a drink about once *a week.*
5. Have a drink *a day.*
6. Have more than a drink a day.
7. Other, please specify_______________

77. Not applicable.
88. Do not want to answer.
99. Don’t know.

4.d. Would you consider the ***types of alcohol*** listed below safe to consume during pregnancy? If yes how much would you consider safe?

Please tick in the appropriate box and fill in the last box against all your "Yes" answers.

Options

Type of alcohol	No	Yes	If 'Yes' How many 3	
			Units per occasion	Units per week
Beer	1	2		
Wine	1	2		
Spirits	1	2		

4.e. As a ***professional,*** what role do you think ***alcohol could play*** in the lives of pregnant women?

Please tick in the appropriate box and fill in the last box against all your "Yes" answers.

Options

Criteria	No	Yes	If 'Yes' how many	
			Units per Occasion	Units per Week
Can be consumed throughout pregnancy.	1	2	3	4
Can be consumed during 1st trimester of pregnancy.	1	2	3	4
Can be consumed during 2nd trimester of pregnancy.	1	2	3	4
Can be consumed during 3rd trimester of pregnancy.	1	2	3	4
Can be consumed while socialising.	1	2	3	4
Can be consumed to help in relaxing the mother.	1	2	3	4
Can be consumed to help prevent premature labour.	1	2	3	4
Stout (beer) can be consumed for its iron content.	1	2	3	4
Can be consumed to induce delayed labour.	1	2	3	4

Question 4a (q 4a) of the preliminary questionnaire was initially designed to collect what the personal opinions of midwives were on women drinking in pregnancy. This was a close-ended question with 6 options in the preliminary questionnaire. The pilot studies revealed that rephrasing this question would prove to more useful and would give a better reflection of the personal opinion of the midwife on the issue of alcohol consumption in pregnancy. Hence midwives were asked (Q 4c) what they would do in their own pregnancy and 10 options were provided. Midwives also had the opportunity to fill in an answer that was not provided by using option number 7.

Question 4b of the preliminary questionnaire was tested and used after minor changes in the wording of the question in the final questionnaire (Q 4e). The "Unsure" option in q 4b was not included, as all midwives who participated in the pilot studies answered this question.

Question 4d of the preliminary questionnaire was tested and adopted in the final questionnaire (Q 4d) with minor wording changes. Question 4c of the preliminary questionnaire was found to be not useful as it was a repetition of q 4b and hence was abandoned. In the final questionnaire (Q 4d and 4e) changes were made to how much alcohol was perceived to be safe by asking midwives who answered, "Yes" to the various categories in Q 4d and Q 4e to include the number of units per occasion and per week that the midwives perceived safe for consumption.

The specific objective of question 4c was to assess the personal opinions of midwives on the issue of alcohol consumption in pregnancy and that of 4d was to assess the perceptions of midwives on a safe type of alcohol. Midwives who answered "Yes" to any of the type of alcohol listed were also asked how many units they would consider safe, per occasion and per week. The specific objective of question 4e was to assess the professional attitudes of midwives toward drinking in pregnancy. As seen above, the question asked specifically about the three trimesters of pregnancy and throughout pregnancy. It also asked questions on the professional opinions of midwives on the role of alcohol in various other situations, for example alcohol consumption during socialising in pregnancy. The research also aimed to assess whether the personal opinions of midwives towards alcohol in pregnancy had any influence on their professional opinions. Hence, the underlying aim of questions 4c, 4d and 4e was to look for an association between personal opinions and professional opinions of midwives on the issue of alcohol consumption in pregnancy. The study also aimed at assessing the influence of midwives with client load on their clients' drinking behaviour in pregnancy. This objective (part of objective 1) was achieved by assessing the prevalence of drinking among the clientele of midwives according to the midwife's personal opinion.

Question 5: This question comprising of 2 sub-questions (5a & b) was designed to contribute in achieving the third objective of the study.

5.a. How many cases do you see in a year of infants that you think ***have been affected*** due to alcohol intake by the mother during pregnancy?

Please tick (✓) in the appropriate box.

Number of infants

None	1-4	5-7	8-10	11-13	14-16	17-19	20 and above
1	2	3	4	5	6	7	8

5.b. How commonly have you come across the symptoms listed below ***in new-borns*** in the ***past year?***

Please tick (✓) in the appropriate box against each symptom.

Options

Symptoms ↓	Very common	Common	Sometimes	Never
Disturbances in sleep patterns.	1	2	3	4
Facial and body tremors.	1	2	3	4
Kept their eyes open for a long time.	1	2	3	4
Touched their hands to their faces frequently.	1	2	3	4
Poor sucking pressure.	1	2	3	4
Takes longer to suck after contact with nipple.	1	2	3	4
Restless, irritable and is active a longer time.	1	2	3	4

Question 5a aimed to assess the encounter of midwives with infants perceived by them to be affected by maternal alcohol consumption. In the preliminary questionnaire, the above question (q 6c) was open-ended. However, in the final questionnaire ranges were incorporated and the question was adopted with minor changes to the wording of the question.

Question 6b in the preliminary questionnaire aimed at assessing the encounter of midwives with abnormalities in infants born to mothers who gave birth under the influence of alcohol.

q 6b. Do you see any abnormalities in infants of the above-mentioned mothers (women giving birth heavily under the influence of alcohol) at birth or later? Please comment.

However, this question was not well answered by the midwives and hence was deleted from the final questionnaire. Instead, a new question (Q 5b) was developed based on the literature that associated specific symptoms in newborn infants of heavy drinkers. Some of the symptoms at birth associated with heavy maternal alcohol consumption in the Seattle longitudinal study were poor neonatal habituation, decreased sucking pressure, increased tremulousness, irritable and remained active a longer time (Streissguth *et al.*, 1981). As part of the Seattle longitudinal study, Landesman-Dwyer *et al.* (1978) in a naturalistic observation of infants born to women who were heavy social drinkers in pregnancy found an increased incidence of hand to mouth activity and inability to sleep. Sleep disorders were also seen in infants born to heavy drinkers in the study by Rosett *et al.* (1979).

In a prospective study by Coles *et al.* (1985), infants exposed to alcohol during any period of gestation, born with no characteristics of foetal alcohol syndrome and diagnosed to be otherwise healthy, still showed significant alterations in reflexive behaviour and increased levels of activity compared with non-exposed infants. In the latter study infants exposed throughout pregnancy to alcohol showed signs of instability in the central nervous system like tremors. Question 5b aimed to assess the encounter of midwives in the year prior to the survey with some of the symptoms in newborns associated in the literature with heavy prenatal exposure to alcohol.

Question 6: This question comprising of 4 sub-questions (6a, 6b, 6c and 6d) was designed to contribute in achieving the third objective of the study and to assess the usefulness of certain tools for midwives to communicate effectively on the issue of alcohol consumption in pregnancy.

6.a. How many of your clients have experienced ***miscarriage*** in the ***past year*** of your practice?

Please tick (✓) in the appropriate box.

Number of miscarriages

Time of pregnancy ↓	Not sure	None	1-2 cases/year	3-5 cases/year	6-10 cases/year	Above 10 cases/year
First six weeks	1	2	3	4	5	6
6-12 weeks	1	2	3	4	5	6
13-24 weeks	1	2	3	4	5	6
Above 24 weeks	1	2	3	4	5	6

Spontaneous abortion or miscarriage has been associated in the literature with varying levels of alcohol consumption in pregnancy (Kline *et al.*, 1980, Kesmodel, 2002). The objective of question 6a was mainly to evaluate the frequency in the occurrence of miscarriage at various stages of pregnancy among the clients of the midwives. The study also aimed to assess if there was a correlation between the number of miscarriages and the proportion of drinkers according to style of drinking in the clientele of midwives. This question was piloted (q 3a) and was adopted in the final questionnaire with minor changes to the wording of the question. However, it must be stated at this point that the term "miscarriage" adopted in this study to describe loss of foetus up to and above 20 weeks of gestation is not concurrent with current definitions used. According to the New Zealand Health Information Service (2001), a foetus that is dead and expelled from the mother after the 20th week of gestation is referred to as "still birth". Although it was unfortunate that the latest terminologies were not adopted in the current research it is unlikely to have affected the purpose of this question, which was to assess the prevalence of foetal death in the clientele of midwives. The discrepancy seen with respect to the terminology used in the current research is also unlikely to affect the discussion with respect to a possible outcome of maternal alcohol abuse as these terminologies have been used concurrently in the literature ((Kline *et al.*, 1980, Kesmodel, 2002).

6.b. How would you rate the ***issues*** listed below ***as to the level of concern*** they have caused ***in your practice as a midwife:***

Please tick (✓) in the box of the most appropriate level of concern against each issue.

	Level of Concern				
Issues ↓	**Not caused Concern**	**Caused Mild Concern**	**Caused Moderate Concern**	**Caused High Concern**	**Caused Extreme Concern**
Recreational drugs	1	2	3	4	5
Prescription drugs	1	2	3	4	5
Alcohol	1	2	3	4	5
Smoking	1	2	3	4	5
Young pregnant teenager	1	2	3	4	5
Older pregnant women	1	2	3	4	5
Preparedness for motherhood	1	2	3	4	5
Diet during pregnancy	1	2	3	4	5

The objective of question 6b was to evaluate the level of concern caused by alcohol consumption as an issue in comparison with other common issues faced by midwives in their practice. This question (q 2a) in the pilot study read as,

To what level of concern would you categorise the issues listed below in your practice as a midwife?

The pilot study revealed that the question lacked clarity and inclusion of the "Other" category did not provide any useful information. Hence this question (Q 6b) was reworded and the "Other" category was not included in the final questionnaire.

6.c. How many cases would you have encountered of birth defects listed below during your ***current midwifery practice*** in New Zealand?

Please tick (✓) in the appropriate box against each birth defect.

Number of Cases

Type of birth defect ↓	**Don't know**	**Never**	**Below 5 cases**	**6-10 cases**	**11-20 cases**	**21-30 cases**	**Above 30 cases**
Spina bifida	1	2	3	4	5	6	7
Microcephaly	1	2	3	4	5	6	7
Hydrocephaly	1	2	3	4	5	6	7
Cleft palate/lip	1	2	3	4	5	6	7
Polydactyly (abnormal number of fingers and toes)	1	2	3	4	5	6	7
Syndactyly (webbing or joining of fingers & toes)	1	2	3	4	5	6	7
Club feet.	1	2	3	4	5	6	7
Down syndrome	1	2	3	4	5	6	7
Fetal alcohol syndrome	1	2	3	4	5	6	7
Peculiar faces*	1	2	3	4	5	6	7

***Peculiar faces may include protruded forehead, sunken nasal bridge, short upturned nose, retracted upper lip, receding chin and deformed ears.**

The rationale behind question 6c was to assess the encounter of midwives with noticeable birth defects during their current midwifery practice. The specific objective of this question was to compare the encounter of midwives with foetal alcohol syndrome and peculiar faces and their encounter with other obvious birth defects. As birth defects are not seen often (which was evident from the pilot studies), midwives were asked to state the number of cases seen in the years of their current midwifery practice and this figure was then standardised[42] for cases of birth defects seen per year. Literature reviewed in Chapter 2 indicated that microcephaly, cleft palate, cleft lip, and abnormalities in the growth of fingers and toes were commonly seen in infants exposed

[42] Standardisation of the number of cases of birth defects for a year was done by dividing the number of cases seen in their current midwifery practise (Q 6c) by the number of years of experience (Q 1b) in their current midwifery practice.

in utero to high levels of alcohol (Autti-Ramo *et al*., 1992a). Discussions with midwives also indicated that midwives quite frequently encounter the birth of infants with "Peculiar faces" and used the term "Funny looking kids" as a colloquial terminology to describe such infants In a study by Little *et al.* (1990), on examining hospital records, the authors found that "Facies", a terminology used for a cluster of minor dysmorphic features, was seen only among infants born to drinking mothers. Hence this question was also included to assess the possible prevalence of "Peculiar faces" in New Zealand. Specific definition of peculiar faces associated in the literature with maternal alcohol consumption by Jones and Smith (1973) was provided as a caption to the table to enable the midwives to give more accurate estimates. Other common birth defects such as Down syndrome and spina bifida were also included for the purpose of comparison.

In the preliminary questionnaire, this question (q 3b and 3c) was piloted for two time periods namely, in the "Past year" and "During your career". The aim of this exercise was to test the appropriate time period for which information on the encounter of midwives with various birth defects was to be collected. The pilot study indicated that, as birth defects do not occur frequently it was best to collect this information for a longer time period. However, the use of the latter option (*during your career*) also created some confusion among midwives as many worked as nurses prior to becoming midwives. Hence, in the final questionnaire (Q 6c) changes were made to the wording of this question and the time period "In your current midwifery practice" was adopted. Definitions of terminologies that may have been unfamiliar to midwives were also included in parenthesis under the birth defect.

6.d. Alcohol intake is a very sensitive issue to talk about with clients. Do you think that the following tools would help you in discussing this issue with your clients?

Please circle one appropriate answer against each tool		
Training in effective communication.	1. Yes	2. No
Knowledge of how much alcohol is safe.	1. Yes	2. No
Training to recognise early symptoms in an infant exposed to alcohol *in utero*.	1. Yes	2. No
Education on alcohol in pregnancy for midwives	1. Yes	2. No
Education on alcohol in pregnancy for mothers	1. Yes	2. No

Literature reviewed has indicated primary maternity caregivers can effectively provide intervention in reducing the risk for the prevalence of alcohol related effects (Jones-Webb *et al*., 1999; Hilton & Condon, 1989; Ihlen *et al*., 1993). However, literature also shows that the educational needs of primary maternity caregivers on the issue of alcohol consumption in pregnancy may be an on-going process (Nanson *et al*., 1995; Diekman *et al*., 2000) as new research is undertaken and more is known about the adverse effects of alcohol consumption. Question 6d aimed to assess the usefulness of certain tools including education of midwives, for enabling them to effectively communicate with their clients about the adverse effects of alcohol consumption in pregnancy. This question was piloted (q 7b) and, following the suggestions made by those midwives who participated in the pilot studies, two other tools namely education on alcohol in pregnancy for midwives and for mothers were included.

Question 7a of the preliminary questionnaire on piloting did not reveal any useful information by itself. Hence this question was combined with question 7b of the preliminary questionnaire. In the final questionnaire this question was reworded for better clarity and two other "Tools" were included following suggestions made in the pilot studies by participating midwives (Q 6d).

Question 7: The aim of this question was to collect information on the region and place (Urban or rural) of practice.

7.a. The ***place*** where you ***practised in the past year*** was a:

Please circle the number beside the area that best describes your place of practice.

1. Farming or rural area.
2. Town.
3. City.

88. Not applicable.
99. Don't know.

7.b. The ***area*** in which you ***practised in the past year*** was:

Please circle the number that best describes the area you practice.

1. Northland
2. Auckland
3. Waikato
4. Bay of Plenty
5. Gisborne
6. Hawkes Bay
7. Taranaki
8. Manawatu - Wanganui
9. Wellington
10. West Coast
11. Canterbury
12. Otago
13. Southland
14. Tasman
15. Nelson
16. Marlborough
17. Any other_____

7.c. Do you wish to receive a summary of the results of the study?

1. Yes 2. No

Questions 8a and 8b of the preliminary questionnaire were compressed and the changed version was included in the final questionnaire (Q 7a and 7b). This change was not made as a result of the pilot study but was the outcome of discussions held with the statistician. Questions 7a and 7b aimed at collecting demographic details of the practice of midwives and question 7c was included to allow provision of a summary of results[43] on the key objectives of this study to those midwives who were interested.

Questions 2d and 2e of the preliminary questionnaire were found not to produce any useful information in the pilot studies and hence were not included in the final questionnaire.

The second and third objectives of the pilot study were to assess the average time taken to complete the questionnaire and to get a first hand experience of issues faced by the participants of the survey. The pilot studies revealed that on average, midwives took about 30 to 45 minutes to complete the questionnaire. With respect to issues faced by participants, the major constraint was the length of the questionnaire. As this was a base-line study, questions on a number of issues had to be asked to lay the foundation

[43] This summary is in Appendix 6

for future research in New Zealand. The use of ranges for all questions asking numerical data was employed to help improve the ease of participation in the survey.

4.3.6 Methods employed to improve response rate:

Health professionals in general are widely believed to be a difficult population to survey (Berry & Kanouse, 1987). Studies have also shown that factors that affect response rates of surveys on health professionals were research sponsor, the extent of follow-up, questionnaire length and the relevance of the topic to the respondent (Shosteck and Fairweather, 1979). Other studies have shown that researcher status can also affect response rate (Brennan, 1990). Studies have also shown that the use of reminder letters, reply paid envelopes and providing monetary incentive are effective methods for achieving higher response rates (Brennan, 1992; Brennan *et al*., 1993).

The methods used in the current research to improve response rate to the study are discussed below. The Alcohol Advisory Council and the Foetal Alcohol New Zealand Trust agreed to provide letters[44] of support for the research. As already cited previously, studies have shown that sponsors of research can affect response of health professionals to the study. Hence support letters from two important organisations, the Alcohol Advisory Council, a Crown Institute and Foetal Alcohol New Zealand trust, a non-profitable organisation working towards increasing the awareness of alcohol related effects in New Zealand, were used to accentuate the importance of the study.

The slogan ***"Let us strive together to provide the best care to the mother and the precious life within her"*** was developed by the researcher with the aim of building a common bridge between the professional interests of the researcher and those of the respondents. This slogan was printed on the questionnaire and on the reminder letters. Two reminder letters[45] were also used in the current research to improve the response rate to the survey. The first reminder letter was mailed out after a gap of 14 days to those midwives who had not responded to the survey. The second reminder letter along with another copy of the questionnaire was again mailed out after a further 14 days to

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[44] The letters of support from the Alcohol Advisory Council and from Foetal Alcohol New Zealand trust are in Appendix 7a and 7b.
[45] The reminder letters used are in Appendix 8a and 8b.

those midwives who did not respond to the first reminder letter. A reply paid envelope with a code number for each midwife was also included with each of the mail-outs.

In addition, it was also announced that a prize of 300 dollars would be offered to one randomly selected midwife among those who participated in the study. It was indicated that this prize-money was to be used towards membership fees of a professional organisation the midwife was associated with. As indicated in the information sheet, the reply-paid envelopes were used to randomly select one midwife to receive the prize-money, as these were number coded for each midwife.

4.3.7 Eligibility criteria and time frame:

The research aimed to set a time frame for which data was to be collected. This time frame was the immediate year prior to the survey. Hence an eligibility criterion was included so that those midwives who had not practised in the immediate past year were not eligible to participate in the study. Such midwives were requested to return their questionnaire unanswered, using the reply-paid envelope.

4.3.8 The Sample:

The target population of this study was current practising midwives. The list of all midwives in New Zealand was processed from the latest 1999 electoral roll[46], which formed the sampling frame of the current research. The sampling frame consisted of 1991 names and addresses of midwives. The number of midwives who had renewed their annual practising certificates for the year 1998-1999 was 1868[47]. As the number of midwives in the sampling frame of this study was similar to the total number of practising midwives it was assumed that the sampling frame comprised of a high proportion of practising midwives. However, it should be mentioned at this point that no formulae was used to determine the sample size of the study sample. One reason for this omission was primarily due to the fact that the design of this study was novel in New Zealand and hence estimating the population proportion by prior information (Hair *et*

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[46] The latest electoral roll for all aged between 20 to 65 years of age was purchased from the Electoral enrolment centre, Wellington.
[47] Personal Communications, Appendix 9

al., 2000) that is required for the calculation of sample sizes would not be possible. According to Hair *et al.* (2000) the objective of calculating sample sizes is primarily for obtaining statistics that have accounted for the variability of the population characteristic under investigation, the level of confidence desired in the estimate and the degree of precision in the estimation of the population characteristic. One way to account for all the above factors to produce an estimate of reasonable precision is to have a large enough sample size. Hence, anticipating a response rate of 50% for health professionals (Hoise, 1995), a computer generated (using SPSS) random sample of 1000 midwives was then selected from the sampling frame as the study sample. A package with the questionnaire, the information sheet, and letters from the Alcohol Advisory Council and the Foetal Alcohol New Zealand Trust was mailed to each individual in this random sample of 1000 midwives.

4.4 Data entry:

For the purpose of treating the information provided by the participants of this research confidentially, all questionnaires were separated from the reply-paid envelopes and stored in a filling cabinet. The questionnaire was then recoded and checked for completion and response status of the participant was entered on to a new database as "Returned not practising", "Returned completed" and "Returned partially completed". Of the 1000 midwives surveyed, 445 (44.5%) participated in the study, 235 (23.5%) returned the questionnaire as they were not practising at the time of the study and 303 (30.3%) did not respond to the study. There is a possibility that a small proportion of midwives who returned the questionnaire were un-willing to participate in the survey. However, based on the eligibility criteria set for this research, all midwives who returned their questionnaire in the reply-paid envelope provided were treated as "Returned not practising". Furthermore, the addresses of 17 midwives (1.7%) had changed and could not be traced and hence were labelled as "Gone no address" (GNA). Data from the questionnaires were entered onto a SPSS spreadsheet by the researcher, using the built-in coding system from the questionnaire, creating a new database with the responses from the midwives.

4.5 Statistical methods:

All analysis in the current research was executed using the Statistical Package for Social Sciences (SPSS), Version 10.0. Individual statistical procedures used are discussed below under each objective and unless otherwise stated the acceptable level of significance was fixed at $\propto = 0.05$. Explanations of the various statistical procedures used for the current research and cited in this chapter are from the information provided by SPSS, Version 10.0.

4.5.1 Statistical procedures used to provide background information of midwives and their clients:

The background information on midwives (Q 1) and their clients (Q 2) is reported in Chapter 5. Analysis of variance was executed to investigate for differences in the mean age of midwives according to response status. Comparisons were also made between the proportions of midwives in the study sample (N = 1000), in the sample of all respondents (N = 445) and in the sample of midwives with a client load (N = 257), according to the regions of New Zealand. As depicted in the map of New Zealand (Appendix 10), for the purpose of the current research, New Zealand was divided into 4 major regions, namely upper North Island, central North Island, southern North Island and South Island. The upper North Island region comprised of Northland, Auckland and Waikato regions. The central North Island comprised of Bay of Plenty, Gisborne, Hawkes Bay and Taranaki regions. The southern North Island comprised of Manawatu, Wanganui and Wellington regions. The West Coast, Canterbury, Otago, Southland, Tasman, Nelson and Malborough regions formed the South Island region in this research. Similar comparisons were also carried out between the metropolitan and provincial regions of New Zealand. Midwives from urban Auckland, Hamilton, Wellington, Christchurch and Dunedin were grouped as from the metropolitan cities of New Zealand and those from all the other regions were grouped as from the provincial regions of New Zealand. Comparisons were also made between the distribution of midwives in the current study according to regions and that seen in the Nursing and Midwifery Workforce Survey (2000).

Frequency distribution of midwives according to type of midwifery practice and experience in the current midwifery practice were also computed. Similarly, experience of midwives in their current midwifery practice and the distribution of midwives according to client load were also computed for midwives with a client load (N = 257). Comparisons were also made between the proportions of midwives with a client load according to type of practice in the current study and that seen in the Nursing and Midwifery Work Force (2000).

Proportions were used to depict the distribution of the clients of midwives according to age, income and marital status. As numerical information was collected using ranges, the mid-point of the ranges was adopted as the actual number and with respect to the last open-ended range the lower limit was adopted as the actual number. The proportion of clients of midwives according to various age groups was also compared with the actual pregnant population of New Zealand for the year 1999.

4.5.2 Statistical procedures used to estimate the prevalence of drinking among the clientele of midwives (Objective 1):

Of the 445 midwives who participated in the study, 289 midwives (64.5%) had their own client load and 157 midwives (35.5%) did not have their own client load. Midwives who indicated that they were (Q 1a) independent midwives, shared-care midwives or hospital-based midwives were categorised as those having their own client-load. Data on client number provided by these midwives was screened using a scatter plot, by plotting the total number of clients (Q 2a) against the total number of clients obtained by adding the number of clients in each age group (Q 2b)[48]. Inconsistencies between the total number of clients (Q 2a) and the total computed from the number of clients of various age groups were found in the data provided by 32 midwives who were excluded from all analysis pertaining to client information. For the purpose of assessing the prevalence of drinking among the clientele of midwives only data from midwives (N = 257) with their own client load were used. Information was obtained from midwives on the number of clients who had consumed any beverage alcohol in pregnancy according to various age groups (Q 3a). Similarly, information

[48] This analysis was done by the statistician.

was also obtained on the number of clients with various drinking styles (Q 3b). Proportions of drinkers of various age groups (Q 3a) and according to various styles of drinking (Q 3b) were then computed by dividing the total number of drinking clients under each category by the total number of clients (Q 2a) for each midwife. Raw values were then subjected to standard log transformation techniques and changed to logit values, which were then used for all the analyses. As the client-base between midwives differed in size, the data were also weighted for the size of the client-base of the midwives. The weight variable was computed as follows:

$$\text{Weight Variable} = \frac{\text{Number of clients in the clientele of each midwife}}{\text{Mean number of clients}}$$

Mean and Median statistics were used to depict the distribution of pregnant drinkers in the clientele of midwives according to their age group and drinking style. With respect to all analysis and discussion of results of data on drinking style (Q 3b), the terms "Regular drinking" and "Heavy drinking" have been used instead of "Have a drink a day" and "Have more than a drink a day" respectively. The definition of heavy drinking adopted in the current research is based on the definition[49] used by Streissguth *et al*., (1981) in the Seattle longitudinal study. Differences in the prevalence of drinking among clients of various age groups were also tested for the four major regions and the metropolitan and provincial regions of New Zealand using the Analysis of variance. Similar analysis was done to test for differences in the prevalence of drinking according to age group and style of drinking between independent and hospital-based midwives with client load and according to the personal opinion of midwives on alcohol consumption in pregnancy. For this purpose all midwives who responded to Q 4c as "Abstain totally from alcohol" were categorised as the "Abstinent" group and those who ticked any other option were categorised as the "Lenient" group.

Difference in the proportion of drinkers among various age groups was tested using the general linear model repeated measures test. Repeated measures ANOVA was executed on logit of proportions of drinkers in different age groups and the confidence interval and the significance levels were adjusted for multiple comparisons using the Bonferroni method. This method uses "t" tests to perform pair-wise comparisons between group

[49] In the Seattle longitudinal study, heavy drinkers were defined as those consuming on average two or more drinks a day.

means, but controls overall error rate by setting the error rate for each test to the experiment-wise error rate divided by the total number of tests. Hence the observed significance level is adjusted for the fact that multiple comparisons are being made.

Personal discussions with midwives also revealed that they sometimes come across clients who totally deny any drinking contrary to the belief of the midwife. With respect to research on alcohol consumption, denial of drinking is a problem faced by almost all studies. In the current research the prevalence of denial of drinking among the clientele of midwives was depicted using the mean and median statistic and differences in this prevalence according to type and region of practice was investigated using the analysis of variance.

Transformations similar to those described above were made to the raw data from question 3c and the mean and median statistics were used for the purpose of depicting the prevalence of drinking among the clients of midwives prior to recognition of pregnancy. However, as data on drinking prior to recognition of pregnancy is not routinely collected by midwives, only total prevalence and according to style of drinking has been reported and no further analysis has been done to investigate whether the prevalence differed according to region and type of practice.

For the purpose of assessing the encounter of midwives with women giving birth under the influence of alcohol, responses from all (N = 445) midwives who participated in the survey were analysed. Differences in the proportions of midwives who had seen women giving birth under the influence of alcohol from the upper North Island, central North Island, lower North Island and the South Island were investigated using chi-square analysis. The number (midpoint of the range) of such cases seen in the year preceding the survey was depicted using the Mean statistic. Differences in the mean number of cases between the four regions and the metropolitan and provincial regions were investigated using Analysis of Variance (ANOVA). Midwives were also asked to comment on the most likely type of antenatal care received by such women and the most frequent answer against the categories provided was assessed using the Mode statistic.

4.5.3 Statistical procedures used to assess the attitudes and knowledge of midwives on alcohol consumption in pregnancy (Objective: 2):

For the purpose of assessing the attitudes and knowledge of midwives on drinking in pregnancy responses of all midwives (N = 445) were analysed. The number of midwives who had heard about foetal alcohol syndrome and other alcohol related effects were expressed as proportions. Chi-square analysis was used to test for differences in the awareness of foetal alcohol syndrome and alcohol related effects according to type and region of practice.

The study aimed to assess the personal opinion of midwives on the issue of drinking in pregnancy. These opinions were depicted using proportions. Furthermore, chi-square analysis was executed to investigate whether these opinions differed according to type and region of practice. Similarly, the professional attitudes of midwives on the role of alcohol in the lives of pregnant women were assessed for various trimesters and for other reasons in pregnancy. The results of the above analyses are expressed as proportions. Midwives were also asked to indicate what they thought was a safe level of drinking expressed as units of alcohol per occasion and per week in pregnancy. The Mean statistic was used to depict the results of this analysis. Analysis of variance was used to investigate whether there were any differences in the mean number of units perceived to be safe according to type and region of practice. Furthermore, chi-square analysis was executed to investigate whether there was an effect of the personal opinions of midwives on their professional attitudes toward the role of alcohol in pregnancy. The Phi coefficient and Cramer's V statistic were used to measure the apparent strength of association between the nominal variables studied.

The study also assessed the perceptions of midwives as to a "Safe type of alcohol" in pregnancy and the results were expressed as proportions. Analysis of variance was used to investigate whether the mean number of units perceived to be safe for consumption by midwives differed according to type and region of practice. Similar analysis as above was used to investigate whether there was an effect of personal opinions of midwives on the issue of drinking in pregnancy on their perceptions of a "Safe type of alcohol".

The current research also aimed to assess the usefulness of certain tools for midwives to effectively communicate about alcohol consumption in pregnancy to their clients. For this purpose midwives were asked to indicate a "Yes" or a "No" against the usefulness of 5 tools. The result of this analysis was depicted using proportions. Furthermore, using chi square analysis, the study also investigated to see whether the proportions of midwives who responded, "Yes" or "No" to each of these tools differed according to type and region of practice.

4.5.4 Statistical procedures used to assess the prevalence of outcomes associated with heavy maternal drinking in the clientele of midwives (Objective: 3):

In attempting to achieve the above objective, at the outset the current research aimed at assessing the level of concern caused by alcohol consumption in comparison to other issues faced in the practices of midwives (Q 6b). The result of this analysis was depicted using proportions and chi-square analysis was used to investigate whether various levels of concern caused by alcohol consumption differed according to type and region of practice. Secondly, the study aimed at assessing the prevalence of miscarriage among the clientele of midwives (Q 6a). The Mean statistic was used to depict the encounter of midwives with miscarriage in their practice for the year preceding the survey. Analysis of variance was used to investigate whether the mean number of cases differed according to type and region of practice. Further analysis was executed to investigate whether there was a linear association between the cases of miscarriage encountered in the practices of midwives and the proportion of various types of drinkers in their practice. For this purpose, non-parametric test for linear association (Spearman's Rho correlation coefficient) was used and the data were weighted for the size of the client-base of the midwife, using the weight variable. As questions 6a and 6b aimed at collecting information on the clientele of midwives, all analyses pertaining to the above two questions were executed only on the responses of midwives (N = 257) who had their own client load.

For the purpose of assessing the probable estimates of infants that the midwives perceived to be affected by *in utero* exposure to alcohol the mean statistic was used to depict the results. As this was purely an estimate provided by midwives no further analysis was done to investigate whether these estimates differed according to type and region of practice. A 4-point "Likert" scale was used to assess the prevalence of common symptoms in infants associated with heavy maternal drinking in the practices of midwives. Proportions were used to depict the responses of midwives against each listed symptom. Further analysis was done using HOMALS optimal scaling data reduction technique to investigate whether there was any relationship between these symptoms and their categories. HOMALS is an acronym for homogeneity analysis by means of alternating least squares. The aim of this analysis is to describe the relationships between two or more nominal variables in a low-dimensional space containing the variable categories as well as the objects in those categories. Objects within the same category are plotted close to each other, whereas objects in different categories are plotted far apart. Each object is as close as possible to the category points for categories that contain that object. This analysis is similar to correspondence analysis but is not restricted to two variables and is also known in the literature as multiple correspondence analysis (SPSS, Version, 10.0). The study also aimed to assess the encounter of midwives with noticeable birth defects in the current midwifery practice. The mean statistic was used to depict the number of cases of various birth defects encountered by midwives. As the encounter of midwives with the above birth defects was purely an estimation, no further analysis was done to investigate if these estimates differed according to type and region of practice.

4.6 Potential bias and limitations of the study:

All survey research runs the risk of being affected by error. Survey error is made up of two components, the sampling error and the non-sampling error. Good sampling techniques can reduce the magnitude of sampling error. Non-sampling errors are also present in surveys and are not easy to measure (Duoba and Maindonald, 1988). Efforts have been made in this study to reduce sampling error by using a defined target population, random selection procedures, and a defined period for which information was required. An eligibility criterion was set so that only those midwives who had practised in the set time period were eligible to participate.

The problem of non-response affects all surveys and any survey that achieves less than 100% response rate may produce estimates affected by non-response error. A 50% response rate has been suggested as a reasonable minimum response rate in the literature (Hoise, 1995). The current research achieved a response rate[50] of nearly 60% which is higher than that suggested. The primary reason for non-response in this study would probably be due to lack of time or lack of information on hand to complete the questionnaire. Discussion of the analysis with respect to mean age of midwives according to their response status is given in detail in Chapter 5.

Among the 445 midwives who responded, 329 midwives answered all the questions and 116 midwives did not answer all the questions. This partial response was primarily due to non-participation in questions that asked information on client details by midwives who did not have a client load. One limitation of the current research in this respect was the non-inclusion of a question that asked the participants if they had their own client load. This oversight was probably a consequence of conducting the pilot studies on midwives who were predominantly with a client load. Hence, in the current research categorisation of midwives according to those with and without a client load was done purely on the basis of the response of the participants to Q 1a, which asked about their type of midwifery practice. The distribution of midwives of this study with and without a client load was similar to that seen in the Nursing and midwifery work force survey (2000). The total proportion of midwives with a client load and according to the 4 major regions of New Zealand who responded to this study was also similar to that found in the Nursing and midwifery work force survey (2000). A detailed discussion on this is given in Chapter 5. Hence it is highly unlikely that error of any significant magnitude was introduced due to this discrepancy in designing the questionnaire.

One potential source of error that could affect the results of the first objective of this study which was to assess the prevalence of drinking among the clientele of midwives, is the reliability of respondents reporting and recall. Although midwives collect information on alcohol consumption using the booking form (Appendix 1), some midwives may have depended to some extent on their memory to answer questions

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[50] The following formula was used to calculate the response rate of the study:

$$\text{Response rate} = \frac{\text{Number of responses}}{\text{Total number} - (\text{Number of not eligibles} + \text{Gone no address})} \times 100$$

$$\text{Response rate} = \frac{445}{1000 - (235 + 17)} \times 100 = 59.49\%$$

about client information. To overcome this problem, the questionnaire was designed to check for discrepancies. Unreliable data received from respondents were not used in the analysis. Proportions of drinkers among all clients of midwives were computed and those that exceeded 1 (over-estimation) were discarded from the analysis. However, there is no way of knowing the extent of underestimation in the data provided by the midwives. With respect to prevalence of drinking (total) among the clientele of midwives this information was collected from two separate questions (Q 3a and Q 3b). The actual survey form of some Independent midwives contained tally marks against questions 3a and 3b indicating the maintenance of record on alcohol consumption. However, it should be mentioned here that it was not possible to validate the proportion of drinkers among the clientele of midwives obtained in the current study externally with their records for two reasons. The first reason being the ethical protocol followed for the current research (see appendix 5a, section 3.1.3). The second reason was that although midwives routinely ask information about alcohol consumption in pregnancy, they do not submit this statistic in their annual review report as they do for prevalence of smoking. Use of ranges instead of actual number of clients was adopted in this study primarily to increase the ease of participation and hence the response rate. Although the ranges used were small, this method adopted in the current research for collecting all numerical data may also have contributed to the overall non-sampling error of the estimates. As the study sample comprised of a specific target population (midwives) the results of this research is limited to this population. However, as the majority of the New Zealand pregnant population were under the care of midwives these results obviously apply to the majority of New Zealand pregnant women.

Chapter - 5

Survey Details and Background Information of Midwives and their Clients

5.1 Survey Details:

As already mentioned in the previous chapter, all (N = 1991) those who recorded their profession as "Midwives" in the electoral roll (1999) formed the sampling frame of this research. From this sampling frame, a computer-aided selection of a random sample of 1000 midwives was made to form the study sample. Details of the survey are tabulated below in Table 5.1.

Table 5.1

Details of the survey of midwives

Details	Number of midwives
Responded	445
Not eligible and returned the questionnaire	235
Non-response	303
Gone no address	17
Total sample	1000

The study achieved a response rate of nearly 60% from those midwives who were eligible to participate in the survey. Two reminder letters were used to increase the response rate of the survey. Details of response to the reminder letters are given below in Table 5.2. Overall 322 midwives responded to the survey prior to sending the first reminder letter. Among these midwives 42.7% (N = 144) fully completed the questionnaire, 13.9% (N = 47) partially completed the questionnaire, 39.2% (N = 132) returned the questionnaire as they were not practising and 4.2% (N = 15) of the questionnaires were returned as "Gone no address".

Table 5.2

Response of midwives to reminder letters

Reminder letters	Number of midwives
Responded without reminder letters	322
Responded to the first reminder letter	170
Responded to the second reminder letter	188
Gone no address (GNA)	17
Did not respond	303
Total	**1000**

Among midwives who responded to the first reminder letter, 55.6% (N = 95) fully completed the questionnaire, 21.1% (N = 36) partially completed the questionnaire and 22.8% (N = 39) returned their questionnaire, as they were not practising at the time of the survey. One survey form was returned as "Gone no address". Among midwives who responded to the second reminder letter, 18.5% (N = 91) fully completed the questionnaire, 6.7% (N = 33) partially completed the questionnaire, 13% (N = 64) returned the questionnaire, as they were not practising at the time of the survey. One survey form was returned as "Gone no address". Above 60% (N = 303) of midwives who were sent the second reminder letter did not respond and were treated as non-respondents in this study.

5.2 Demographic details of midwives:

As the sampling frame for this study was processed from the current electoral roll, the available demographic detail for the midwives was region of residence. With respect to age of the midwife, the electoral roll provided information on age group, rather than actual age of the midwife. This "Age group" was defined as birthdays falling within a period of 5 years, being either the first half or second half of a decade. Hence the age of the midwife as given in the electoral roll and used for the current research may not be the actual age and is not comparable with national data. However, comparisons were made internally to assess if the mean age of midwives differed according to their response to the study (Table 5.3).

Analysis of variance was executed to investigate whether there were any differences in the mean age of midwives according to their response status to the survey. It was found that there were no significant differences (F = 1.247; p = 0.291) in the mean age of midwives according to their response status to the survey. The average age of midwives in the sampling frame (N = 1986) was 54.58 (± 8.41) years and that of the sample (N = 1000) was 54.87 (± 8.38) years. The average age of midwives who participated in the study (N = 445) and of midwives with client load (N = 257) was also similar at 54.50 (± 8.23) years and 54.81 (± 7.85) years respectively.

Table 5.3

Mean age (years) of midwives according to response status to the survey

Response status	N	Mean age	Standard deviation	95% CI of mean		Mini age	Maxi age
				Lower bound	Upper bound		
Full response	329	55	8	54	56	35	65
Partial response	116	54	9	53	56	35	65
Not practising	235	55	9	53	56	34	65
Non-response	303	56	8	55	57	35	65
All midwives	983*	55	8	54	55	34	65

*** This figure is arrived at by removing the GNA's**

Further comparison of midwives according to response status was also done according to region of practice using Chi-Square analysis (Table 5.4). The proportion of midwives who fully responded to the study significantly differed according to the four major regions of New Zealand. A higher proportion (39%) of midwives from the upper North Island had a full response status in this study in comparison to midwives from the southern North Island (29%) and the South Island (27%) regions. A greater proportion of midwives from the southern North Island region (14%) responded partially to the study in comparison to midwives from the South Island (10%). A lower proportion of midwives from the upper North Island region (18%) were not practising in comparison to midwives from the central North Island (26%) and the South Island (32%) regions. A higher proportion of midwives from the southern North Island region (33%) did not respond to the study in comparison to the proportions of midwives who did not respond to the study from the other regions of New Zealand. The above results were statistically significant at $\alpha = 0.05$. Similar analysis executed for the metropolitan and the provincial regions of New Zealand showed that there were no statistically significant ($p = 0.250$) differences in the distribution of midwives according to their response status.

Table 5.4

Comparison of response status of midwives according to regions of New Zealand

Regions (N)	**Response status (%)**			
	Full response	***Partial response***	***Not practising***	***Non-response***
Upper NI (421)	40	12	19	30
Central NI (124)	33	11	27	29
Southern NI (206)	29	14	24	33
South Island (233)	27	10	32	31
Statistics	$\chi^2 = 22.851$	$p = 0.007$		
Metropolitan (597)	34	10	24	32
Provincial (387)	33	14	24	29
Statistics	$\chi^2 = 4.111$	$p = 0.250$		
All midwives (983)	34	12	24	31

Frequency distribution of midwives in the study sample (N = 1000) was compared to data from the Nursing and Midwifery Workforce Survey (2000) according to the four major regions of New Zealand. The results of this comparison are given in Table 5.5. There are two limitations to this comparison. Firstly, data collected for the current research was for the year 1999, while the Nursing and Midwives Workforce survey (NMWF) was conducted in the year 2000. Secondly results given in New Zealand Nurses and Midwives 2000 on data collected in the Nursing and Midwives workforce survey also included nurses with midwifery qualifications who may not be actually practising as midwives (MOH, 2002). Despite these limitations, on comparing the distribution of midwives in the four major regions of New Zealand between the NMWF survey and the actual study sample, it is noted that the distribution is quite similar with only marginal differences.

Table 5.5
Comparison of distribution of midwives according to regions in the study sample and in the NMWF survey

Region	NMWF[1] survey, % (N)	Study sample % (N)
Upper North Island	45 (1606)	43 (427)
Central North Island	12 (430)	13 (129)
Southern North Island	19 (675)	21 (208)
South Island	25 (907)	24 (236)
Total	**100 (3618)** [2]	**100 (1000)**

[1] **Nursing and Midwifery Work Force survey, 2000**
[2] **Includes nurses with midwifery qualifications**

Comparisons of the distribution of midwives according to region were also made between the sample surveyed (N = 1000) and those who responded (N = 445). The frequency distribution of midwives according to the four major regions of New Zealand in the study sample and in the sample of respondents (all midwives and midwives with a client load) is given below in Table 5.6. The proportion of respondents (all midwives and midwives with a client load) from the upper North Island of New Zealand was about 5- 6% more than the proportion of midwives in the study sample from that region. The proportion of respondents comprising of all midwives from the central North Island was similar to that of the study sample. However, the proportion of midwives with client load from the central North Island was higher by 4%.

The proportion of all midwives who responded to the study from the southern North Island was lower by 1%, whereas that of midwives with client load was lower by 3% when compared to the study sample. The proportion of all midwives who responded from the South Island was lower by 4.7% and that of midwives with client load was lower by 3.6% in comparison to the total proportion of midwives surveyed from that region. However, overall the samples of respondents gave a good representation of the regions that were surveyed.

Table 5.6

Geographical distribution of midwives: In the major regions of New Zealand

Region	Study Sample % (N)	Sample of respondents (All midwives) % (N)	Sample of respondents (Midwives with client load) % (N)
Upper North Island	43 (427)	49 (217)	47 (121)
Central North Island	13 (129)	13 (56)	17 (43)
Southern North Island	21 (208)	20 (88)	17 (44)
South Island	24 (236)	19 (84)	20 (49)
Total	**100 (1000)**	**100 (445)**	**100 (257)**

The frequency distribution of midwives in the study sample and the samples of respondents (all midwives and midwives with client load) in the metropolitan and provincial regions was also investigated and the result of this analysis is given below in Table 5.7. The proportion of all midwives who responded to the study and of those midwives who had their own client load from the metropolitan regions of New Zealand was lower than the study sample by 5-8% and that from the provincial regions were higher by 5-8% than the study sample. However, overall the metropolitan and provincial regions of New Zealand were well represented by the respondents of this study.

Table 5.7

Geographical distribution of midwives: In the metropolitan and provincial regions of New Zealand

Region	Study sample % (N)	Sample of respondents (All midwives) % (N)	Sample of respondents (Midwives with client load) % (N)
Metropolitan	60.3 (603)	55.1 (245)	52.5 (135)
Provincial	39.7 (397)	44.9 (200)	47.5 (122)
Total	**100 (1000)**	**100 (445)**	**100 (257)**

5.3. Distribution of midwives according to type of midwifery practice, experience and client load:

The response to question 1a helped to identify 16 different types of midwifery practice. The number and proportion of midwives with various types of practice is given below in Table 5.8. The majority (38.4%) of midwives were independent midwives. Less than 2% were shared-care midwives and about 25% were hospital-based midwives with client load. A small proportion of midwives provided labour-only, antenatal or post-natal care. The other hospital based midwifery care category included those specialised

Table 5.8

Type of midwives who participated in the study

Type of Practice	N	Proportion
Independent	171	38.4
Shared-care	8	1.8
Hospital-based with client	110	24.7
Labour only care	4	0.9
Antenatal care	3	0.7
Postnatal care	22	5.0
Other hospital-based midwifery care	127	28.5
Total	**445**	**100**

in neonatal care, those working in high-risk clinics, those providing antenatal education to pregnant women, those in managerial positions, and relieving and training midwives.

The independent midwives (N = 171), shared care midwives (N = 8) and the hospital-based midwives with client load (N = 110) were categorised as midwives with client load (N = 289) and the remaining were categorised as midwives without client load (N = 156). However on screening the data (see Chapter 4, Section 4.4.2), client information provided by 32 midwives was not consistent and only data from 257 midwives were used for all the analyses.

Comparisons were also made between the proportions of independent and hospital based midwives in the current research and the proportions reported from the Nursing and Midwifery workforce survey (MOH, 2002). The result of this comparison is given below in Table 5.9. In comparison to the results of the Nursing and Midwifery workforce survey, 2000, the proportion of independent midwives in the current research was lower by 4% and that of the hospital-based midwives was higher by 4%.

Table 5.9

Comparison of independent and hospital based midwives in the current study and in the NMWF [1] survey

Type of midwife	NMWF survey % (N)	Current study, 1999 % (N)
Independent Midwife	66.0 (556)	62.0 (179)
Hospital-based with client load	34.0 (286)	38.0 (110)
Total	100 (842)	100 (289)

[1] **Nursing and Midwifery Work Force survey, 2000**

The responses of all (N = 445) midwives to question 1b, that asked about the number of years of experience in their current midwifery practice is given below in Table 5.10. The majority (84.5%) of midwives who participated in the study had above 2 years of experience in their current midwifery practice.

Table 5.10

Experience of all midwives (N = 445) in their current midwifery practice

Experience	N	Proportion
Less than 2 years	68	15.3
2-5 years	138	31.0
5-10 years	140	31.5
More than 10 years	98	22.0
Not answered	1	0.2
Total	445	100

Furthermore the experience of midwives with client load (N = 257) was also analysed separately. The frequency distribution of these midwives according to experience in their current midwifery practice is given below in Table 5.11. As seen among all midwives (Table 5.10), the majority of midwives with client load (~ 81 %) had above 2 years of experience in their current midwifery practice.

Table 5.11

Experience of midwives with client load (N = 257) in their current midwifery practice

Experience	N	Proportion
Less than 2 years	49	19.1
2-5 years	81	31.5
5-10 years	84	32.7
More than 10 years	43	16.7
Total	257	100

The frequency distribution of midwives with client load (N = 257) according to their number of clients in the year preceding the survey (Q 2a) is given below in Table 5.12. For the purpose of giving optimum care to clients, the New Zealand College of Midwives recommends a midwife to have a maximum caseload of 70 clients a year (Cole, 1996).

Nearly 75% of midwives in this study had a client load within the above recommendations, while about 25% had client load above that recommended. On further investigation using chi-square analysis, it was found that hospital-based midwives were more likely (p = 0.000) than independent midwives to have client load above 70 per year. Among independent midwives (N = 162), 89% had a client load within the recommended range and 11% had more than 70 cases a year. Among hospital-based midwives (N = 110), 71% had a client load within the recommended range and 29% had more than 70 cases a year.

Table 5.12

Frequency distribution of midwives according to client load

Client Load	N	Proportion
Less than 10	12	4.7
10-20	25	9.7
21-30	20	7.8
31-40	20	7.8
41-50	44	17.1
51-60	42	16.3
61-70	27	10.5
71-80	21	8.2
81-90	21	8.2
Above 90	25	9.7
Total	**257**	**100**

5.4 Distribution of the clients of midwives according to age, income and marital status:

Questions 2b, 2c and 2d aimed at collecting information on age, income and marital status of the clientele of midwives to understand their distribution according to the above demographics. Information on ethnicity of the clients of midwives was not collected in the current research as overseas (Serdula *et al*., 1991) and New Zealand (Counsell *et al*., 1994) studies have shown that the prevalence of "Any drinking" in pregnancy did not differ according to ethnicity. Moreover, based on the political climate in New Zealand at the time of the study, the research officer of the Alcohol Advisory Council recommended the non-inclusion of questions on the ethnicity of the clients of midwives. Except for the "Age" variable, the objective of collecting data on the other demographic variables of the clients of midwives was purely to understand their distribution accordingly, as the design of the study does not allow to assess any relationships between these variables and alcohol consumption (see Chapter 4, Section 4.3.5 for an explanation). The results presented under this section have been drawn from the responses of only those midwives (N = 257) who had their own client load. Information regarding the age and marital status of the client are usually recorded[51] on the first prenatal visit. Information regarding employment status of the clients is not usually recorded. However, midwives are familiar with the socio-economic background of their clients and hence income status was used instead to understand the socio-economic distribution of the clients. It is essential however, to state that it is likely that the data provided by the midwives with respect to the income status of their clients may be subjective in nature.

The total number of clients according to age groups, income status and marital status are given Table 5.13, Table 5.15 and Table 5.16 respectively. Although, theoretically the total number of clients from questions 2b, 2c and 2d should be identical, in reality they differed from one another by 500 to 1500 clients. This difference is primarily due to the variation in the number of midwives who participated in these questions.

Table 5.13
Distribution of clients of midwives according to age group

Age group of clients	N of midwives with client load	N of clients	Proportion
Teenage (14-19 years)	228[1]	1972	14.0
Young adults (20-25 years)	243[2]	4425	31.4
Adults (26-35 years)	247[3]	5965	42.3
Older adults (> 35 years)	221[4]	1749	12.3
All	**257**	**14111**	**100**

1 Eleven midwives had no teenage clients and 18 midwives did not provide this information.
2 Three midwives did not have young adult clients and 11 midwives did not provide this information.
3. Three midwives did not have adult clients and 7 midwives did not provide this information.
4. Six midwives did not have older clients and 30 midwives did not provide this information.

[51] See the booking forms in Appendix 1

Table 5.13 shows the distribution of the clients of midwives according to their age groups. A majority of the pregnant women among the clientele of midwives were adults followed by young adults, teenagers and older adults. The distribution of the clients of midwives according to age group was also compared with the actual pregnant population of New Zealand in 1999 (Statistics NZ, 2000).

Table 5.14

Comparison of proportion of pregnant women according to age groups in the current study and in the actual pregnant population

Age group	Clientele of midwives (%)	Actual pregnant population of New Zealand (%)
14-19 years	14.0	6.9
20-25 years	31.4	22.5
26-35 years	42.3	57.9
> 35 years	12.3	12.7
Total	**100**	**100**

The result of this comparison is given in Table 5.14. The proportion of pregnant teenagers and young adults were over represented and the proportion of pregnant adults was under represented among the clientele of midwives who responded to the study. On ranking the age group by their proportion, the rank order of adults and young adults were similar but that of teenagers and older adults were different. This over-representation of teenagers among the clientele of midwives, by nearly 50% in comparison to the actual pregnant population, is most likely to be due to the preference of teenagers for midwifery care in pregnancy. This preference of younger women for midwifery care was also reported in the 1999 report on maternity (MOH, 2001). The proportion of older pregnant adults was similar among the clientele of midwives and in the pregnant population of New Zealand.

Table 5.15 shows the distribution of the clients of midwives according to their income status. Overall there were more middle-income clients followed by beneficiaries and fewer high-income clients in the clientele of midwives. All midwives (N = 245) had clients who were of middle-income status, 2% of midwives had no clients on beneficiary incomes and 8% had no high-income clients.

Table 5.15

Distribution of clients of midwives according to income status

Income level of clients	N of midwives with client load	N of clients	Proportion
Benefit	236[1]	4945	39.3
Middle Income	245[2]	6177	48.9
High Income	181[3]	1491	11.8
All	**257**	**12613**	**100**

1. **Five midwives had no benefit clients and 16 midwives did not give this information.**
2. **Twelve midwives did not give this information**
3. **Twenty midwives did not have any high-income clients and 56 midwives did not give this information.**

A recent study in New Zealand has indicated that pregnant women on beneficiary incomes were more likely to drink heavily and have blood alcohol levels twice that of the legal limit (Watson and McDonald, 1999). As nearly all midwives had clients on the beneficiary, it is likely that the prevalence of drinking in their clientele was reasonably high.

Table 5.16

Distribution of clients of midwives according to marital status

Marital Status	N of midwives with client load	N of clients	Proportion
Married	242[1]	5380	40.8
Partnered	239[2]	5216	39.7
Single	230[3]	2564	19.5
All	**257**	**13160**	**100**

1. One midwife did not have any married clients and fourteen midwives did not give this information.
2. Three midwives did not have any partnered clients and 15 midwives did not give this information.
3. Eight midwives did not have any single clients and 19 midwives did not give this information.

As seen in Table 5.16 the majority of the clients of midwives were married or partnered and only one-fifth were single. Literature has documented single women to be more at risk for heavy drinking (Caswell, 1980, Martin *et al.*, 1992) and being unmarried has also been reported as a risk factor for frequent drinking in pregnancy (Ebrahim *et al*., 1998).

5.5 Conclusions:

The sample of midwives who responded to this survey was mature women with an average age of 54 years. The mean age of midwives did not differ according to response status and was almost identical to the average age of midwives in the sampling frame and in the sample surveyed. The majority of midwives had above 2 years of experience in their current midwifery practice and 75% of midwives had caseloads recommended by the College of Midwives. The frequency distribution of midwives of the current research according to region was similar to that in the national data. The region of practice of midwives who responded to the study was fairly representative of the regions surveyed. With respect to client information, teenagers were markedly over-represented among the clientele of midwives in comparison with the actual pregnant population in the study year. A majority of the clients of midwives were adult, married or partnered women with a middle-income status.

Chapter - 6: Results and Discussion, Objective: 1

Prevalence of Drinking among the Clientele of Midwives of New Zealand

6.1 Introduction:

The literature reviewed in Chapter 3 indicates that abstinence rates among pregnant women have increased in countries like the United States. The healthy people 2010 goal in the United States is to increase pregnant women's rate of abstinence from 86% in 1996 and 1997 to 94% in 2010[52]. In New Zealand studies during the 1990's, the prevalence of drinking during pregnancy in a random sample (Counsell *et al.*, 1994) was 41.6% and in a self-selected sample (Watson and McDonald, 1999) was 29%. Because of the differences in the methodology adopted in the studies done by Counsell and colleagues (1994) and Watson and McDonald (1999), it is not possible to conclude that there was a significant decrease in drinking during pregnancy between 1990[53] and 1999. However, the abstinence rate of 71% suggested by the results of the study by Watson and McDonald (1999) is much lower than the 86% achieved by 1997 in the United States of America. The current research was designed to investigate the prevalence of drinking among the clientele of midwives as they provide maternity care to the majority (66%) of pregnant women (MOH, 2001) in New Zealand.

Drinking in the context of this research was defined as "having consumed any beverage alcohol" in pregnancy. The rationale for this definition has already been discussed in Chapter 4, Section 4.3.2. All analysis with respect to client information was executed on information provided by midwives (N = 257) with a client load. Total prevalence of drinking among the clientele of midwives was analysed for the four major regions and the metropolitan and provincial regions of New Zealand. Similar analysis was also executed for the prevalence of drinking within various age groups. An attempt was also made to test if the prevalence of drinking between various age groups was different. The prevalence of drinking according to the style of drinking was also assessed for the major

[52] (http://www.health.gov/healthypeople/Document/tableofcontents.htm).

[53] The year of the actual study.

regions and the metropolitan and provincial regions of New Zealand. Similarly, the prevalence of denial of drinking in pregnancy among the clientele of midwives was also assessed. Reporting of drinking prior to pregnancy recognition among the clientele of midwives was also assessed in the current research. Lastly the encounter of midwives with women giving birth under the influence of alcohol was assessed. As this particular question was not aimed at the clients of midwives, analysis was executed on information provided by all midwives (N = 445) who participated in the study.

6.2 Prevalence of drinking among the clientele of midwives:

Midwives were asked the following question to elucidate the prevalence of drinking among their clientele.

How many of your clients of various ages in the past year would have consumed any beverage alcohol during pregnancy?

In response to the above question, midwives reported that a mean proportion of 36.8 % (± 3%) of the pregnant women in their clientele had some alcohol in pregnancy (Table 6.1). The median proportion of total drinkers (32%) was lower than the mean proportion by 5%, indicating that the mean was slightly biased by some midwives who had higher proportions of drinkers among their clientele. However, the mean proportion of total drinkers in this study fell between the percentages reported by the other two New Zealand studies (Counsell *et al*., 1994; Watson and McDonald, 1999), which were 41.6% and 29% respectively. The current research and the study of Counsell *et al.* (1994) were both done on a random sample. The upper end of the estimate provided by the midwives (40%) is very similar to that obtained by Counsell and colleagues (42%) providing an external validation to this estimate. In the study by Bell and Lumley (1985) carried out in Australia, midwives prospectively collected alcohol consumption data from 8884 pregnant women and found that a similar proportion of pregnant women (36%) to that found in the current research were drinkers in pregnancy. Other overseas studies have also reported similar proportions of women drinking in pregnancy (Bolumar *et al*., 1994; Temple *et al*., 1992; Wright *et al*., 1983).

About 82 % of pregnant teenagers among the clientele of midwives had some alcohol in pregnancy. The mean and median proportions of teenage drinkers were similar, indicating that the mean was not biased by some midwives who had higher or lower proportions of teenage drinkers than others. A mean proportion of 48% of young adults, 26% of adults and nearly 28% of older adults had drunk some alcohol in pregnancy. The mean proportions of adult and older adult clients who had drunk some alcohol in pregnancy were similar. The median proportions of young adult (38%) and older adult drinkers (25%) were lower than the mean proportion by 10% and 3% respectively but the mean and median proportions of adult drinkers were similar. These results indicate that the mean proportions of young adults and older adult drinkers reported in this study may be slightly biased by some midwives who had higher proportions of drinkers in these two age groups.

Table: 6.1

Prevalence of drinking among clients of midwives of different age groups

Age group of clients	N of Midwives	Mean % of drinking clients	95% CI of mean (%)	SEM (%)	Median % of drinking clients
Teenage (14-19)	228	81.9	74.9-87.2	2.50	82.6
Young adults (20-25)	243	48.3	40.2-56.4	3.16	37.7
Adults (26-35)	247	26.1	20.9-31.6	2.76	27.1
Older adults (> 35)	221	27.5	19.3-37.6	2.90	24.6
All	257	36.8	31.9-41.9	3.01	31.7

The mean percentages of adults (26%) and older adults (27.5%) among the clientele of midwives who had consumed some alcohol in pregnancy were lower than those seen in the study by Counsell *et al.* (1994), in which 44% of the 25 to 34 year olds and 42% of the above 35 year olds consumed alcohol in pregnancy. The mean percentages of teenagers and young adults among the clientele of midwives who had drunk some alcohol in pregnancy were higher than those reported by Counsell *et al.* (1994). In the study by Counsell *et al.* (1994), only 35% of women below 20 years of age and 36% of 20 to 24 year olds had consumed alcohol in pregnancy compared with nearly 82% and 48% respectively, reported in the current study. The median percentage of drinking young adults in the current study however, is much closer at ~ 38% to the 36% reported by Counsell *et al.* (1994). The median percentage of teenage clients who consumed any alcohol in pregnancy is similar to the mean percentage in the current study and varies markedly from that reported by Counsell and colleagues (1994). There could be several reasons for this major difference, the primary one being the methodology adopted in collecting information on alcohol consumption. Counsell and Colleagues collected information on alcohol consumption retrospectively after the birth of the child from a random sample of mothers. Evidence from overseas literature indicates that teenagers are more prone to drinking in the early stages of pregnancy (Cornelieus *et al.*, 1994; Jonathan *et al.*, 1997). Further analysis done on the data from the *"Nutrition during pregnancy study"* (see Chapter 10) also indicates that higher proportions of younger women (16-25 years of age) were drinkers in the early stages of pregnancy. It is possible that teenage mothers in the study by Counsell *et al.* (1994) were more prone to recall bias than mothers of other age groups. In addition, evidence from the Alcohol Advisory Council of New Zealand indicates that prevalence of drinking among the younger general populace of New Zealand has dramatically increased since 1990, when the study by Counsell *et al.* (1994) was done and was at its peak in 2000, with 84% of teenagers being current drinkers (Fryer *et al.*, 2002). By 1998, the year of the current study, New Zealand was well on the way to approving lowering the legal drinking age from 20 to 18 years. With the second highest rate of teenage pregnancies in the world (Dickson *et al*, 2000), many of which are probably unplanned (Dickson *et al*, 2002), it is highly possible that teenagers continue drinking in the early stages of pregnancy (Cornelius *et al.*, 1994; Jonathan *et al.*, 1997). The study done by Ebrahim *et al.* (1998) also found that "Students" were at high risk for "Any drinking" in pregnancy. Hence, the high proportion of teenagers who had drunk some alcohol in pregnancy among the clientele of midwives is consistent with trends generally seen in New Zealand and overseas. The very high percentage of drinking among teenage mothers is a matter of grave concern and illustrates the need to review legislative and education policies with some urgency.

6.3 Differences in the prevalence of drinking in pregnancy between women of various age groups:

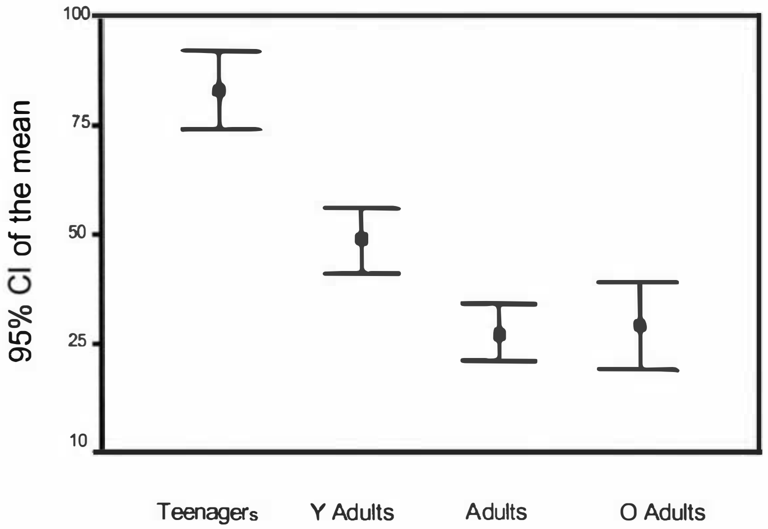
Overseas and New Zealand literature indicates that "Age" is a demographic variable that clearly demarcates drinking styles. Across all New Zealand studies among the non-pregnant population it is clear that the younger women were most at risk for heavy and binge drinking. Literature reviewed in Chapter 2 on foetal outcomes of maternal drinking is more conclusive on the adverse effects of heavy and binge drinking in pregnancy. The study by Watson and McDonald (1999) on a non-random sample of pregnant women of New Zealand indicates that the risk for younger women to continue this pattern of heavy drinking in pregnancy may be high. The results discussed above (Section 6.2) indicated that the prevalence of drinking among clients of midwives was different for different age groups, with the teenage group having a very high percentage of drinkers. Further analysis was undertaken to assess the significance of the differences of drinking between women of different age groups. Repeated measures analysis of variance on proportions of drinkers in different age groups was executed to achieve this and the confidence interval and the significance levels were adjusted for multiple comparisons using the Bonferroni method.

As seen in Figure 6.1, the mean proportion of teenagers drinking in pregnancy (82%) was significantly ($p = 0.000$) higher than all other age groups. The mean proportion of young adult pregnant drinkers (48%) was lower ($p = 0.000$) than the teenagers but was significantly higher than the adult (26%) ($p = 0.000$) and older adult (27%) drinkers ($p = 0.003$). There was no significant difference between the mean proportion of adult and older adult pregnant drinkers among the clientele of midwives.

Studies have differed in their findings of the age group of pregnant women most at risk for drinking in pregnancy. Some studies have documented the younger women to be most at risk (Stewart and Streiner, 1994; Serdula *et al*., 1991; Cornelius *et al*., 1994) whilst others (Bell and Lumley, 1989; Weiner *et al*., 1983) have reported the older women to be at risk for drinking in pregnancy. In the study by Counsell *et al*. (1994) on New Zealand women, compared to abstainers, women most likely to drink in pregnancy were older. However, in this study although the percentage of drinkers in each age group was reported, comparisons were not made that allowed the assessment of the statistical significance of differences in drinking between different age groups of pregnant women.

Figure: 6.1

Mean proportion of drinkers among pregnant women of different age groups



In a more recent New Zealand study (McLeod *et al.*, 2002), questions on alcohol consumption were asked of a self-selected group of pregnant women at 24 weeks of gestation. In this sample, women with tertiary education were more likely to have consumed alcohol in the preceding seven days. No information was given on the age group most likely at risk for drinking in pregnancy. Results from various studies differ probably due to the methodology adopted, questions asked and the period in pregnancy when the study was conducted. The results of the current research indicate that younger women are most likely to drink in pregnancy. If these younger women continue their pre-pregnancy drinking behaviour in pregnancy, then they are also in danger for drinking heavily or binge drinking in pregnancy.

6.4 Prevalence of drinking in the major regions of New Zealand:

The prevalence of drinking among the clientele of midwives in the major four regions of New Zealand was also investigated in the current research. Analysis of variance was executed to investigate whether there were any differences in the mean proportion of drinkers in the four major regions of New Zealand. Similar analysis was also executed on prevalence of drinking among various age groups of the four major regions of New Zealand. The results of these analyses are given in Table 6.2.

The mean proportion of teenagers having drunk any alcohol in pregnancy in the four regions of New Zealand ranged from 75% to 90%. The difference in the mean proportions of teenage drinkers in the four regions was not statistically significant (p = 0.294). The median proportion of pregnant teenagers having consumed any alcohol in pregnancy was lower than the mean proportion in the Upper and Central North Island by nearly 25% and was higher than the mean proportion in the Southern North Island and South Island by around 10%. These results indicate that the mean proportions of teenage drinkers in the upper and central North Island regions were biased by some midwives of this region having a higher proportion of teenage drinkers and vice versa for the southern North Island and South Island regions. These results also highlight the fact that 50% of midwives in the Southern North Island and South Island regions had nearly all teenage clients (99%) who had drunk some alcohol in pregnancy.

The mean proportions of young adults having consumed any alcohol in the four major regions of New Zealand ranged from 46% to 51%. There was no statistically significant difference (p = 0.983) in the mean proportions of young adult drinkers in the four regions of New Zealand. The median proportions in the upper and southern North Island and the south Island were lower than the mean proportions and that of the central North Island was marginally higher than the mean proportion. The median proportions of young adult drinkers in the southern North Island and the South Island regions were lower than the mean proportions by nearly 20% indicating that there were some midwives with higher proportions of young adult drinkers than other midwives of these regions.

The mean proportions of adult women having consumed any alcohol in pregnancy in the four major regions of New Zealand ranged from 16% to 31%. The difference in the mean proportions of adult drinkers in the four regions was not statistically significant (p = 0.271). The median proportion in all the three regions of the North Island was

Table 6.2

Prevalence of drinking in the major regions of New Zealand

Regions	Age group	N of midwives	Mean %	95% CI of mean	SEM (%)	Median %
Upper North Island	Teenagers	108	78.1	66.6 – 86.4	3.97	53.3
	Young adults	115	47.6	36.9 – 58.5	4.65	41.5
	Adults	116	29.3	22.0 – 38.0	4.22	24.9
	Older adults	109	18.3*	11.0 – 28.6	3.70	20.6
	All	121	36.9	30.4 – 44.1	4.38	30.7
Central North Island	Teenagers	39	75.9	55.7 – 88.8	6.84	53.3
	Young adults	39	46.1	30.5 – 62.5	7.98	50.0
	Adults	40	31.1	19.5 – 45.6	7.31	27.1
	Older adults	36	29.5	11.1 – 58.4	7.60	37.7
	All	43	41.6	30.3 – 53.9	7.51	41.7
Southern North Island	Teenagers	41	87.9	72.1 – 95.3	5.09	99.0
	Young adults	42	49.9	29.3 – 70.6	7.71	30.4
	Adults	43	28.3	12.2 – 36.5	6.86	27.1
	Older adults	35	58.1*	28.1 – 83.1	8.33	37.7
	All	44	35.5	23.8 – 31.9	7.05	29.6
South Island	Teenagers	40	90.6	72.3 – 97.3	4.61	99.0
	Young adults	47	51.5	25.1 – 77.0	7.28	37.7
	Adults	48	16.1	7.7 – 20.9	5.30	20.6
	Older a dults	41	36.4	12.3 – 69.2	7.51	20.6
	All	49	32.4	20.1 – 31.9	6.68	29.2

* $P = 0.04$

marginally lower than the mean proportion and that of the South Island was marginally higher than the mean proportion.

The mean proportions of older adults having consumed any alcohol in pregnancy in the four major regions of New Zealand ranged from 18% to 58%. The proportion of older adult drinkers in the southern North Island region was higher than all other regions and was significantly ($p = 0.040$) different from the upper North Island region. The median proportion of older adult drinkers in the upper and central North Island regions was marginally higher than the mean proportions. The median proportion of older adult drinkers from the southern North Island and the South Island regions was lower than the mean proportions by 15% to 20% indicating that the mean proportion of older adult drinkers in this region is biased by some midwives who had higher proportions of older adult drinkers than other midwives of this region.

The total mean proportions of drinkers in the four major regions of New Zealand ranged from 36% to 41%. The difference in the mean proportions of the four regions was not statistically significant ($p = 0.790$). The median proportions were marginally lower than the mean proportions in the upper and southern North Island regions and the South Island. The median proportion and the mean proportion of total drinkers in the central North Island was similar.

In ranking of the mean proportions with respect to age groups, teenagers had the first rank in all the 4 regions of New Zealand. Similarly, the mean proportion of young adults may be ranked second in all the four regions of New Zealand. The ranking of mean proportion of adults was third in the upper and southern North Island and was fourth in the southern North Island and South Island. The ranking of mean proportions of older adults was third in the southern North Island and South Island and fourth in the upper and central North Island. The pattern of ranking according to mean proportion of drinkers in the various age groups in all the four major regions of New Zealand is similar to that seen in all of New Zealand (Table 6.1).

6.5 Prevalence of drinking in the metropolitan and provincial regions of New Zealand:

The prevalence of drinking among the clientele of midwives in the metropolitan and provincial regions of New Zealand was investigated using analysis of variance. Similar analysis was also executed on prevalence of drinking among pregnant women of various age groups in the metropolitan and provincial regions. The results of these analyses are given in Table 6.3.

The mean proportion of teenagers in the provincial regions (88.8%) was higher (p = 0.012) than that in the metropolitan regions (73.3%) of New Zealand. The median proportion of teenage drinkers in the metropolitan region was 20% lower than the mean proportion and that of the provincial region was 10% higher than the mean proportion. The very high median proportion of teenagers (99%) in the provincial regions of New Zealand indicates that 50% of midwives in this region had almost all their teenage clients who had consumed some alcohol in pregnancy.

Table 6.3

Prevalence of drinking in the metropolitan and provincial regions of New Zealand

Type of city	Age group	N of midwives	Mean %	95% CI of mean	SEM (%)	Median (%)
Metropolitan	**Teenage**	114	73.3	60.3 –83.2	3.94	53.3
	Y Adults	127	47.9	36.8-59.2	4.28	37.7
	Adults	129	26.9	20.0-35.3	3.76	27.1
	O Adults	115	24.2	15.1- 36.6	3.74	20.6
	All	134	33.9	27.6 -40.9	3.97	29.4
Provincial	**Teenage**	113	88.8*	81.6 -93.4	2.97	99.0
	Y Adults	116	48.6	37.0 -60.5	4.70	37.7
	Adults	118	25.0	17.9 -33.8	4.07	20.9
	O Adults	106	31.7	18.0 -49.6	4.51	37.7
	All	122	40.5	33.3- 48.2	4.59	37.7

*** Significantly higher mean proportion of teenage drinkers in the provincial regions of New Zealand, p = 0.012**

The mean proportions of young adults (47.9% & 48.65; $p = 0.930$), adults (26.9% & 25.0%; $p = 0.731$) and older adults (24.2% & 31.7%; $p = 0.432$) consuming any alcohol in pregnancy in the metropolitan and provincial regions of New Zealand did not differ statistically. The median proportions of young adults drinking in pregnancy in both the metropolitan and provincial regions were lower than the mean proportions by 10%. The median and mean proportions of adult and older adult drinkers in both these regions were only marginally different. On ranking the mean proportions according to age groups, a similar pattern is seen as in the case of the four major regions of New Zealand (Table 6.2) and all of New Zealand (Table 6.1).

6.6 Prevalence of drinking according to type of midwifery practice:

Among midwives with client load some are independent midwives and others are hospital-based midwives. The study aimed at assessing whether the proportion of total drinkers and of various age groups differed according to the type of midwifery practice. The results of these analyses are given in Table 6.4. As seen in this table, the proportion of teenage (80.0% & 84.0%; $p = 0.549$), young adults (43.7% & 54.7%; $p = 0.190$), adults (24.8% & 27.9%; $p = 0.594$), older adults (29.9% & 24.3%; $p = 0.552$) and total (34.1% & 40.7%; $p = 0.198$) drinkers did not differ according to the type of midwifery practice. These proportions according to various age groups and total drinkers in both types of practices were similar to that seen in the whole sample (Table 6.1).

The median proportion of teenage drinkers in both types of practices was similar to the mean proportion. The median proportion of young adult drinkers was lower than the mean by 13% in the practices of independent midwives and was lower by less than 5% in the practices of hospital-based midwives. The median proportions of adult and older adult drinkers in both practices were only marginally different from the mean. The median proportion of total drinkers was lower than the mean by 10% in the practices of independent midwives and was lower by 4% in the practices of hospital-based midwives. The results of this analysis indicate that the prevalence of drinking did not differ according to the type of practice of midwives with client load.

Table 6.4

Prevalence of drinking according to type of midwifery practice with a client load

Type of practice	Age group	N of midwives	Mean (%)	95% CI of mean	SEM (%)	Median (%)
Independent	**Teenage**	141	80.2	69.6 – 87.8	3.35	82.7
	Y Adults	153	43.7	33.3 – 54.6	4.01	30.1
	Adults	158	24.8	18.2 – 32.9	3.77	20.6
	O Adults	141	29.9	18.5 – 44.6	3.57	31.7
	All	161	34.1	28.2 – 40.5	3.73	25.9
Hospital-based	**Teenage**	86	84.0	73.9 – 90.7	8.04	83.7
	Y Adults	90	54.7	42.4 – 66.5	5.24	50.0
	Adults	89	27.9	20.5 – 36.7	6.65	27.1
	O Adults	80	24.3	13.9 – 38.9	4.7	20.6
	All	95	40.7	32.8 – 49.2	5.04	36.3

6.7 Prevalence of drinking according to the personal opinion of midwives on alcohol consumption in pregnancy:

The second objective of the study was to assess the perceptions and knowledge of midwives on alcohol consumption in pregnancy. The results of analyses that aimed at achieving the above objective are dealt with in the following chapter (Chapter 7). As part of this endeavour, midwives were asked what their personal opinions were (Q 4c.) about alcohol consumption in pregnancy. An attempt was made in the current chapter to assess whether the personal opinions of midwives had any influence on the proportion of pregnant women who had drunk any alcohol in pregnancy among their clientele. The results of these analyses are given in Table 6.5 and indicate that personal opinion of midwives in pregnancy had a significant influence on the proportion of teenage, young adult and adult drinkers and total drinkers in the clientele of midwives. The mean proportions of teenage (75.8% & 91.1%; $p = 0.009$), young adults (39.7% & 68.8%; $p =$

0.001), adults (19.9% & 48.1%; p = 0.000) and total drinkers (31.9% & 51.7%; p = 0.000) were higher among the clientele of midwives who were lenient towards drinking than midwives who preferred to abstain in their own pregnancy. There was no significant difference (p = 0.198) in the mean proportion of older adult drinkers (24.5% & 38.7%) among these groups of midwives.

The median proportion of teenage drinkers among the clientele of midwives who had the personal opinion of abstinence in pregnancy was lower than the mean by about 20%. In the case of midwives who were lenient towards drinking in their own pregnancy, the median proportion of drinkers was marginally higher than the mean. The median proportion of young adult drinkers among midwives who were lenient to alcohol consumption in their own pregnancy was lower than the mean proportion by 18% indicating that the mean was biased by some midwives having a much higher proportion of drinkers in this age group than others.

Table 6.5

Prevalence of drinking according to the personal opinion of midwives on alcohol consumption in pregnancy

Personal opinion	Age group	N of Midwives	Mean %	95% CI of mean	SEM (%)	Median (%)
Abstain	Teenage	149	75.8	64.7 – 84.3	3.50	53.3
	Y Adults	160	39.7	30.4 – 49.8	3.86	30.4
	Adults	161	19.9	15.3 - 25.3	3.14	20.6
	O Adults	146	24.5	15.4 – 36.7	3.98	20.6
	All	167	31.9	26.6 – 37.7	3.60	27.5
Lenient[1]	Teenage	71	91.1*	84.4 – 95.1	3.37	99.0
	Y Adults	75	68.8*	55.9 – 79.2	5.34	50.0
	Adults	78	48.1*	34.7 – 61.9	5.65	50.0
	O Adults	69	38.7	21.7 – 59.0	5.86	37.7
	All	80	51.7*	41.7- 61.7	5.58	41.7

[1] **All midwives who were of the opinion that they may drink some alcohol in their own pregnancy**

*** Significantly different at $\alpha = 0.05$**

The median proportion of adult and older adult drinkers in the clientele of both groups of midwives was only marginally different from the mean proportions. The median proportion of total drinkers among the clientele of midwives who was of the opinion that they would abstain in their own pregnancy was only marginally lower than the mean proportion, whereas, that of the lenient group was lower by 10% than its mean proportion. Overall, these results indicate that the personal opinion of midwives on alcohol consumption in pregnancy had a significant influence on the proportion of drinking clients in their clientele. As there are no other studies that have assessed the effect of personal opinions of midwives or other health professionals on the prevalence of drinking, it is not possible to support this finding. It is also possible that midwives who were lenient to drinking in their own pregnancy were over-reporting the prevalence of drinking in their clientele. Hence this result need further testing to answer the question whether personal opinions of maternity care givers have any influence on the prevalence of drinking among their clientele.

6.8 Prevalence of drinking according to style of drinking among the clients of midwives:

Midwives were also asked the following question to elucidate the proportion of drinking pregnant women according to style of drinking in their clientele.

How many of your clients who consumed any beverage alcohol during pregnancy in the past year of your practice could be categorised as follows.

The categorisation of styles of drinking adopted in the current research was occasional drinking, regular drinking (Having a drink a day), heavy drinking (Having more than a drink a day), occasional binge drinking and regular binge drinking. It has to be stated at this point that no specific definition was provided to the midwives on what "Binge drinking" was. Based on personal discussions with midwives (see Chapter 4, Section 4.3.2) it was assumed that the midwives were familiar with this terminology.

The total mean proportion of clients who had some alcohol in pregnancy categorised according to their style of drinking (Table 6.6) was slightly lower (33.6% vs 36.8%) than that obtained from the different age groups (Table 6.1). However, statistically these two estimates are the same as they fall within the 95% confidence interval of each other and provides an internal validation for the estimates on total prevalence of drinking arrived at, in this research.

The majority of drinkers (~ 24%) among the clientele of midwives were occasional drinkers. A mean proportion of 7.3% of pregnant women among all clients of midwives were regular drinkers, usually consuming a glass of alcohol a day. A mean proportion of 4% of pregnant women among the clientele of midwives, who usually consumed more than a glass a day, could be classified as drinking heavily in pregnancy. A mean proportion of 8.8% of pregnant women among the clientele of midwives were occasional or regular binge drinkers. The median proportions of drinkers according to style of drinking were only marginally different from the mean proportions.

The results presented in the current research on styles of drinking, could not be compared to other New Zealand data, as such information was unavailable. Publications from the studies of Counsell *et al.* (1994) and Watson and McDonald (1999) are on frequency of drinking in pregnancy and not on style of drinking. However, with respect to drinking at intoxicating levels, Watson and McDonald (1999) reported 10% of pregnant women in the "*Nutrition during pregnancy*" study drank at intoxicating levels. This figure is close to the total of heavy (4%) plus occasional or binge drinkers (8.8%) in the present study.

Table: 6.6

Prevalence of various styles of drinking among all clients of midwives

Style of drinking	N of midwives	Mean %	95% CI of mean	SEM %	Median %
Occasional	229	23.7	17.3 - 24.7	2.82	22.1
Regular	120	7.3	5.6 - 9.6	2.37	9.6
Heavy	123	4.1	3.4 - 5.1	1.78	4.8
Occasional binge	159	5.1	4.4 – 5.9	1.74	5.5
Regular binge	144	3.7	3.1 – 4.4	1.57	3.9
All	226	33.6	29.5 – 37.9	3.14	35.4

In the current research, the methodology adopted to collect information on prevalence of drinking did not allow the investigation of the age groups most likely to adopt these styles of drinking in pregnancy. However, in the study by Watson and McDonald (1999) among women who were drinking at intoxicating levels, more women were below 25 years of age.

Drinking behaviour among the non-pregnant women of New Zealand shows a higher proportion of 15-25 year olds consumed 5 or more drinks per day and per occasion than the other age groups (Statistics NZ, 1998). Overseas studies have also associated binge drinking with pregnant teenagers (Jonathan *et al.*, 1997) especially at the time of conception and the first trimester of pregnancy (Cornelius *et al.*, 1993). A recent study has shown that a woman who starts drinking at 15 years or younger, which is highly prevalent in New Zealand, are more likely to be risky drinkers in pregnancy (Jones-Web *et al.*, 1999). A longitudinal study on a New Zealand cohort of children found that 75% of 8 and 9 year olds surveyed had already tried alcoholic drinks and a further 18% had taken sips of alcoholic drinks (Caswell *et al.*, 1983). Only 7% of the sample had not drunk any alcohol at that age. Follow-up of these children at 13-15 years showed that the proportion of abstainers (8%) among these adolescents was similar to the adult population of New Zealand. By 15 years, a change in drinking behaviour was observed especially among females, who adopted adult drinking patterns (Caswell *et al.*, 1991). Studies on non-pregnant women of New Zealand indicates that younger women of New Zealand are more likely to drink heavily (Caswell *et al.*, 1983; Wyllie & Caswell, 1989; Martin *et al.*, 1992; Dacey, 1995; Wyllie *et al.*, 1996; Statistics NZ, 1998) and the possibility of continuing this drinking behaviour in pregnancy is high as was seen in the study by Watson and McDonald (1999). Hence it is likely that younger women of New Zealand are more likely to exhibit risky drinking behaviours like bingeing in pregnancy.

6.9 Prevalence of various styles of drinking in the major regions of New Zealand:

The prevalence of various styles of drinking in the four major regions of New Zealand was investigated using analysis of variance. The results of these analyses are presented in Table 6.7. The mean proportion of total drinkers according to style of drinking in the four major regions of New Zealand ranged from 28% to 42%, and these differences in the mean proportions were not statistically significant. The median proportions of total drinkers were marginally higher than the mean proportions in the upper and southern North Island and that of the South Island was lower than the mean proportion. The median and mean proportion of total drinkers in the central North Island was similar.

The mean proportions of occasional drinkers in the four major regions of New Zealand ranged from 20% to 33%. The proportion of occasional drinkers in the southern North Island region was higher ($p = 0.050$) than the other two regions of the North Island. The median and mean proportions of occasional drinkers in the upper and central North Island was similar. However, the median proportion of occasional drinkers was marginally higher than the mean proportion in the southern North Island and that of the South Island was lower than the mean proportion by around 8%.

The mean proportions of regular drinkers (Have a drink a day) in the four major regions of New Zealand ranged from 3% to 16%. The difference in the mean proportion of regular drinkers in the southern North Island region and the South Island was statistically significant ($p = 0.015$). However, the number of midwives reporting regular drinkers from the Southern North Island region was only 16 and hence this significant difference should be interpreted with caution. The median proportions of regular drinkers in the regions of the North Island were higher than the mean proportions and that of the South Island was lower than the mean proportion.

The mean proportions of heavy drinkers (More than a drink a day) in the four major regions of New Zealand ranged from 3.4% to 4.8% and this difference was not statistically significant ($p = 0.651$). The median proportions of heavy drinkers were marginally higher than the mean proportions in all the four regions of New Zealand.

The mean proportions of occasional binge drinkers in the four major regions of New Zealand ranged from 3.3% to 6.0%. Differences in the mean proportions of occasional binge drinkers between the four regions were not statistically significant ($p = 0.223$). The median proportions of occasional binge drinkers were marginally higher than the mean proportions in all the four regions. The mean proportions of regular binge drinkers ranged from 2% to 4%. The proportion of regular binge drinkers in the upper North Island region differed significantly ($p = 0.026$) from that of the South Island. However,

Table 6.7

Prevalence of various styles of drinking in the major regions of New Zealand

Regions	Style of drinking	N of midwives	Mean %	95% CI of mean	SEM %	Median %
Upper North Island	Occasional	111	20.7	17.3 - 24.7	3.84	20.6
	Regular	60	7.3	5.2 – 10.1	3.35	11.6
	Heavy	61	4.4	3.3 – 5.8	2.62	4.9
	Occ[1] binge	81	3.9	4.4 – 6.5	2.15	5.5
	Regular binge	78	4.4*	3.5 – 5.6	2.32	3.9
	All	115	33.4	27.4 – 39.7	4.39	40.1
Central North Island	Occasional	38	20.7	15.9 - 26.4	6.57	20.6
	Regular	14	8.6	3.8 – 18.4	7.49	10.3
	Heavy	15	3.6	2.1 – 6.2	4.80	4.4
	Occ[1] binge	26	4.9	3.4 – 6.9	4.23	5.5
	Regular binge	21	2.6	1.9 – 3.8	3.47	3.9
	All	38	29.4	22.7 – 36.9	7.39	30.6
Southern North Island	Occasional	37	32.6*	22.9 - 43.9	7.70	35.3
	Regular	16	16.3*	6.5 – 35.3	9.23	17.8
	Heavy	18	4.8	2.9 – 7.8	5.03	5.5
	Occ[1] binge	26	6.0	4.1 – 8.6	4.65	6.3
	Regular binge	22	4.1	2.7 – 6.2	4.22	5.5
	All	38	42.9	32.3 – 54.2	8.02	45.1
South Island	Occasional	43	29.8	16.5 - 47.8	6.97	22.2
	Regular	30	3.4*	1.8 – 6.5	3.30	1.0
	Heavy	29	3.2	1.8 – 5.8	3.26	3.7
	Occ[1] binge	26	3.3	1.9 – 5.8	3.50	3.9
	Regular binge	23	2.1	1.3 – 3.5	2.98	1.0
	All	35	28.5	17.9 – 41.9	7.63	23.6

* $p < 0.05$; [1] Occasional

as the number of midwives in the South Island who had regular binge drinkers among their clientele was small (N = 23) this result is interpreted with caution. The median proportion of regular binge drinkers was marginally different from the mean proportions in all the four regions.

6.10 Prevalence of various styles of drinking in the metropolitan and provincial regions of New Zealand:

The prevalence of drinking according to style of drinking among the clientele of midwives was also investigated for metropolitan and provincial regions of New Zealand. The result of this analysis is given in Table 6.8. The total mean proportion of drinkers in the metropolitan region was 34% and in the provincial region was nearly

Table 6.8

Prevalence of various styles of drinking in the metropolitan and provincial regions of New Zealand

Type of city	Style of drinking	N of midwives	Mean %	95% CI of mean	SEM %	Median %
Metropolitan	**Occasional**	118	26.3	21.4-31.7	4.05	25.9
	Regular	72	6.5	4.5 - 9.3	2.90	9.6
	Heavy	72	4.1	3.1 - 5.2	2.33	4.4
	Occ[1] Binge	85	4.9	3.9 - 6.1	2.34	5.5
	Regular Binge	79	3.6	2.8 - 4.5	2.09	3.9
	All	119	34.1	28.1- 40.7	4.34	40.1
Provincial	**Occasional**	111	20.9	17.0 -25.3	3.85	15.7
	Regular	48	9.0	6.0 -13.2	4.13	11.7
	Heavy	51	4.2	3.0 - 5.8	2.80	4.9
	Occ[1] Binge	74	5.2	4.2 - 6.4	2.58	5.8
	Regular Binge	65	3.9	3.1 - 5.0	2.40	5.2
	All	107	32.9	27.6-38.7	4.54	33.1

[1] **Occasional**

33%. There was no statistically significant difference ($p = 0.791$) in the mean proportion of total drinkers in the metropolitan and provincial regions of New Zealand.

The median proportion of the total drinkers was similar to the mean proportion in the provincial region, but was higher by 6% in the metropolitan region. The mean proportions of occasional drinkers (26.3% & 20.9%; $p = 0.112$), regular drinkers (6.5% & 9.0%; $p = 0.257$), heavy drinkers (4.1% & 4.2%; $p = 0.844$), occasional binge drinkers (4.95 & 5.2%; $p = 0.714$) and regular binge drinkers (3.6% & 3.9%; $p = 0.617$) were similar and did not differ in the metropolitan and provincial regions of New Zealand. The median proportions according to the various styles of drinking were marginally higher than the mean proportions in all cases except for occasional drinkers in the provincial region of New Zealand, which was higher by 5% than the mean.

6.11 Prevalence of various styles of drinking according to type of midwifery practice:

The study also aimed at investigating the prevalence of various styles of drinking according to the type of midwifery practice. The results of this analysis are given in Table 6.9. Analysis of variance was executed on the mean proportions of various styles of drinkers among the clientele of independent and hospital-based midwives with client load. The results indicate that there were no differences in the mean proportions of regular drinkers (7.3% & 7.5%; $p = 0.938$), heavy drinkers (3.8% & 4.5%; $p = 0.408$), occasional binge drinkers (4.9% & 5.3%; $p = 0.624$), and total drinkers (31.9% & 36.0%; $p = 0.345$) in the clientele of independent and hospital-based midwives. However, there were marginal differences in the mean proportion of occasional drinkers (26.5% & 20.3%; $p = 0.067$), and regular binge drinkers (3.2% & 4.4%; $p = 0.054$) between these two types of midwifery practice. Independent midwives tended to have a higher proportion of occasional drinkers and hospital-based midwives tended to have higher proportion of regular binge drinkers in their practices.

Table 6.9

Prevalence of various styles of drinking according to type of midwifery practice with a client-load

Type of practice	Style of drinking	N of midwives	Mean %	95% CI of mean	SEM %	Median %
Independent	**Occasional**	143	26.5	21.7 – 31.9	3.69	20.6
	Regular	67	7.3	4.8 – 11.0	3.17	9.6
	Heavy	71	3.8	2.8 – 5.1	2.26	4.8
	Occ[1] Binge	95	4.9	3.9 – 6.1	2.34	2.2
	Regular Binge	83	3.2	2.4 - 4.1	1.93	3.9
	All	143	31.9	26.8- 37.4	3.89	32.9
Hospital-based	**Occasional**	83	20.3	16.6 – 24.6	4.41	23.4
	Regular	53	7.5	5.3 – 10.4	3.61	11.1
	Heavy	52	4.5	3.4 – 6.0	2.87	3.3
	Occ[1] Binge	64	5.3	4.2 – 6.5	2.80	5.5
	Regular Binge	61	4.4	3.6 – 5.5	2.62	3.9
	All	83	36.0	29.2 – 43.5	5.26	42.5

[1] **Occasional**

6.12 Prevalence of various styles of drinking in the clientele of midwives according to their personal opinion on alcohol consumption in pregnancy:

The current research also aimed at assessing the influence of personal opinion of midwives on drinking during pregnancy on the mean proportions of drinkers according to various styles in their practice. Question 4c asked midwives on their personal opinion about drinking in their own pregnancy. Detailed analysis with regard to this question is discussed in Chapter 7, and in this chapter an attempt was made to assess if this personal opinion had any influence on the proportion of clients with various drinking styles. This investigation was done using the analysis of variance and the results are given in Table 6.10. The results of this analysis indicate that there were no differences in the mean proportion of regular drinkers (6.4% & 8.9%; p = 0.259) and occasional binge drinkers (4.5% & 5.9%; p = 0.079) according to the personal opinion of midwives on alcohol consumption in pregnancy. However, there were significant differences in the mean proportion of occasional drinkers (20.9% & 29.1%), regular binge drinkers (3.2% & 4.9%) and total drinkers (28.0% & 47.7%) among midwives with different personal opinions on drinking in pregnancy.

Midwives with a personal opinion of "Abstinence" had a significantly lower proportion of occasional drinkers ($p = 0.032$), heavy drinkers ($p = 0.018$), regular binge drinkers ($p = 0.023$) and total drinkers ($p = 0.000$) than midwives who were "Lenient" towards drinking in their own pregnancy.

Table 6.10

Prevalence of various styles of drinking according to the personal opinion of midwives on alcohol consumption in pregnancy

Personal opinion	Style of drinking	N of midwives	Mean %	95% CI of mean	SEM %	Median %
Abstinence	**Occasional**	148	20.9	17.4 – 24.9	3.34	18.4
	Regular	75	6.4	4.5 – 9.1	2.82	9.3
	Heavy	76	3.4	2.6 – 4.4	2.07	3.9
	Occ[1] binge	96	4.5	3.8 – 5.4	2.11	4.9
	Regular binge	94	3.2	2.7 – 3.9	1.81	3.9
	All	149	28.0	22.4 – 32.9	3.67	29.5
Lenient[2]	**Occasional**	75	29.1*	22.6 – 36.6	5.24	24.4
	Regular	43	8.9	5.8 – 13.3	4.34	10.5
	Heavy	44	5.7*	4.0 – 8.1	3.49	6.3
	Occ[1] binge	58	5.9	4.5 – 7.9	3.09	6.3
	Regular binge	46	4.9*	3.4 – 7.3	3.18	4.9
	All	75	47.7*	40.0 – 55.3	5.76	44.6

[1] Occasional

[2] All midwives who were of the opinion that they may drink some alcohol in their own pregnancy

These results seem to indicate that the personal opinion of midwives has a significant influence on drinking in pregnancy and the style of drinking adopted in pregnancy. However, it is highly likely that there are other factors influencing the prevalence of style of drinking in pregnancy, which was not accounted for in this research. Nevertheless, the results of this study highlight the need to educate midwives on the deleterious effects of alcohol consumption in pregnancy and recommend abstinence as prudent advice since it has not been clearly established what a "Safe" level of consumption might be.

6.13 Prevalence of denial of drinking among the clientele of midwives:

Under reporting and denial of drinking are problems faced by researchers aiming at investigating the prevalence of drinking, especially among pregnant women. In the current research an attempt was made to assess the prevalence of denial of drinking among the clientele of midwives. An attempt was also made to investigate if this prevalence differed according to type and region of practice and according to the personal opinion of midwives on alcohol consumption in pregnancy. The results of these analyses are given in Table 6.11. Less than half of all midwives with client load (41%) had some clients who denied drinking in pregnancy. Overall a mean proportion of 6.8% of clients denied drinking in pregnancy. The median and mean proportion of total clients denying any drinking in pregnancy differed only marginally.

The mean proportion of clients who denied drinking among the practices of independent and hospital-based midwives did not differ significantly (p = 0.513) and ranged from 6% to 7%. The median proportions were only marginally different from the mean proportions. Similarly the mean proportions of pregnant women denying drinking among the clientele of midwives did not differ (p = 0.764) in the four major regions of New Zealand and ranged from 5% to 7%. However, there was a marginal difference (p = 0.056) in the mean proportion of pregnant women denying drinking among the clientele of midwives from the metropolitan and provincial regions of New Zealand. A higher proportion of clients from the provincial regions (8%) denied drinking than those from the metropolitan (6%) regions.

Table 6.11

Prevalence of denial of drinking according to various criteria among the clientele of midwives

Criteria		N of midwives	Mean %	95% CI of mean	SEM %	Median %
Type of practice	Independent	56	7.15	5.82 – 8.75	3.44	5.46
	Hospital-based	51	6.51	5.32 – 7.93	3.45	6.67
	Statistics			F = 0.430	p = 0.513	
Region of practice	U[1]. North Island	61	7.07	5.74 – 8.68	3.28	5.46
	C[2]. North Island	13	5.84	3.96 – 8.53	6.50	4.62
	S[3]. North Island	20	7.21	5.40 – 9.54	5.78	6.67
	South Island	13	5.96	4.42 – 7.99	6.56	5.71
	Statistics			F = 0.386	p = 0.764	
	Metropolitan	61	6.10	5.06 – 7.35	3.06	4.62
	Provincial	46	8.07	6.52 – 9.95	4.01	6.67
	Statistics			F = 3.725	p = 0.056	
Personal opinion	Abstain	70	6.28	5.27 – 7.43	2.89	5.46
	Lenient [4]	34	7.97	6.18 – 10.27	4.64	5.46
	Statistics			F = 2.511	p = 0.116	
Total		107	6.81	5.91 – 7.84	2.43	5.46

[1] Upper; [2] Central; [3] Southern; [4] All midwives who were of the opinion that they may drink some alcohol in their own pregnancy

On investigating whether the prevalence of denial of drinking in pregnancy differed according to the personal opinion of midwives on alcohol consumption in pregnancy, the results of this analysis indicate that there were no significant differences ($p = 0.116$). The results of these analyses indicate that denial of drinking is not prevalent in all the practices of midwives and where prevalent only a small proportion (less than 10%) of clients deny drinking in pregnancy.

6.14 Drinking prior to recognising pregnancy:

Drinking prior to recognising pregnancy is a danger faced by many women, especially among those women who had not planned a pregnancy. A majority of these women are likely to stop drinking on recognising pregnancy and prior to their first antenatal visit. There is no New Zealand literature on how many women drink prior to recognising pregnancy. However, the review of literature in Chapter 2 (Section 2.4) has shown that the periconceptional period is a vulnerable period for the growing foetus in relation to alcohol exposure.

Personal discussions with midwives suggested that many pregnant women confide in their midwife of having drunk alcohol prior to pregnancy recognition. As the current research aimed to assess this prevalence, midwives were asked the following question:

What number of your clients in the past year reported having consumed any beverage alcohol before realising they were pregnant?

Midwives were asked to tick an appropriate range according to their clients' style of drinking. Personal discussions with midwives indicated that when their clients report having consumed some alcohol prior to recognising pregnancy, they usually also reported that they had drunk an occasional glass or had binged at a party. Hence three options namely, "Occasional", "Regular" and "Binge" drinking were provided under this question.

A mean proportion of 12.5 % (Table 6.12) of pregnant clients of midwives reported having drunk some alcohol prior to pregnancy recognition. However, it should be noted that this estimate is of those clients who confided in their midwife and is also likely to be subjective, as midwives do not usually record this information. Consequently, this estimate is much lower than that recorded in overseas literature. An overseas cross-sectional survey reported 45% of pregnant women were periconceptional drinkers (Floyd *et al.*, 1999) and a case-control study reported an average of 40% of pregnant women were periconceptional drinkers (Shaw and Lammer, 1999).

Table 6.12

Clients reporting having drunk alcohol prior to recognising pregnancy

Type of drinkers	N of midwives	Mean %	95% CI of mean	SEM %	Median %
Occasional	228	19.1	16.8 – 21.7	2.75	20.6
Regular	157	8.1	6.9 – 9.5	2.17	9.8
Binge	178	5.6	4.9 – 6.5	1.72	4.0
All	242	12.5	8.6 – 17.7	2.39	10.1

Nearly one-fifth of all pregnant women among the clientele of midwives reported having drunk alcohol "Occasionally", prior to recognising pregnancy. Over 8% reported having consumed alcohol "Regularly" and nearly 6% reported having "Binged" prior to recognition of pregnancy. Further analysis of the data from the "*Nutrition during Pregnancy*" study (part of the current research discussed in Chapter 10) showed that 45.8% of all pregnant women in that study continued to drink in the early stages of pregnancy. The results of this research and overseas studies highlight the need for midwives and other health professionals to record this information, as the foetus is highly vulnerable to damage caused by alcohol during this period.

6.15 High risk pregnant women of New Zealand:

Overseas studies have indicated that women opting out of prenatal care are likely to be heavy drinkers (Weiner *et al*., 1983; Fanden *et al*., 1997). In the study by Weiner *et al.* (1983) a quarter of all women who delivered with no prenatal care and those who registered for care after the 38th week were heavy drinkers. In New Zealand no statistics are available on the number of women who opt out of prenatal care or their drinking habits. However, personal discussions with midwives suggested that they do encounter pregnant women who do not register for prenatal care but arrived at the hospital just to deliver the baby. Personal discussions with midwives also suggested that they encounter some pregnant women who give birth while heavily intoxicated. The objective of the following question was to assess the encounter of midwives with such women and their most likely type of antenatal care. The question asked was:

Do you see women giving birth while heavily under the influence of alcohol? If Yes, from your knowledge please comment on the most likely type of antenatal care these women would have received during their pregnancy.

As the above question did not ask information on the clientele of midwives, responses of all midwives who participated in the question (N = 398) were analysed. The result of this analysis is given in Table 6.13. Twenty percent of all midwives reported having seen women giving birth under the influence of alcohol in the year prior to the study.

Table 6.13

Women giving birth under the influence of alcohol

Regions	Proportion of midwives*	Cases in the past year Mean ± S D
Upper North Island	63.8	2.6 ± 1.9
Central North Island	10.0	2.0 ± 0.0
Southern North Island	17.5	2.4 ± 1.8
South Island	8.8	1.4 ± 0.9
Statistics	$\chi^2 = 10.508$	$F = 0.988$
	$p = 0.015$	$p = 0.403$
Metropolitan	18.2	2.7 ± 2.2
Provincial	22.5	2.1 ± 1.1
Statistics	$\chi^2 = 1.137$	$F = 1.953$
	$p = 0.173$	$p = 0.166$

*** Proportion of midwives who had seen women giving birth while heavily under the influence of alcohol.**

On executing chi-square analysis, it was found that, among midwives who had seen such cases, more midwives were from the upper North Island (p = 0.015). Similar analysis indicated the proportion of midwives who had seen such cases in the metropolitan and provincial regions did not differ significantly (p = 0.173). Those midwives who had seen women giving birth under the influence of alcohol were also asked how many such cases had they seen in the year preceding the survey. Analysis of variance indicated that there were no significant differences in the mean number of cases seen during the year prior to the survey, among these regions ($p = 0.403$) or in the metropolitan and the provincial regions ($p = 0.166$) of New Zealand.

The comments of midwives on the most likely type of antenatal care of women who gave birth heavily under the influence of alcohol was a “Few” women in each of the three categories which were, “No antenatal care”, “Some antenatal care” and “Full antenatal care”. The estimates obtained here indicate that there are areas in New Zealand, notably the upper North Island, where there may be a higher prevalence of women who are heavy drinkers with some opting out of antenatal care. These women will be at a particularly higher risk for having an alcohol-affected child.

6.16 Conclusions:

The results of this study indicate that a mean proportion of 36.8% (SEM 3%) of pregnant women among the clientele of midwives consumed some alcohol in pregnancy. With respect to age groups, a greater proportion of teenagers (82%) and young adults (48%) had consumed some alcohol in pregnancy compared to adults (26%) and older adults (27%) in the clientele of midwives. There were no statistically significant differences in the mean proportions of total drinkers and according to age groups in the four major regions of New Zealand. However, in comparing the prevalence of drinking in the metropolitan and provincial regions of New Zealand, a higher proportion of teenagers from the provincial regions in comparison to the metropolitan regions of New Zealand had drunk some alcohol in pregnancy. Literature in Chapter 3 indicates that younger women of childbearing age are at risk for heavy and binge drinking. Overseas literature also indicates that these women, especially teenagers, are at risk for continuing this behaviour into the early stages of pregnancy. As literature documented in Chapter 2 is conclusive on the deleterious effects of heavy and binge drinking in pregnancy on the foetus, the results of this study indicate that younger women of New Zealand are at risk for having alcohol affected children. The situation becomes even more serious when one considers the fact that New Zealand has the second highest rate of teenage pregnancy in the world (Dickson *et al.*, 2000).

An interesting finding of this research was that midwives with a personal opinion of abstinence in their own pregnancy had significantly lowered proportions of teenage, young adult, adult and total drinkers in their clientele. Similarly, they also had lowered proportions of heavy and regular binge drinkers than those who were lenient towards drinking in their own pregnancy. These results seems to indicate that midwives who were of the opinion that abstinence was best in pregnancy were likely to have a positive influence on their clientele with regard to the issue of alcohol consumption in pregnancy. However, these results are not conclusive in nature as it is possible for midwives who were lenient towards some drinking in pregnancy may have over-reported on the prevalence of drinking among their clientele. It is also likely that there are several other factors that influence drinking styles in pregnancy, which have not been addressed in the current research.

Although a majority of drinkers among the clientele of midwives were occasional drinkers, nearly 15% of all pregnant women in the midwives' clientele were drinking at levels currently perceived to be harmful in pregnancy. However, in view of a recent study that has shown that children exposed to any alcohol were 3.2 times more likely to suffer from delinquent behaviour than children who were not prenatally exposed to alcohol (Sood *et al*., 2001), all women who drink in pregnancy may be at risk of having an alcohol-affected child.

The results of the current study on the prevalence of drinking prior to recognition of pregnancy among the clientele of midwives are likely to be subjective and under-estimated. However, it highlights the need to record this information by all health professionals, as literature reviewed in Chapter 2 indicates that in the periconceptional period the foetus is highly vulnerable to the effects of alcohol. The current study also highlights the prevalence of high-risk women who may be abusers of alcohol especially in the upper North Island regions of New Zealand. It also indicates that some of these women may opt out of prenatal care in pregnancy. However, further research is essential to assess the actual statistics of women who opt out of prenatal care, their drinking status in pregnancy and the related outcomes of pregnancy.

Chapter - 7: Results and Discussion, Objective: 2

Attitudes and Knowledge of Midwives on Alcohol Consumption in Pregnancy

7.1 Introduction:

Literature reviewed in Chapter 3 (Jones-Webb *et al.*, 1999; Hilton & Condon, 1989; Ihlen *et al.*, 1993) suggests that primary maternity caregivers can play a role in preventing alcohol related effects. However, studies have also shown that primary maternity caregivers can be reluctant to discuss the issue of alcohol consumption in pregnancy (Morse & Hutchins, 2000) and their attitudes, knowledge and beliefs can influence their decision to counsel their patients on particular health issues (Green *et al.*, 1988). In New Zealand midwives are the most popular lead maternity caregivers, providing care for more than half of all pregnancies (Guilliland, 1998). Their non-clinical style of practice may enable them to play an effective role in preventing the prevalence of alcohol related effects in New Zealand. However their attitudes and knowledge on the issue of alcohol in pregnancy have not been assessed, which may be important to equip them to play an effective role in preventing the prevalence of alcohol related effects in New Zealand.

The current research aimed to assess the attitudes and knowledge of midwives on issues associated with drinking in pregnancy. To achieve the above objective, this research endeavoured to assess whether midwives were aware of outcomes associated with maternal drinking, and their knowledge on the role of alcohol in pregnancy on both a personal and professional level. The study also investigated whether there was any relationship between the personal opinions of midwives on alcohol consumption during pregnancy and their attitudes towards the role of alcohol in pregnancy as professionals. The current research also endeavoured to assess the perception of midwives of any "Safe type" of alcohol in pregnancy and the effect of their personal opinion on alcohol consumption in pregnancy on this perception. Finally, the perception of midwives of certain tools being useful to effectively communicate with clients on issues of alcohol in pregnancy was assessed. As the response rate of midwives to the number of questions

Table 7.1
Number of midwives who responded to the various questions asked to achieve the second objective of the study (Total N = 445)

Question		Table Number	N of midwives
Awareness of FAS and ARE		7.2	
	Awareness of FAS		439
	Awareness of ARE		429
Personal opinions of midwives		7.3	431
Personal opinions according to type and region of practice		7.4	431
Professional opinions		7.5a	
	Throughout pregnancy		425
	First trimester		433
	Second trimester		432
	Third trimester		431
Total abstinence versus lenience		7.5b	433
Units of alcohol considered safe in the second trimester of pregnancy			
	Per occasion	7.6a	80
	Per week	7.6b	76
Units of alcohol considered safe in the third trimester of pregnancy			
	Per occasion	7.7a	100
	Per week	7.7b	86
Professional opinions for various reasons		7.8	
	While socialising		433
	For relaxation		433
	Prevent premature labour		432
	Stout beer		436
	Induce delayed labour		433
Units of alcohol considered safe while socialising in pregnancy			
	Per occasion	7.9a	112
	Per week	7.9b	73
Effect of personal opinion on professional opinion		7.10	
	First trimester		423
	Second trimester		422
	Third trimester		421
Beer, wine and spirits as safe type of alcohol in pregnancy		7.11	
	Beer		428
	Wine		429
	Spirits		429

Table 7.1
Number of midwives who responded to the various questions asked to achieve the second objective of the study (Total N = 445) continued

Question		Table number	N of midwives
Units of beer considered safe			
	Per occasion	7.12a	107
	Per week	7.12b	82
Units of wine considered safe			
	Per occasion	7.13a	144
	Per week	7.13b	98
Effect of personal opinion on safe type of alcohol		7.14	414
Tools for effective intervention		7.15	
	Education of midwives on alcohol in pregnancy		432
	Knowledge on how much alcohol is safe		426
	Training in effective communication		419
	Training in identifying symptoms in infants		426
	Education of mothers		437
Education of midwives		7.16a	432
Knowledge of safe amount of alcohol according to type and region of practice		7.16b	426
Training in effective communication		7.16c	419
Training in identifying symptoms		7.16d	426
Education of mothers		7.16e	437

asked to achieve this objective of the study differed, this information has been tabulated in Table 7.1.

7.2 Awareness of foetal alcohol syndrome and other alcohol related effects:

At the outset, midwives were asked if they had heard of foetal alcohol syndrome and other alcohol related effects before participating in the current survey.

Q 4a & 4b. Had you heard of foetal alcohol syndrome and other alcohol related effects before receiving this survey?

Nearly all (99.8%) midwives had heard of foetal alcohol syndrome but only around 80% had heard of other alcohol related effects prior to this study. It should be mentioned at this point that the current study did not investigate any further, as to how much the midwives knew about the above-mentioned manifestations of drinking in pregnancy. An attempt was made in the pilot study to assess the knowledge of midwives on what they knew about symptoms of other alcohol related effects (q 2.d) but was abandoned as this question was not attempted by the majority of midwives who participated in the pilot studies. Hence the high percentage of midwives who had heard about foetal alcohol syndrome and other alcohol related effects does not necessarily mean that they have detailed knowledge of the same.

The current research investigated whether the proportion of midwives who were aware of foetal alcohol syndrome and other alcohol related effects, differed according to type and region of practice. The results of these analyses are given in Table 7.2. Awareness of foetal alcohol syndrome did not differ according to type of midwifery practice (p = 0.470), in midwives of the four major regions (p = 0.788) and the metropolitan and provincial regions (p = 0.551) of New Zealand.

Similarly, awareness of other alcohol related effects did not differ according to type of midwifery practice (p = 0.123). However, among midwives who had heard of other alcohol related effects, a lesser proportion (p = 0.052) of midwives were from the central North Island region and the South Island. Awareness of other alcohol related effects did not differ (p = 0.373) in midwives from the metropolitan and provincial regions of New Zealand.

Table 7.2

Awareness of foetal alcohol syndrome and other alcohol related effects according to type and region of practice

	Practice	Heard of foetal alcohol syndrome (%)		Heard of other alcohol related effects (%)	
		Yes	No	Yes	No
Type	Independent	99.4 (174)	0.6 (1)	83.6 (143)	16.4 (28)
	HB[1] with client load	100 (106)	0	82.9 (87)	17.1(18)
	HB[1] without client load	100 (158)	0	75.2 (115)	24.8 (38)
	Statistics	$\chi^2 = 1.152$	$p = 0.470$	$\chi^2 = 4.197$	$p = 0.123$
Region	Upper North Island	99.5 (213)	0.5 (1)	84.6 (176)	15.4 (32)
	Central North Island	100 (55)	0	74.5* (41)	25.5 (14)
	Southern North Island	100 (87)	0	82.4 (70)	17.6 (15)
	South Island	100 (83)	0	71.6* (58)	28.4 (23)
	Statistics	$\chi^2 = 1.054$	$p = 0.788$	$\chi^2 = 7.729$	$p = 0.052$
	Metropolitan	99.6 (241)	0.4 (1)	81.2 (190)	18.8 (44)
	Provincial	100 (197)	0	79.5 (155)	20.5 (40)
	Statistics	$\chi^2 = 0.816$	$p = 0.551$	$\chi^2 = 0.197$	$p = 0.373$
	All midwives	99.8 (438)	0.2 (1)	80.4 (345)	19.6 (84)

[1] Hospital based; Figures in parenthesis are the number of midwives.

The results of this study indicate that a greater proportion of midwives are aware of the most severe manifestation of alcohol abuse during pregnancy, namely foetal alcohol syndrome. This may not be just peculiar to midwives of New Zealand. As evident from a plethora of literature on foetal alcohol syndrome, one can say in general that health professionals and researchers are more preoccupied with this extreme condition associated with alcohol abuse during pregnancy. However, literature to-date does not state a safe level of drinking and the studies reviewed in Chapter 2 indicate a dose-dependent effect of alcohol on the developing brain of the foetus. It is imperative that midwives and other maternity caregivers of New Zealand are made fully aware of the spectrum of disorders associated with maternal drinking.

7.3 Personal opinions of midwives on drinking during pregnancy:

To assess the personal opinions of midwives, they were questioned as to the role they would consider for alcohol in their own pregnancy (Q 4c). This was a close-ended question, with an option for including responses other than that was given and achieved a good response rate with only 3% of midwives not participating.

The responses of midwives according to probable drinking behaviour in their own pregnancy are shown in Table 7.3. The majority of midwives (64.5%) said they would abstain from alcohol if they were pregnant and overall, only about 33% said they might drink some alcohol during their pregnancy. About 14% of midwives were likely to drink less than once a month and about 6% once a month. Nearly 5% of midwives said that they would consume alcohol once a week. Only 1 midwife said that she would drink a glass of alcohol every day and no midwives used the option of "Have more than a drink a day".

Midwives who did not choose the close-ended options, but gave their own response were included under the "Others" category. This category included "Frequent wine drinkers", " Abstain first trimester and drink half a glass of wine per week", " Drink ½ to 3 glasses of wine per week in the third trimester", "Social drinking and "Occasional drinking".

Table 7.3

Personal opinions of midwives on the role of alcohol in their own pregnancy

Options	N of midwives	Proportion of midwives
Abstain totally from alcohol	287	64.5
Have a drink less than once a month	62	13.9
Have a drink once a month	26	5.8
Have a drink a week	21	4.7
Have a drink a day	1	0.2
Have more than a drink a day	0	0
Others	34	7.6
Did not answer	14	3.1
Total	**445**	**100**

The study also investigated whether the personal opinions of midwives differed according to type and region of practice using chi-square analysis. For the purpose of this analysis and all further analysis using the personal opinions of midwives, all midwives who said they would drink some alcohol in pregnancy were categorised as the "Lenience" group and those midwives who said they would abstain in pregnancy were categorised as the "Abstinence" group. The results of the analyses that investigated whether there was an association between personal opinions of midwives according to type and region of practice are given in Table 7.4.

There was no statistically significant (p = 0.586) association between the type of practice and the personal opinions of midwives on alcohol consumption in pregnancy. The proportion of midwives who said they would abstain from alcohol in their own pregnancy according to type of practice ranged from 65% to 71% and those who said they would be lenient towards alcohol consumption in their own pregnancy ranged from 32% to 35%.

Table 7.4

Personal opinion of midwives according to type and region of practice

	Practice	Abstinence (%)	Lenience (%)	Statistics
Type	Independent (171)	64.9	35.1	$\chi^2 = 1.069$
	HB[1] with client load (103)	70.9	29.1	$p = 0.586$
	HB[1] without client load (156)	67.9	32.1	
Region	Upper North Island (207)	68.6	31.4	$\chi^2 = 1.704$
	Central North Island (55)	69.1	30.9	$p = 0.636$
	Southern North Island (85)	69.4	30.6	
	South Island (83)	61.4	38.6	
	Metropolitan (237)	63.7	36.3	$\chi^2 = 3.344$
	Provincial (193)	72.0*	28.0	$p = 0.042$
	All midwives (431)	67.4	32.6	

[1] Hospital based; Figures in parenthesis are the number of midwives

Similarly there was no significant ($p = 0.636$) association between the personal opinions of midwives and their region of practice. The proportion of midwives, who said they would abstain in their own pregnancy according to their region of practice ranged from 61% to 69% and those who were lenient towards drinking, ranged from 31% to 39%. However, a higher proportion (72%) of midwives from the provincial regions of New Zealand said they would abstain in pregnancy ($p = 0.042$) in comparison to the proportion (63.7%) of midwives from metropolitan regions of New Zealand.

7.4 Professional opinions of midwives towards drinking in pregnancy:

The current research also endeavoured to assess the professional opinions of midwives on the role of alcohol in the various trimesters of pregnancy and for various other reasons in pregnancy.

Q 4e. As a professional, what role do you think alcohol could play in the lives of pregnant women?

The periods of pregnancy listed under this question were "Through out pregnancy", "First trimester", "Second Trimester" and "Third trimester" of pregnancy. The objective of including "Through out pregnancy" as a separate option was simply to assess if midwives perceived that there may be a vulnerable period in pregnancy when maternal alcohol consumption was more harmful to the foetus. These questions were dichotomous in nature with a "Yes" and "No" option provided against each period. Those midwives who answered, "Yes" for any period of pregnancy were also asked to indicate the number of units that they perceived to be safe per occasion and per week.

Overall, this question was answered by 99% (N = 441) of midwives. A high proportion (Table 7.5a) of midwives perceived that alcohol had no role to play in all the trimesters of pregnancy. These proportions were highest for first trimester and decreased considerably in the second and third trimester with close to 30% of midwives perceiving that alcohol could play some role in the third trimester of pregnancy.

Table 7.5a

Professional opinions of midwives towards drinking in pregnancy

Period	N of midwives	No % (N)	Yes % (N)
Throughout Pregnancy	425	91.5 (389)	8.5 (36)
First Trimester	433	95.6 (414)	4.4 (19)
Second Trimester	432	77.5 (335)	22.5 (97)
Third Trimester	431	71.7 (309)	28.3 (122)

On further analysis it was found that although 8.5% (N = 36) of midwives (Table 7.5a) considered drinking throughout pregnancy to be safe, only 4% (N = 16) of midwives (Table 7.5b) actually ticked "Yes" against the role of alcohol in all the three trimesters and 71% (312) of midwives ticked "No" against the role of alcohol in all the three trimesters. This result indicates that only a negligible proportion of midwives perceived that there was no vulnerable period in pregnancy when maternal alcohol consumption was more harmful for the foetus. Nearly 19% (81) of midwives considered drinking some alcohol in the second and third trimesters to be safe whilst 6% (26) of midwives considered only the third trimester to be safe for alcohol consumption.

Table 7.5b

Total abstinence versus lenience in the various trimesters of pregnancy (N = 433)

Professional opinions	Proportion of midwives % (N)
Recommend total abstinence	71.7 (311)
Safe to drink only in the third trimester	6.0 (26)
Safe to drink in second and third trimester	18.6 (81)
Safe to drink through-out pregnancy	3.7 (15)

Midwives who were lenient towards alcohol consumption in the various trimesters of pregnancy were also asked to indicate the units of alcohol per occasion and per week perceived to be safe. As the proportions of midwives who were lenient towards drinking “Throughout pregnancy” and the “First trimester” of pregnancy were small, no other investigations was executed. However, as a considerable number of midwives were lenient towards drinking in the second and third trimester, analysis of variance was carried out to investigate whether the units of alcohol perceived to be safe for consumption per occasion and per week in the second and third trimesters of pregnancy, differed according to type and region of practice.

The results of the above analyses are given in Table 7.6a. Although 97 midwives (Table 7.5) were lenient towards drinking in the second trimester of pregnancy, only 80 midwives actually indicated the number of units of alcohol that they perceived to be safe per occasion in the second trimester of pregnancy. Overall, midwives perceived a mean of 1 unit with a minimum of 0.5 units and a maximum of 2 units of alcohol to be safe to consume per occasion in the second trimester of pregnancy. There were no statistically significant differences between the mean units of alcohol perceived to be safe per occasion in the second trimester of pregnancy, according to type of practice ($p = 0.117$), by midwives in the 4 major regions of New Zealand ($p = 0.783$) and in the metropolitan and provincial regions ($p = 0.293$) of New Zealand.

Similar analysis as above was done to investigate whether the units of alcohol perceived by midwives to be safe per week in the second trimester of pregnancy, differed according to type and region of practice. The results of these analyses are given in Table 7.5b. Although 97 midwives (Table 7.5) were lenient towards drinking in the second trimester of pregnancy, only 76 midwives actually indicated the number of units of alcohol that they perceived to be safe per week, in the second trimester of pregnancy.

Table 7.6a

Perceptions of midwives on units of alcohol considered safe per occasion in the second trimester of pregnancy

	Practice	N	Mean	95% CI	Min	Max
Type	Independent	33	1.0	0.96 – 1.08	0.5	1.5
	HB[1] with client load	23	1.0	0.90 – 1.14	0.5	2.0
	HB[1] without client load	24	1.2	1.01 – 1.29	0.75	2.0
	Statistics		$F = 2.205$	$p = 0.117$		
Region	Upper North Island	34	1.1	0.98 – 1.91	0.5	2.0
	Central North Island	15	1.1	0.97 – 1.16	1.0	1.5
	Southern North Island	14	1.0	0.80 – 1.19	0.5	2.0
	South Island	17	1.1	0.97- 1.14	1.0	1.5
	Statistics		$F = 0.359$	$p = 0.783$		
	Metropolitan	44	1.1	1.00 – 1.17	0.5	2.0
	Provincial	36	1.0	0.94 – 1.11	0.5	2.0
	Statistics		$F = 0.079$	$p = 0.293$		
	All midwives	80	1.1	1.00 – 1.12	0.5	2.0

[1] Hospital based

This result indicates that not all midwives who perceive drinking in the second trimester as safe were of the opinion that weekly drinking in the second trimester is safe. The mean number of units perceived safe per week by those midwives who responded was

1.5 with a minimum of 0.5 units and a maximum of 3.5 units. Two midwives perceived 10 units and 1 midwife each perceived 5 and 7 units to be safe per week in the second trimester of pregnancy. Data from these 4 midwives were treated as outliers and were not included in the above analysis.

Analysis of variance on the units of alcohol perceived to be safe per week in the second trimester of pregnancy by midwives indicated that there were differences according to the type of midwifery practice. The mean number of units perceived to be safe for consumption per week by the hospital-based midwives with client load was significantly (p = 0.035) higher than that of hospital-based midwives without client load. However, it should be noted that the number of midwives in each type of practice was small and hence this result is interpreted with caution.

Table 7.6b

Perceptions of midwives on units of alcohol considered safe per week in the second trimester of pregnancy

	Practice	N	Mean	95% CI	Min	Max
Type	**Independent**	31	1.5	1.14 – 1.75	0.5	3.5
	HB[1] with client load	18	1.9*	1.14 – 2.14	1.0	3.5
	HB[1] without client load	27	1.3	0.98 – 1.5	0.5	3.5
	Statistics		***F = 3.503***	***p = 0.035***		
Region	**Upper North Island**	33	1.6	1.28 – 1.86	0.5	3.5
	Central North Island	15	1.6	1.08 – 2.18	0.5	3.5
	Southern North Island	13	1.1	0.86 – 1.36	0.5	2.0
	South Island	15	1.6	0.96 - 2.16	0.5	3.5
	Statistics		***F = 1.082***	***p = 0.362***		
	Metropolitan	46	1.5	1.20 – 1.73	0.5	3.5
	Provincial	30	1.6	1.25 – 1.87	0.5	3.5
	Statistics		***F =0.235***	***p = 0.630***		
	All midwives	76	1.5	1.30 – 1.70	0.5	3.5

[1] **Hospital based**

The minimum number of units per week was also highest among this group of midwives. However, the perceptions of a safe number of units of alcohol in the second trimester of pregnancy among midwives of all three types of practice are well within the recommendations of the RCOG (UK).

There were no statistically significant differences in the mean units of alcohol perceived to be safe in the second trimester among midwives of the 4 major regions ($p = 0.362$) and of the metropolitan and provincial regions ($p = 0.630$) of New Zealand. On observing the data in Tables 7.6a and 7.6b, it is clear that the mean units perceived by midwives to be safe per occasion and per week is similar indicating that majority of midwives perceive about 1 drink per occasion and per week to be safe in the second trimester of pregnancy.

Similar analysis was executed to investigate whether the perceptions of midwives on a safe number of units of alcohol per occasion in the third trimester differed according to type and region of practice. The results of these analyses are given in Table 7.7a. Although 122 midwives indicated that alcohol consumption in the third trimester was safe (Table 7.5), only 100 midwives gave information on how many units of alcohol they perceived to be safe for consumption per occasion. The overall minimum unit stated as safe was 0.5 and the maximum was 2.0 per occasion.

There was significant difference in the mean number of units perceived to be safe for consumption per occasion in the third trimester, according to type of practice. The number of units perceived to be safe by independent midwives was lower than that of hospital-based midwives without client load ($p = 0.049$). There was no difference ($p = 0.667$) in the mean number of units perceived to be safe by midwives with client load, ie independent and hospital-based. There were no differences in the mean number of units perceived to be safe to be consumed per occasion in the third trimester by midwives of the 4 major regions ($p = 0.769$) and the metropolitan and provincial regions ($p = 0.339$) of New Zealand.

Similar analysis was done to investigate whether there was any difference in the mean number of units perceived to be safe for consumption per week in the third trimester of pregnancy, according to type and region of practice. The results of these analyses are given in Table 7.7b. Although 122 midwives indicated that alcohol consumption in the third trimester is safe (Table 7.5), only 86 midwives gave information on how many units of alcohol they perceived to be safe for consumption per week. The overall minimum unit stated as safe was 0.5 and the maximum was 3.5 units per week. Two midwives perceived 10 units, 1 midwife perceived 7 units and 2 midwives perceived 5 units to be safe to consume per week in the third trimester of pregnancy. The information provided by these midwives was treated as outliers and was not included in the above analysis.

Table 7.7a

Perceptions of midwives on units of alcohol considered safe to consume per occasion in the third trimester of pregnancy

	Practice	N	Mean	95% CI	Min	Max
Type	**Independent**	44	1.0*	0.89 – 1.02	0.5	1.5
	Hospital based with client load	22	1.1	0.93 – 1.16	0.5	2.0
	Hospital based without client load	34	1.1	0.99 – 1.22	0.5	2.0
	Statistics		$F = 3.107$	$p = 0.049$		
Region	**Upper North Island**	48	1.1	0.96 – 1.14	0.5	2.0
	Central North Island	16	1.0	0.85 – 1.08	0.5	1.5
	Southern North Island	14	1.0	0.85 – 1.21	0.5	2.0
	South Island	22	1.0	0.94- 1.11	0.5	1.5
	Statistics		$F = 0.378$	$p = 0.769$		
	Metropolitan	57	1.1	0.97 – 1.12	0.5	2.0
	Provincial	43	1.0	0.92 – 1.07	0.5	2.0
	Statistics		$F = 0.922$	$p = 0.339$		
	All midwives	100	1.0	0.97 – 1.08	0.5	2.0

There were no statistically significant differences between the mean number of units perceived to be safe for consumption per week in the third trimester of pregnancy by midwives of the 4 major regions (p = 0.446) and the metropolitan and the provincial (p = 0.106) regions of New Zealand. However, there was a significant (p = 0.018) difference in the perception of hospital-based midwives with client load and hospital based midwives without client load. Hospital based midwives with client load perceived a marginally higher number of units of alcohol as safe than the other group of midwives. The number of midwives in these two groups was small and hence the result needs to be interpreted with caution. Moreover, the units perceived as safe per week by all groups of midwives were well within the recommendations of the RCOG (UK).

Table 7.7b

Perceptions of midwives on units of alcohol considered safe to consume per week in the third trimester of pregnancy

	Practice	N	Mean	95% CI	Min	Max
Type	**Independent**	35	1.4	1.15 – 1.64	0.5	3.0
	Hospital based with client load	20	1.8*	1.41 – 2.18	1.0	3.5
	Hospital based without client load	31	1.2	1.04 – 1.43	0.5	2.5
	Statistics		***F = 4.246***	***p = 0.018***		
Region	**Upper North Island**	40	1.5	1.25 – 1.73	0.5	3.5
	Central North Island	14	1.6	1.15 – 1.99	0.5	3.0
	Southern North Island	14	1.2	0.91 – 1.44	0.5	2.0
	South Island	18	1.4	1.02- 1.75	0.5	2.5
	Statistics		***F = 0.898***	***p = 0.446***		
	Metropolitan	54	1.3	1.15 – 1.52	0.5	3.0
	Provincial	32	1.6	1.33 – 1.85	0.5	3.5
	Statistics		***F = 2.670***	***p = 0.106***		
	All midwives	86	1.4	1.28 – 1.58	0.5	3.5

Midwives were also asked about what role alcohol could play in the lives of pregnant women when they are socialising, as a relaxant, to prevent premature labour, to induce delayed labour and also consumption of stout beer for its iron content. These reasons for alcohol consumption in pregnancy were chosen primarily based on the personal discussions with midwives. Social drinking is generally well accepted by midwives, which is evident in the information contained in the "Informed choice for professionals" leaflet (Appendix 11a), popularly used by midwives. Personal discussions with midwives also indicated that in situations where their client was highly stressed, a glass of wine was sometimes advocated for the purpose of relaxing the mother. Stout beer, especially made from Oatmeal, was recognised for its nutritional value, probably for its iron content and was popular in England among nursing mothers[54]. Anecdotal evidence from midwives suggested that stout beer was also used among pregnant mothers of New Zealand. Personal discussions with midwives also revealed that in the past, alcohol was used for delaying premature labour and for inducing labour when it was overdue. Literature also documents the use of alcohol for the purpose of delaying premature labour (Abel, 1980). In a review on the behavioural teratology of alcohol, Abel has cited studies where alcohol was used to inhibit premature labour as it has an inhibitory effect on the release of oxytocin from the pituitary gland.

The professional opinions of midwives on the use of alcohol in pregnancy for various reasons are given in Table 7.8. A similar proportion (30%) of midwives who perceived third trimester drinking to be safe also considered social drinking to be safe. About 10% considered alcohol safe to be used as a relaxant in pregnancy. However, only an insignificant proportion of midwives perceived that alcohol had any role to play to prevent premature labour or to induce delayed labour.

Table 7.8

Professional opinions of midwives towards drinking in pregnancy for various reasons

Role of Alcohol in Pregnancy	**N of midwives**	**Abstinence** % (N)	**Lenience** % (N)
While Socialising	433	70.7 (306)	29.3 (127)
For Relaxation	433	89.9 (384)	10.1 (43)
Prevent premature labour	432	98.4 (427)	1.6 (7)
Stout beer	436	91.6 (395)	8.4(36)
Induce delayed labour	433	99.3 (430)	0.7 (3)

[54] http://www.sallys-place.com/beverages/beer/stout_beers.htm

Only 8% of midwives in this study perceived stout beer safe to be consumed for its iron content during pregnancy indicating that this formerly accepted practice was less popular today. As the proportion of midwives who perceived that alcohol could be used for all reasons listed above except for socialising was small, further investigations are done only on the professional opinions of midwives toward social drinking in pregnancy.

Analysis of variance was used to investigate whether the number of units perceived by midwives as safe to consume per occasion while socialising differed according to type and region of practice. The results of these analyses are given in Table 7.9a. Although 127 (Table 7.8) midwives perceived consuming alcohol in pregnancy as safe, only 112 midwives indicated the number of units that they considered safe to be consumed per occasion while socialising. The mean units considered safe was 1 with minimum of 0.5 units and a maximum of 2.0 units.

Table 7.9a

Perceptions of midwives on number of units of alcohol considered safe per occasion while socialising in pregnancy

	Practice	N	Mean	95% CI	Min	Max
Type	**Independent**	49	1.0	0.89 – 1.05	0.5	2.0
	HB[1] with client load	25	1.1	0.91 – 1.18	0.5	2.0
	HB[1] without client load	38	1.1	1.01 – 1.21	0.5	2.0
	Statistics		***F = 2.314***	***p = 0.104***		
Region	**Upper North Island**	56	1.1	0.96 – 1.15	0.5	2.0
	Central North Island	15	1.0	0.96 – 1.10	1.0	1.5
	Southern North Island	21	1.0	0.88 – 1.15	0.5	2.0
	South Island	20	1.0	0.93- 1.12	0.5	1.5
	Statistics		***F = 0.114***	***p = 0.952***		
	Metropolitan	65	1.0	0.96 – 1.11	0.5	2.0
	Provincial	47	1.0	0.95 – 1.13	0.5	2.0
	Statistics		***F = 0.019***	***p = 0.891***		
	All midwives	112	1.0	0.98 – 1.09	0.5	2.0

[1] Hospital based

The mean number of units perceived to be safe to consume per occasion while socialising in pregnancy did not differ according type of practice (p = 0.104), by midwives in the 4 major regions (p = 0.952) and in the metropolitan and provincial regions (p = 0.891) of New Zealand.

Similar analysis was carried out to investigate whether the units of alcohol perceived by midwives as safe to consume per week while socialising differed according to type and region of practice. The results of these analyses are in Table 7.9b. Although 127 midwives drinking alcohol in pregnancy while socialising is safe, only 57% (N = 76) of these midwives perceived that socialising on a weekly basis was safe.

Table 7.9b

Perceptions of midwives on number of units of alcohol considered safe per week while socialising in pregnancy

	Practice	N	Mean	95% CI	Minim	Maxim
Type	**Independent**	27	1.4	1.06 – 1.64	0.5	3.0
	Hospital based with client load	18	1.5	1.18 – 1.81	0.5	2.5
	Hospital based without client load	28	1.1	0.84 – 1.36	0.5	2.5
	Statistics		***F = 2.001***	***p = 0.143***		
Region	**Upper North Island**	33	1.4	1.09 – 1.62	0.5	3.0
	Central North Island	12	1.2	0.77 – 1.64	0.5	2.0
	Southern North Island	10	1.1	0.69 – 1.50	0.5	2.0
	South Island	18	1.3	0.97- 1.69	0.5	2.5
	Statistics		***F = 0.407***	***p = 0.749***		
	Metropolitan	46	1.4	1.14 – 1.56	0.5	3.0
	Provincial	27	1.2	0.92 – 1.45	0.5	3.0
	Statistics		***F = 0.971***	***p = 0.328***		
	All midwives	73	1.3	1.12 – 1.14	0.5	3.0

The mean number of units perceived to be safe by midwives included in this analysis (N = 73) was 1.29 units with a minimum of 0.5 and a maximum of 3.0 units. Two midwives each perceived 5 and 10 units to be safe per week and these data were treated as outliers and not included in the above analysis. There were no differences in the mean number of units of alcohol perceived to be safe for consumption per week according to type of practice (p = 0.143), by midwives of the 4 major regions (p = 0.749) and of the metropolitan and provincial regions (p = 0.328) of New Zealand.

The current research also endeavoured to assess whether the personal opinions of midwives on the issue of alcohol consumption in pregnancy had an association with their professional opinions. Chi-square analysis was executed to achieve this objective. The results of this analysis (Table 7.10) show that a high proportion of midwives who were likely to abstain in their own pregnancy also perceived that abstinence was best in all the three trimesters of pregnancy. Chi-square analysis showed that the personal opinions of midwives toward drinking in pregnancy had a statistically significant association with their professional opinions on the role of alcohol in pregnancy. Midwives who thought that they would personally abstain from any alcohol in pregnancy were significantly (p = 0.000) more likely to advocate total abstinence in all the three trimesters of pregnancy.

Table 7.10

Role of alcohol in pregnancy: Effect of personal opinion on professional opinions

Opinion on alcohol intake in own pregnancy	**Professional opinion on the role of alcohol in pregnancy**					
	First trimester		***Second trimester***		***Third trimester***	
	N=423		N=422		N=421	
	A	L	A	L	A	L
Abstinence (%)	99.0*	1.0	93.4*	6.6	89.8*	10.2
Lenience (%)	87.5	12.5	44.1	55.9	34.6	65.4
All midwives (%)	95.4	4.6	77.2	22.8	71.4	28.6
Statistics	$\chi^2 = 25.39$		$\chi^2 = 126.19$		$\chi^2 = 138.00$	

A = abstinence L = Lenience; * p =0.000

The effect of personal opinions was much more profound for the professional opinions of midwives towards drinking in the second and third trimester of pregnancy. Fifty-six percent of midwives who were lenient towards drinking in their own pregnancy were lenient towards drinking in the second trimester whilst only 6.6% of midwives from the abstinent group indicated lenience to drinking in the second trimester. This proportion was even higher for third trimester drinking, with 65% of midwives of the lenient group indicating lenience towards third trimester drinking as against only 10% from the abstinent group.

Further investigations were made using Phi and Cramer's V correlation coefficient. The Phi and Cramer's V correlation coefficient was high for second (54%) and third (57%) trimesters but were low for the first (24%) trimester. These results indicate that irrespective of the personal attitudes of midwives a high proportion recommended abstinence in the first trimester.

The results of this study indicate that a majority of midwives advocate abstinence in pregnancy. In a study by Diekman *et al.* (2000) on a sample of obstetricians and gynaecologists in the United States, only 20% of obstetrician-gynaecologists surveyed reported that pregnant women should abstain from alcohol. In a New Zealand study that surveyed general practitioners and obstetricians, only 46% of respondents recommended total abstinence in pregnancy (Leversha & Marks, 1995b). In comparison 71% of midwives of this study perceived abstinence as the best option in pregnancy. However, this does not necessarily mean that midwives actively advocate abstinence to their clients, or that if they do this is successful in deterring drinking, as nearly 37% (± 3%) of the clients of midwives were drinkers in pregnancy. The proportion of drinkers among the clientele of midwives of this study was similar to that seen in the study by Counsell *et al.* (1994) done nearly a decade[55] ago, on a random sample of pregnant women (41.6%) across New Zealand. A similar situation was also seen in the study by Leversha and Marks (1995), where although the New Zealand doctors surveyed perceived that they were knowledgeable on the effects of alcohol consumption in pregnancy, it was not reflected in their reported clinical practice. This effect seen in the study by Leversha and Marks (1995) in New Zealand doctors and a similar effect seen

[55] The current research was conducted in 1999 and that by Counsell *et al.* (1994) was conducted in 1990.

in the current research in New Zealand midwives are probably due to the views prevailing among the health professionals of New Zealand, which may be largely influenced by the recommendations of the RCOG.

The results of this study also indicate that more midwives perceive that drinking some alcohol in the second and third trimester as safe compared to the first trimester. A similar proportion of midwives perceived social drinking as safe in pregnancy. These perceptions of midwives are also evident in the "Informed choice for professionals" leaflet (Appendix 11a) popularly used by midwives. This leaflet is produced by the Midwives Information and Resource Service (MIDIRS) and the National Health Service (NHS) centre for Reviews and Dissemination (U.K.) and states under timing of exposure as "Inhibition of growth and development occurs in the second and third trimester" of pregnancy. It also indicates under implications for practice, "That occasional light social drinking constitutes no risk to the baby". What is unclear is their definition of "Occasional light social drinking", as the advice stated in this leaflet to be given to clients reads as "Pregnant women should be advised to keep their alcohol intake below 10 units per week". This opinion of the compilers of this leaflet is also reflected in a similar leaflet (Appendix 11b) produced for pregnant mothers. These opinions of MIDIRS and NHS are in line with the recommendations of the RCOG but are contrary to evidence found in literature, which shows that the foetal brain is vulnerable in a dose-dependent manner to alcohol in all the trimesters of pregnancy (Streissguth *et al.*, 1981; Day *et al.*, 1990; Coles *et al.*, 1995; Jacobson *et al.*, 1998). In the study by Jacobson *et al.* (1998) deficits in cognitive development were seen in infants exposed to 0.5 ounces (14g) or 1 standard glass of alcohol. In the study by Day *et al.* (1990), a reduction of 5 mm in head circumference was seen for every single drink consumed in the third trimester. Moreover, studies on the acute effects of alcohol indicate an immediate effect on foetal breathing (McLeod *et al.*, 1983) and foetal brain function (Mulder *et al.,* 1998) with the administration of 2 glasses of wine, to normal social drinkers. A more recent study by Sood *et al.* (2001) (Follow-up of the Detroit study) has shown that children exposed to any alcohol were 3.2 times more likely to suffer from delinquent behaviour than children who were not prenatally exposed to alcohol. In view of these recent studies it is important that all midwives and other health professionals adopt the recommendation that abstinence is best in pregnancy.

7.5 Perceptions of midwives on a "Safe type" of alcohol in pregnancy

In a study by Streissguth and colleagues (1983b), the authors raised the concern as to whether beer was actually considered an alcoholic beverage by some women. In the above study, the use of liquor had dropped by 50% after knowledge of pregnancy, the use of wine had dropped by 40% after the knowledge of pregnancy but the use of beer had only dropped by 30% after the knowledge of pregnancy. The results of the study by Streissguth *et al.* (1983b) indicate that some types of alcohol are perceived to be safer to consume in pregnancy than other types by some women. Similarly in the study by Temple *et al.* (1992), a higher proportion of pregnant women had heard that spirit drinking (33%) was more harmful for the baby than beer (29%) and wine (26%) drinking. What is not known in the literature is whether similar perceptions exist among maternity caregivers and the influence it may have on their clinical practice, with regard to addressing the issue of alcohol consumption in pregnancy with their clients. The current research being a base-line study endeavoured to assess whether midwives perceived some types of alcohol to be safer than other types during pregnancy. To achieve this, midwives were asked the following question.

Q 4d. Would you consider the types of alcohol listed below, safe to consume during pregnancy? If yes, how much would you consider safe?

The types of alcohol listed under this question were beer, wine and spirits. The question used was a dichotomous one with a "Yes" and "No" option provided against each type of alcohol. Those midwives who were to answer "Yes" against any of the type of alcohol were also asked to indicate the number of units that they perceived to be safe per occasion and per week in pregnancy. Chi-square analysis was used to investigate whether the perceptions of midwives differed according to type and region of practice. The results of these analyses are given in Table 7.10.

Overall the response to this question was good, with 96% (N = 429) of midwives participating. About 30% of midwives perceived that beer was a safe type of alcohol to consume in pregnancy. A marginally higher proportion (33.6%) of midwives perceived wine to be a safe type of alcohol to consume in pregnancy and only 5.4% perceived spirits to be safe to be consumed in pregnancy. There were no statistically significant

Table 7.11

Perceptions of midwives of beer wine and spirits to be "Safe type" of alcohol in pregnancy according to type and region of practice

	Practice	Beer % (N)		Wine % (N)		Spirits % (N)	
		Yes	*No*	*Yes*	*No*	*Yes*	*No*
Type	**Independent**	30.6 (53)	69.4 (120)	37.8 (65)	62.6 (107)	4.0 (7)	96.0 (166)
	HB[1] with client load	25.0 (26)	75.0 (78)	26.0 (27)	74.0 (77)	5.8 (6)	94.2 (98)
	HB[1] without client load	32.5 (49)	67.5 (102)	34.0 (52)	66.0 (101)	6.6(10)	93.4 (142)
	Statistics	$\chi^2 = 1.704$	$p = 0.426$	$\chi^2 = 4.086$	$p = 0.130$	$\chi^2 = 1.068$	$p = 0.586$
Region	**Upper North Island**	29.5 (61)	70.5 (146)	29.3 (61)	70.7 (147)	5.3 (11)	94.7 (198)
	Central North Island	32.1 (17)	67.9 (36)	37.0 (20)	63.0 (34)	3.8 (2)	96.2 (51)
	Southern North Island	24.7 (21)	75.3 (64)	35.3 (30)	64.7 (55)	8.2 (7)	91.8 (78)
	South Island	34.9 (29)	65.1 (54)	40.2 (33)	59.8 (49)	3.7 (3)	96.3 (79)
	Statistics	$\chi^2 = 2.238$	$p = 0.525$	$\chi^2 = 3.722$	$p = 0.293$	$\chi^2 = 2.120$	$p = 0.548$
	Metropolitan	33.6 (80)	66.4 (158)	34.5 (82)	65.5 (156)	5.9 (14)	94.1 (225)
	Provincial	25.3 (48)	74.7 (142)	32.5 (62)	67.5 (129)	4.7 (9)	95.3 (181)
	Statistics	$\chi^2 = 3.214$	$p = 0.061$	$\chi^2 = 0.189$	$p = 0.664$	$\chi^2 = 0.262$	$p = 0.609$
	All midwives	29.9 (128)	70.1 (300)	33.6 (144)	66.4 (285)	5.4 (23)	94.6 (406)

[1] **Hospital based**

differences in the perception of midwives on beer being a safe type of alcohol in pregnancy according to type of practice ($p = 0.426$), and among midwives of the 4 major regions ($p = 0.525$) and of the metropolitan and provincial regions ($p = 0.061$) of New Zealand (Table 7.11).

Similar analysis indicated that there were no significant differences in the proportion of midwives who perceived wine to be safe, according to type of practice ($p = 0.130$), among midwives of the 4 major regions ($p = 0.260$) and midwives of the metropolitan and provincial regions ($p = 0.371$) of New Zealand (Table 7.11). Similarly there were no significant differences in the proportion of midwives who perceived spirits as a safe type of alcohol according to type of practice ($p = 0.586$), among midwives of the four major regions ($p = 0.548$) and of the metropolitan and provincial regions ($p = 0.387$) of New Zealand (Table 7.11).

As the proportion of midwives who perceived spirits to be safe to consume in pregnancy was very small (5%), no further analysis was done on this data. Analysis of variance was executed to investigate whether there were any differences in the number of units of beer and wine perceived to be safe according to type and region of practice.

Table 7.12a gives the results of the analysis that investigated whether the perceptions of midwives on the number of units of beer considered safe for consumption per occasion in pregnancy differed according to region and type of practice. Although 128 midwives (Table 7.11) perceived beer to be a safe type of alcohol, only 107 midwives indicated the number of units that they perceived to be safe per occasion. The mean number of units was 1 with a minimum of 0.5 and a maximum of 1.5 units.

One midwife each indicated that 2 and 3 units of beer were safe to consume per occasion in pregnancy. The data from these two midwives were treated as outliers and were not included in the above analysis. There were no statistically significant differences in the perceptions of midwives on the number of units of beer considered as safe to consume per occasion in pregnancy according to type of practice ($p = 0.860$), among midwives of the four major regions ($p = 0.785$) and of the metropolitan and provincial regions ($p = 0.128$) of New Zealand.

Table 7.12a

Perceptions of midwives on number of units of beer considered safe to consume per occasion in pregnancy

	Categories	N	Mean	95% CI	Min	Max
Practice	**Independent**	50	1.0	0.92 – 1.02	0.5	1.5
	Hospital based with client load	20	1.0	0.89 – 1.11	0.5	1.5
	Hospital based without client load	37	1.0	0.90 – 1.07	0.5	1.5
	Statistics		***F = 0.151***	***p = 0.860***		
Region	**Upper North Island**	52	1.0	0.94 – 1.06	0.5	1.5
	Central North Island	16	1.0	0.81 – 1.07	0.5	1.5
	Southern North Island	18	1.0	0.87 – 1.08	0.5	1.5
	South Island	21	1.0	0.89 – 1.06	0.5	1.5
	Statistics		***F = 0.356***	***p = 0.785***		
	Metropolitan	63	1.0	0.95 – 1.06	0.5	1.5
	Provincial	44	1.0	0.88 –1.01	0.5	1.5
	Statistics		***F = 2.350***	***p = 0.128***		
	All midwives	107	1.0	0.94 – 1.02	0.5	1.5

Similar analysis was executed to investigate whether there were any differences in the perceptions of midwives on the number of units of beer considered as safe to consume per week in pregnancy according to type and region of practice. The results of these analyses are given in Table 7.12b. Only 64% (80) of all midwives who perceived beer to be a safe type of alcohol to consume in pregnancy considered weekly consumption of beer as safe.

The mean number of units of beer per week indicated as safe was about 1.5 units with a minimum of 0.5 and a maximum of 3 units. Two midwives considered 10 units of beer and 1 midwife each considered 7 and 5 units of beer as being safe to be consumed per week in pregnancy. The data from these four midwives were treated as outliers and were not included in the above analysis.

Table 7.12b

Perceptions of midwives on number of units of beer considered safe to consume per week in pregnancy

	Categories	N	Mean	95% CI	Min	Max
Practice	**Independent**	36	1.6	1.33 – 1.81	1.0	3.0
	Hospital based with client load	17	2.2*	1.53 – 2.46	1.0	3.0
	Hospital based without client load	29	1.4	1.11 – 1.60	0.5	3.0
	Statistics		***F = 4.066***	***p = 0.021***		
Region	**Upper North Island**	38	1.6	1.30 – 1.82	0.5	3.0
	Central North Island	13	1.9	1.36 – 2.41	1.0	3.0
	Southern North Island	12	1.2	0.99 – 1.42	1.0	2.0
	South Island	19	1.7	1.29- 2.02	1.0	3.0
	Statistics		***F = 1.767***	***p = 0.160***		
	Metropolitan	51	1.5	1.25 – 1.66	0.5	3.0
	Provincial	31	1.8	1.50 – 2.08	1.0	3.0
	Statistics		***F = 3.738***	***p = 0.571***		
	All midwives	82	1.6	1.42 – 1.75	0.5	3.0

There was a significant difference (p = 0.021) in the mean number of units of beer perceived to be safe to consume per week by hospital-based midwives with client load and without client load. The former type of midwives perceived a higher number of units to be safe than the latter type of midwives. However, the number of hospital-based midwives with client load was small (N = 17) and the units of beer perceived by all types of midwives were well within the recommendations of the RCOG. There were no significant differences in the mean number of units perceived to be safe per week among midwives of the four major regions (p = 0.160) and the metropolitan and provincial regions (p = 0.057) of New Zealand.

Table 7.13a gives the results of the analysis that investigated whether there were any differences in the number of units of wine perceived as safe by midwives to consume per occasion, according to type and region of practice. All midwives who perceived wine as a safe type of alcohol to consume in pregnancy also indicated the number of units they perceived as safe per occasion. A mean of ~ 1 unit of wine with a minimum of 0.35 units and a maximum of 2 units per occasion was indicated as safe for consumption in pregnancy.

Table 7.13a

Perceptions of midwives on number of units of wine considered safe to consume per occasion in pregnancy

	Practice	N	Mean	95% CI	Min	Max
Type	**Independent**	65	1.0	0.88 – 1.02	0.35	2.0
	Hospital based with client load	27	1.0	0.84 – 1.10	0.5	2.0
	Hospital based without client load	52	1.0	0.86 – 1.04	0.5	2.0
	Statistics		***F = 0.062***	***p = 0.940***		
Region	**Upper North Island**	61	1.0	0.89 – 1.02	0.5	1.5
	Central North Island	20	0.8	0.73 – 0.96	0.35	1.0
	Southern North Island	30	1.0	0.86 – 1.06	0.5	2.0
	South Island	33	1.0	0.87 – 1.16	0.5	2.0
	Statistics		***F = 1.401***	***p = 0.245***		
	Metropolitan	82	1.0	0.89 – 1.05	0.5	2.0
	Provincial	62	1.0	0.88 – 0.98	0.35	1.5
	Statistics		***F = 0.612***	***p = 0.435***		
	All midwives	144	1.0	0.91 – 1.00	0.35	2.0

There were no significant differences in the mean number of units of wine perceived to be safe per occasion according to type of practice ($p = 0.940$), among midwives of the four regions ($p = 0.245$) and of the metropolitan and provincial regions ($p = 0.435$) of New Zealand.

Table 7.13b

Perceptions of midwives on number of units of wine considered safe to consume per week in pregnancy

	Practice	N	Mean	95% CI	Min	Max
Type	**Independent**	44	1.4	1.15 – 1.56	0.5	3.0
	Hospital based with client load	21	1.9*	1.35 – 2.37	0.5	3.5
	Hospital based without client load	33	1.2	0.95 – 1.37	0.5	3.5
	Statistics		***F = 5.446***	***p = 0.006***		
Region	**Upper North Island**	41	1.4	1.18 – 1.68	0.5	3.5
	Central North Island	17	1.6	1.12 – 2.05	0.5	3.5
	Southern North Island	17	1.2	0.93 – 1.37	0.5	2.0
	South Island	23	1.4	0.96 – 1.77	0.5	3.5
	Statistics		***F = 0.908***	***p = 0.440***		
	Metropolitan	57	1.4	1.15 – 1.57	0.5	3.5
	Provincial	41	1.4	1.18 – 1.70	0.5	3.5
	Statistics		***F = 0.207***	***p = 0.650***		
	All midwives	98	1.4	1.23 – 1.55	0.5	3.5

Similar analysis was executed to investigate whether there was any difference in the mean number of units of wine perceived to be safe for consumption per week, according to type and region of practice. Sixty-eight percent (N = 98) of midwives among those who said that wine was a safe type of alcohol to consume in pregnancy considered drinking on a weekly basis as safe. Overall, a mean of ~ 1.5 units of wine was considered as safe per week with a minimum of 0.5 and a maximum of 3.5 units per week.

As seen in Table 7.13b, there was significant difference in the mean number of units of wine perceived to be safe per week by hospital based midwives with client load and without client load. Hospital-based midwives with client load perceived a higher number of units of wine as safe than the other group of midwives ($p = 0.006$). However, the numbers of midwives in both these groups are small and the perceptions of all midwives are well within the RCOG recommendations. There were no significant differences in the number of units of wine per week perceived to be safe by midwives of the 4 major regions ($p = 0.440$) and the metropolitan and provincial regions ($p = 0.650$) of New Zealand.

The study also endeavoured to assess if the personal opinions of midwives on alcohol consumption in pregnancy had an influence on their opinions on a safe type of alcohol in pregnancy. Chi-square analysis showed that the personal opinion of midwives on alcohol in pregnancy and their assumptions about safe types of alcohol in pregnancy were not independent of one another (Table 7.14). Midwives who stated that they would drink some alcohol in pregnancy were significantly ($p = 0.000$) more likely to think of wine, beer and spirits as safe types of alcohol to consume in pregnancy.

Table 7.14

Safe type of alcohol in pregnancy: Effect of personal opinion

Personal opinion in pregnancy	**Safe type of alcohol in pregnancy** Proportion of midwives (N)					
	Beer		**Wine**		**Spirits**	
	No	***Yes***	***No***	***Yes***	***No***	***Yes***
Abstinence	90*	10	87.5*	12.5	98.6*	1.4
	(253)	(28)	(246)	(35)	(277)	(4)
Lenience	27.8	72.2	22.6	77.4	87.2	12.8
	(37)	(96)	(30)	(103)	(116)	(17)
All midwives	70	30	66.7	33.4	94.9	5.1
	(290)	(124)	(276)	(138)	(393)	(21)

*** $p = 0.000$**

On evaluating the association between personal opinions of midwives on drinking during pregnancy and their perception of a safe type of alcohol using Phi and Cramer's V test for nominal variables, it was interesting to note that the association was high for beer (63%) and wine (64%) but was low for spirits (24%). This seems to indicate that irrespective of the personal beliefs of midwives on drinking during pregnancy, a high proportion of midwives perceived spirits as "Not being a safe type of alcohol".

The above results indicate that more midwives in this study perceived wine (33%) and beer (30%) to be safe types of alcohol to consume in pregnancy than spirits (5%). The mean number of units of beer and wine per occasion and per week perceived to be safe by the midwives of this study was well below the current recommendations of the RCOG. There were no differences in the mean number of units of beer and wine perceived to be safe per occasion and per week according to type and region of practice.

7.6 Tools for effective intervention:

Literature reviewed shows that primary maternity caregivers can play an effective role in reducing the risk of prevalence of alcohol related effects. However, for such an intervention to be effective, the primary maternity caregivers should be able to effectively communicate to their clients about the adverse effects of alcohol consumption in pregnancy. Education of the health professionals of New Zealand may be even more critical as the message of abstinence in pregnancy is far from being accepted. The current research endeavoured to assess the usefulness of 5 tools to help midwives in this communication process. To achieve this, midwives were asked the following question.

Q 6.d. Alcohol intake is a very sensitive issue to talk about with clients. Do you think the following tools would help in discussing this issue with your clients?

The tools included were "Education of midwives on alcohol in pregnancy", "Training in effective communication", "Knowledge of how much alcohol is safe", "Training in identifying symptoms in infants exposed to alcohol *in utero*" and "Education of mothers on alcohol in pregnancy". The responses of midwives to these tools are given below in Table 7.15. A very high proportion (93%) of midwives indicated that being more educated on the issue of alcohol consumption in pregnancy would enable them to effectively discuss this issue with their clients. Ninety percent were keen to be educated on a safe level of alcohol consumption in pregnancy and 79% indicated that being trained to effectively communicate information about the effects of alcohol consumption to their clients would be useful.

Table 7.15

Tools for effective intervention

Tools	N	Midwives who said "Yes" %
Education of midwives on alcohol in pregnancy	432	93.5
Knowledge of how much alcohol is safe	426	90.6
Training in effective communication	419	78.8
Training in identifying symptoms in infants exposed to alcohol *in utero*	426	93.2
Education of mothers on alcohol in pregnancy	437	97.3

Chi-square analysis was executed to investigate whether the proportion of midwives who indicated, "Yes" or "No" to the above tools differed according to type and region of practice. The results of these analyses for "Education of midwives on alcohol consumption in pregnancy" are given in Table 7.16a. There was a marginal difference (p = 0.066) in the proportion of midwives who said, "Yes" or "No" to "Education of midwives on alcohol consumption in pregnancy" as a useful tool according to type of practice. A lower proportion of independent midwives perceived the above tool to be useful than the other two types of midwives. However this difference was not statistically significant at $\alpha = 0.05$.

Similar analysis according to the 4 major regions of New Zealand indicated that there were no significant differences (p = 0.186) in the proportions of midwives who said "Yes" or "No" to the above tool. However, a lower proportion of midwives from the provincial regions than the metropolitan regions indicated that education on alcohol consumption would equip them better to discuss this issue with their clients (p = 0.025).

Table 7.16a

Education of midwives on alcohol consumption in pregnancy

	Practice	Yes (%)	No (%)	Statistics
Type	**Independent (173)**	90.2	9.8	$\chi^2 = 5.446$
	HB[1] with client load (102)	95.1	4.9	df =2
	HB[1] without client load (157)	96.2	3.8	$p = 0.066$
Region	**Upper North Island (211)**	93.8	6.2	$\chi^2 = 4.812$
	Central North Island (53)	86.8	13.2	df = 3
	Southern North Island (85)	95.3	4.7	$p = 0.186$
	South Island (83)	95.2	4.8	
	Metropolitan (239)	95.8	4.2	$\chi^2 = 4.658$
	Provincial (193)	90.7*	9.3	df = 1
				$p = 0.025$
All	**N = 432**	93.5	6.5	

[1] **Hospital based; * $p < 0.05$**

Overall, 90% of midwives indicated that "Knowledge of how much alcohol is safe" would be useful to equip them better to talk about the issue of alcohol consumption in pregnancy with their clients (Table 7.16b). However, the usefulness of this tool in effectively communicating with clients differed according to type of practice. A lesser proportion ($p = 0.011$) of independent midwives indicated that this would be a useful tool than the other types of midwives. There were no significant differences in the proportions of midwives who said "Yes" or "No" in the four major regions ($p = 0.896$) and the metropolitan and provincial regions ($p = 0.099$) of New Zealand.

The results of the analysis that investigated whether the response of midwives to "Training in effective communication" as a useful tool differed according to type and region of practice are given in Table 7.16c. Overall, nearly 79% of midwives indicated that the above tool was useful for effective communication with their clients. This proportion was significantly lower ($p = 0.011$) among the independent midwives,

Table 7.16b

Knowledge of how much alcohol is safe

	Practice	Yes (%)	No (%)	Statistics
Type	**Independent (169)**	85.8*	14.2	$\chi^2 = 9.033$
	HB[1] with client load (101)	91.1	8.9	df = 2
	HB[1] without client load (149)	95.5	4.5	$p = 0.011$
Region	**Upper North Island (207)**	89.9	10.1	$\chi^2 = 0.600$
	Central North Island (53)	90.6	9.4	df = 3
	Southern North Island (77)	92.8	7.2	$p = 0.896$
	South Island (83)	90.4	9.6	
	Metropolitan (220)	92.4	7.6	$\chi^2 = 2.115$
	Provincial (166)	88.3	11.7	df =1
				$p = 0.099$
All	**N = 426**	90.6	9.4	

[1] Hospital based; * $p < 0.05$

compared to the other two types of midwives. However, there were no significant differences in this proportion among midwives of the four major regions ($p = 0.558$) and the metropolitan and provincial regions ($p = 0.334$) of New Zealand.

The study also investigated whether the proportion of midwives who indicated, "Yes" or "No" to "Training in identifying symptoms in infants exposed to alcohol *in utero*" as a useful tool, differed according to type and region of practice. The results of these analyses are in Table 7.16d. Personal discussion with midwives indicated that they provide care for most infants born in New Zealand for two weeks after birth. Hence, training midwives to recognize early symptoms in infants exposed to alcohol *in utero* may equip them better to communicate the ill effects of heavy alcohol consumption and also help to identify at-risk children.

Table 7.16c

Training in effective communication

	Practice	Yes (%)	No (%)	Statistics
Type	**Independent (165)**	71.5*	28.5	$\chi^2 = 9.057$
	HB[1] with client load (101)	79.5	21.5	df = 2
	HB[1] without client load (153)	85.0	15.0	$p = 0.011$
Region	**Upper North Island (205)**	77.1	22.9	$\chi^2 = 2.069$
	Central North Island (53)	75.5	24.5	df = 3
	Southern North Island (81)	84.0	15.0	$p = 0.558$
	South Island (80)	80.0	20.0	
	Metropolitan (232)	79.7	20.3	$\chi^2 = 0.300$
	Provincial (187)	77.5	22.5	df = 1
				$p = 0.334$
All	**N = 419**	78.8	21.2	

[1] **Hospital based; $p < 0.05$**

Overall 93% of midwives who participated in this question (N = 426) answered "Yes" to this tool being effective in helping them in the process of intervention. It is notable that there were no significant differences in the proportion of midwives who answered "Yes" to "Training in identifying symptoms in infants exposed to alcohol *in utero*" as an effective tool, according to type of practice (p = 0.406), among midwives from the four major regions (p = 0.824) and the provincial and metropolitan regions (p = 0.440) of New Zealand.

Education of prospective and current mothers of New Zealand is also very crucial to reducing the risk of alcohol related effects as more than 80% of non-pregnant women of childbearing age are drinkers. Midwives who participated in the pilot studies had indicated that educating prospective and current mothers on the adverse effects of alcohol could help them in the intervention process. Hence "Education of mothers" was included as a tool and overall, 97.3% of midwives who participated in this question (N = 437) perceived this tool to be effective in the intervention process.

Table 7.16d

Training in identifying symptoms in infants exposed to alcohol *in utero*

	Practice	Yes (%)	No (%)	Statistics
Type	**Independent (171)**	91.2	8.8	$\chi^2 = 1.805$
	HB[1] with client load (100)	94.0	6.0	df = 2
	HB[1] without client load (155)	94.8	5.2	$p = 0.406$
Region	**Upper North Island (207)**	94.2	5.8	$\chi^2 = 0.906$
	Central North Island (54)	90.7	9.3	df = 3
	Southern North Island (81)	92.6	7.4	$p = 0.824$
	South Island (84)	92.9	7.1	
	Metropolitan (235)	94.0	6.0	$\chi^2 = 0.597$
	Provincial (191)	92.1	7.9	df = 1
				$p = 0.440$
All	**N = 426**	93.2	6.8	

[1] Hospital based

Further analysis was executed to investigate if the responses of midwives differed according to type and region of practice. The results of these analyses are given in Table 7.16e. Again it is notable that there were no statistically significant differences in the proportion of midwives who answered positively or negatively to the above tool according to their type of practice ($p = 0.335$), among midwives from the four major regions ($p = 0.301$) and from the metropolitan and provincial regions ($p = 0.349$) of New Zealand. The perceived advantage of education of mothers was uniformly very high.

Studies by Nanson *et al.* (1995) and Diekman *et al.* (2000) indicate that education of primary maternity care givers on the outcomes of alcohol consumption in pregnancy may need to be an on-going process. In the latter study on obstetricians- gynaecologists, 83% of respondents wanted information on thresholds for adverse outcomes and 44% wanted training and consultation in assessment and counselling for improving assessment of alcohol use in their clinical practice.

Table 7.16e

Education of mothers on alcohol consumption in pregnancy

	Practice	Yes (%)	No (%)	Statistics
Type	**Independent (177)**	96.0	4.0	$\chi^2 = 2.1086$
	HB[1] with client load (102)	99.0	1.0	df = 2
	HB[1] without client load (158)	97.5	2.5	$p = 0.335$
Region	**Upper North Island (212)**	96.2	3.8	$\chi^2 = 3.658$
	Central North Island (55)	98.2	1.8	df = 3
	Southern North Island (86)	100	0	$p = 0.301$
	South Island (84)	96.4	3.6	
	Metropolitan (240)	97.9	2.1	$\chi^2 = 0.875$
	Provincial (197)	96.4	3.6	df = 1
				$p = 0.349$
All	**N = 437**	97.3	2.7	

[1] Hospital based

The results of this study indicate that a high proportion of midwives were keen on further education, knowledge of how much alcohol is safe and training in effective communication skills to effectively address this issue in their clinical practice. However, in comparison to hospital based midwives both with and without client load, a lesser proportion of independent midwives of this study considered the listed tools as useful in helping them to effectively communicate to their clients on the issue of alcohol consumption in pregnancy. However, the total proportion of clients drinking in pregnancy and according to various styles did not differ in the two practices of midwives (see Chapter 6, Section 6.6 and 6.11). It is important that all midwives are periodically updated and educated on current findings of research on alcohol consumption in pregnancy.

The opinions of researchers and health professionals on a safe amount of alcohol in pregnancy are not consistent. Some are of the opinion that a single drink (14g of absolute alcohol) a day in pregnancy can cause no harm to the growing foetus (Abel, 1996). Based on two prospective longitudinal studies (Seattle and Detroit) Jacobson and Jacobson (1994a) attempted to arrive at a threshold for any manifestations of *in utero* alcohol exposure. Reviewing these two studies the authors support the suggestion that 7 standard drinks per week is a threshold level for the manifestation of most neurobehavioural effects. Using the margin of safety factor of 10 they concluded that 0.35 oz (10g) of absolute alcohol or 1 drink in 10 days could be considered as safe.

However, the weight of the evidence in the literature suggests that there is unlikely to be a threshold of alcohol consumption below which no effect occurs, although at very low levels of consumption the adverse effects may be so small that they may be undetectable by current testing methods. Moreover there exists a gap in the current understanding as to all the variables that influence the outcome of maternal drinking and all the possible outcomes caused by maternal drinking are yet to be established. This gap in the current understanding on the outcomes of alcohol consumption in pregnancy is reflected in the recommendation[56] of the Surgeon General of the United States to American women, which is “Abstinence”. However the situation in New Zealand is in stark contrast to the American stand on drinking in pregnancy. At the time of the current study, the guidelines by the Royal College of Obstetricians and Gynaecologists, UK, stated that there was no conclusive evidence of adverse effects to pregnancy outcome at levels of consumption below 120 grams of absolute alcohol per week (cited in Guerri *et al*., 1999). It is also interesting to note that this guideline does not state any vulnerable period in pregnancy, which is contrary to the results of studies (Windham *et al.,* 1997, Kesmodel *et al.,* 2002, Kline *et al.,* 1980, Clarren *et al.,* 1998) that have shown the first trimester of pregnancy to be extremely vulnerable for foetal damage at levels well below that recommended by RCOG. Hence, it would be prudent for midwives and other primary maternity caregivers of New Zealand to adopt abstinence as best in pregnancy.

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[56] Surgeon General's advisory on alcohol and pregnancy. 1981. FAD Drug Bulletin 11:2

7.7 Conclusions:

In this chapter an attempt was made to assess the attitudes and knowledge of midwives toward drinking in pregnancy. The results of this study indicate that midwives need to be educated on the spectrum of disorders associated in the literature to maternal drinking. With respect to personal opinions of midwives on alcohol consumption in pregnancy, about 30% were lenient towards drinking in pregnancy. The proportions of midwives with this opinion did not differ according to type and the four regions of practice. However, a significantly higher proportion of midwives from the provincial than the metropolitan regions of New Zealand had a personal opinion of "Abstinence" in their own pregnancy. A similar proportion of midwives were lenient to third trimester and social drinking.

In comparison to other published studies of primary maternity caregivers (20% of obstetricians and gynaecologists, Diekman *et al.*, 2000 and 46% of general practitioners and obstetricians (Leversha and Marks, 1995), midwives (71%) in this study were more likely to recommend abstinence in pregnancy. However this does not mean that midwives are actively recommending abstinence to their clients or that if they do this is successful in dissuading drinking, as a high proportion of clients were drinking in pregnancy.

The personal opinions of midwives on alcohol consumption in pregnancy had a statistically significant association with their professional attitudes toward drinking in pregnancy. Midwives who were likely to abstain in their own pregnancy were also more likely to recommend abstinence in all three trimesters of pregnancy. This effect of the personal opinion of midwives was much more profound for the first and second trimesters of pregnancy. However, irrespective of their personal opinion, a high proportion (30%) of midwives considered third trimester drinking as safe, which is contrary to the findings of studies on the outcomes of maternal drinking.

On investigating the perception of midwives on a "Safe type" of alcohol in pregnancy, it was found that midwives were more likely to perceive beer and wine as a safer alcoholic drink than spirits. A high proportion of midwives who said that they would be lenient about drinking in their own pregnancy perceived beer and wine to be safe in pregnancy. However the perception of midwives on "Spirits" being a safe drink in pregnancy was less affected by their personal opinion about drinking in pregnancy.

A very high proportion of midwives documented their keenness to be provided various tools including education on the issue of alcohol consumption in pregnancy. This was indeed a true reflection of their commitment to play a role in reducing the risk for the prevalence of alcohol related birth defects in New Zealand. The results of this study highlight the need to provide midwives with continuing education on alcohol consumption in pregnancy and promote the adoption and active advocating of abstinence as the best option in pregnancy.

Chapter - 8: Results and Discussion, Objective: 3

Prevalence of Outcomes Associated with Heavy Maternal Drinking in the Clientele of Midwives

8.1 Introduction:

Literature reviewed in Chapter 2 highlights various foetal outcomes associated with maternal drinking. Literature also records some common symptoms seen in newborns exposed to heavy drinking in pregnancy (Coles *et al.*, 1985; Streissguth *et al.*, 1981; Rosett *et al.*, 1979). As part of their professional services, midwives also provide postnatal care for two weeks or longer and hence are able to assess the general well being of the infants born to their clients. Hence, the third objective (secondary) of the current research was to assess the prevalence of outcomes associated with heavy maternal drinking in the clientele of midwives.

At the outset, the current research endeavoured to compare the "Level of concern" caused by alcohol consumption in pregnancy to that of other common issues faced by midwives in their practice. The study also assessed the prevalence of miscarriage and the probable estimate of alcohol affected infants in the practice of midwives. Furthermore the current research also aimed at assessing the encounter of midwives with some of the symptoms in new-borns associated in the literature with *in utero* exposure to alcohol. Lastly, the encounter of midwives with noticeable birth defects including foetal alcohol syndrome and peculiar faces was assessed.

8.2 "Level of concern" caused by alcohol in comparison to other common issues faced in the practices of midwives.

The purpose of this question was primarily to compare the significance of alcohol consumption as a problem to the significance of other common issues faced by midwives in their practice. For this purpose midwives were asked the following question:

Q 6.b. How would you rate the issues listed below as to the level of concern they have caused in your practice as a midwife?

The issues listed were recreational drugs, prescription drugs, alcohol, smoking, young pregnant teenager, older pregnant women, preparedness for motherhood and diet during pregnancy. A Likert scale of one to five was provided to record the responses of the midwives, with one being "Not caused concern" and five being "Caused extreme concern". Only responses of midwives with client load (N = 257) were analysed as this question was aimed at assessing the magnitude of the problem of alcohol consumption in the practices of midwives. However, it should be mentioned at this point that there is a possibility that the participants have misunderstood the question as the "Level of concern" they as midwives had towards the listed issues rather than the "Level of concern" caused by the listed issues in their practices.

Table 8.1

"Level of Concern" caused by common issues in the practices of midwives

Issue (N)	Proportion of midwives (%)				
	Not caused concern	Mild concern	Moderate concern	High concern	Extreme concern
Recreational drugs (248)	15.0	19.6	21.4	23.9	19.6
Prescription drugs (243)	25.8	33.7	19.0	15.2	6.3
Alcohol (250)	12.5	21.2	29.0	23.2	14.1
Smoking (252)	1.4	6.5	28.4	43.0	20.8
Young pregnant teenager (249)	9.2	21.4	32.6	29.4	7.4
Older pregnant women (246)	29.1	35.0	23.4	10.8	1.8
Preparedness for motherhood (250)	6.5	31.1	40.4	18.2	3.9
Diet during pregnancy (252)	5.9	25.1	38.0	25.2	5.7

Assuming that the midwives have understood the above question correctly, to a majority of midwives (29%), alcohol consumption had caused a "Moderate level of concern" in their practices (Table 8.1). Other issues having caused similar concern were "Young pregnant teenager" (32.6%), "Preparedness for motherhood" (40.4%) and "Diet during pregnancy" (38.0%). These results seem to indicate that the above issues namely, "Alcohol", "Young pregnant teenager", "Preparedness for motherhood" and "Diet during pregnancy" go hand-in-hand or co-exist in the practices of midwives. Smoking (43%) and recreational drugs (24%) as issues were reported by the majority of midwives as having caused "high concern" in their practice. Prescription drugs (26%) and the issue of "Older pregnant women" (35%) were reported as having caused "Mild concern" by the majority of midwives.

The results of this study indicate that there seems to be a trend in the majority of practices for alcohol consumption to have caused a moderate level of concern whilst smoking and recreational drugs caused a high level of concern. However, as no statistical tests were undertaken to explore this issue further due to a possible ambiguity in understanding the question by the midwives, no conclusions have been drawn on this issue.

It is also possible that health professionals of New Zealand are better educated on the ill effects of smoking than alcohol consumption in pregnancy. In the study by Temple *et al.*, (1992), on evaluating the advice given by Doctors on the effects of alcohol and tobacco, it was found that specific advice for alcohol consumption was "Cutting down" rather than "Giving up" in contrast to tobacco, which was "To quit". Hence, it may be important to educate midwives and probably other maternity caregivers on the entire spectrum of manifestations of maternal alcohol consumption.

Further analysis (Chi-square) was executed to investigate whether the levels of concern caused by alcohol in the practices of midwives differed according to region of practice. These results are given in Table 8.2 and indicate that there were no significant differences in the levels of concern caused by alcohol among midwives of the four major regions ($p = 0.063$) and the metropolitan and provincial regions ($p = 0.800$) of New Zealand.

Table 8.2

Level of concern caused by "Alcohol" among the practice of midwives according to region

Level of concern	Proportion of midwives from various regions of New Zealand % (N)					
	Upper North Island (N =120)	Central North Island (N = 41)	Southern North Island (N = 43)	South Island (N = 47)	Metropolitan (N = 133)	Provincial (N = 118)
Not caused concern	12.5 (15)	14.6 (6)	16.3(7)	27.7 (13)	18.8 (25)	13.6 (16)
Caused mild concern	17.5 (21)	17.1 (7)	27.9 (12)	34.0 (16)	21.8 (29)	22.9 (27)
Caused Moderate concern	30.0 (36)	36.6 (15)	20.9 (9)	19.1 (9)	27.8 (37)	27.1 (32)
Caused high concern	20.8 (25)	19.5 (8)	25.6 (11)	10.6 (5)	18.8 (25)	20.3 (24)
Caused extreme concern	19.2 (23)	12.2 (5)	9.3 (4)	8.5 (4)	12.8 (17)	16.1 (19)
Statistics		$\chi^2 = 20.236$	$p = 0.063$		$\chi^2 = 1.650$	$p = 0.800$

8.3 Miscarriage among the clientele of midwives:

In the current research, the term "Miscarriage" defined by Harrison (1986) as the spontaneous abortion of the foetus from the womb between conception and the 28th week of pregnancy was used. The current research aimed at assessing the prevalence of miscarriage among the clientele of midwives. For this purpose, midwives were asked the following question.

Q 6.a. How many of your clients have experienced miscarriage in the past year of your practice?

The periods of pregnancy included under this question were first six weeks, 6 to 12 weeks, 13-24 weeks and above 24 weeks. As this question aimed at collecting information of the clients of midwives, only data from midwives with their own client load (N = 257) has been analysed. With respect to miscarriage in the first six weeks of pregnancy, 37% of midwives (N = 71) were not sure of any miscarriage and 22% (N = 43) had no clients who had a miscarriage in the year prior to the survey. Personal discussions with midwives suggested that most pregnant women have their first antenatal visit at 6-8 weeks of pregnancy. This was probably why a higher proportion of midwives reported they were unsure of the number of miscarriages in the first six weeks of pregnancy among their clients. With respect to the prevalence of miscarriage at 6-12 weeks of pregnancy, about 9% (N = 21) of midwives were unsure of any miscarriage among their clientele and 10% (N = 23) had no cases of miscarriage. For the purpose of all further analyses of this study, the number of cases of miscarriage seen in the first 6 weeks and in the 6-12 weeks are combined and treated as data of the first trimester of pregnancy. Analysis of variance was executed to investigate if the mean number of cases of miscarriage reported in the first trimester (1-12 weeks) differed according to type and region of practice. The results of these analyses are given in Table 8.3.

Overall only 95 midwives with client load reported any case of miscarriage. Analysis of variance indicated that there were no significant differences (p = 0.169) in the mean number of cases of miscarriages in the first trimester of pregnancy among midwives who were independently practising and those who were hospital-based. Similarly there were no significant differences in the mean number of cases of miscarriage among the clientele of midwives in the four major regions (p = 0.949) and the metropolitan and provincial regions (p = 0.193) of New Zealand.

Table 8.3

Cases (mean) of miscarriage in the first trimester according to type and region of practice

Practice		N	Mean	95% CI	Statistics
Type	**Independent**	68	6.05	5.19 - 6.92	F = 1.921
	Hospital based	27	7.33	5.33 - 9.33	p = 0.169
Region	**Upper North Island**	52	7.20	5.88 - 8.49	F = 1.606
	Central North Island	14	6.15	3.99 - 8.28	p = 0.193
	Southern North Island	10	5.40	3.60 - 7.19	
	South Island	19	5.05	3.60 - 7.19	
	Metropolitan	54	6.44	5.25 - 7.64	F = 0.004
	Provincial	41	6.39	5.24 - 7.53	p = 0.949
	All midwives	95	6.42	5.59 - 7.24	

With respect to miscarriage at 13-24 weeks of pregnancy, 40% of midwives (N = 77) had no cases in the year preceding the survey. Similarly, above 60% of midwives (N = 104) had no cases of miscarriage above 24 weeks of pregnancy. The mean cases of miscarriage reported by midwives in the second trimester of pregnancy (13-24 weeks and above 24 weeks) were 5.53 [57]cases in the year prior to the survey. As the number of midwives who reported any cases of miscarriage in the second trimester of pregnancy was small (N = 30), no other further investigations was executed on this data.

Literature has documented spontaneous abortion or miscarriage as an outcome of drinking in the first trimester. Increased risk for spontaneous abortion has been associated with consumption of 2 drinks per week (Kline *et al.*, 1980). Others

[57] The 95% confidence interval of the mean is 4.48 – 7.03

(Windham *et al.*, 1997; Kesmodel *et al.*, 2000) have associated 3 or more drinks per week in the first trimester to increased risk for spontaneous abortion. Hence, further analysis was executed to investigate whether there was correlation between the cases of miscarriage encountered in the first trimester, with the proportion of various types of drinkers in the practice. This investigation was done using non-parametric tests for linear associations (Spearman's Rho correlation coefficient) and the data was weighted for the size of the client base.

The results of the above analyses are given in Table 8.4 and indicate that the prevalence of miscarriage in the first twelve weeks of pregnancy had a modest positive correlation to the proportions of regular, heavy, occasional binge and regular binge drinkers in the clientele of midwives. There was no significant correlation between the prevalence of miscarriage and the proportion of occasional drinkers in the clientele of midwives. The strength of the correlation was highest for the proportion of regular binge drinkers (40%) followed by the proportion of heavy drinkers[58] (37%). The strength of the correlation between the prevalence of miscarriage and the proportion of regular drinkers[59] and occasional binge drinkers was 30 and 32% respectively.

Table 8.4

Correlation between cases of miscarriage (1-12 weeks) and the proportions of different types of drinkers among the clientele of midwives

Proportions of drinkers	Correlation coefficient	Significance (2-tailed)
Occasional drinkers	-0.167	0.108
Regular	0.303	0.017*
Heavy	0.377	0.003**
Occasional binge drinkers	0.317	0.009**
Regular binge drinkers	0.395	0.001**

*** Significant at $\alpha = 0.05$; ** Significant at $\alpha = 0.01$**

Although the correlation seen in the current research between the prevalence of miscarriage in the first 12 weeks of pregnancy among the clientele of midwives and the

[58] Having more than a drink a day
[59] Have a drink a day

proportion of clients of various drinking styles was modest (30 - 40%), it raises concern over the non-acceptance of the "Abstinence" message currently popular among researchers and health professionals of New Zealand.

8.4 Estimates provided by midwives of infants affected by *in utero* exposure to alcohol:

The current research aimed at assessing the probable estimates of infants perceived by midwives to be affected by *in utero* exposure to alcohol. To achieve this objective midwives were asked the following question:

Q 5.a. How many cases do you see in a year of infants that you think have been affected due to alcohol intake by the mother in pregnancy?

As this question was not directed at the clients of midwives, data provided by all midwives (N = 445) were analysed. About 36% (N = 162) of midwives had not seen any cases of infants perceived by them to be affected by *in utero* exposure to alcohol and ~ 9% (N = 39) did not answer this question. Overall, the mean number of cases of affected infants reported by midwives (N = 244) in New Zealand was 3.27 cases (95% CI of mean was 2.93 to 3.62) or 798 cases[60] in the year prior to the survey. These results although subjective in nature seem to indicate that there is reason for concern with alcohol consumption during pregnancy in New Zealand.

8.5 Encounter of midwives with common symptoms associated with *in utero* alcohol exposure among infants:

Literature has associated various symptoms among new-borns to maternal drinking, especially heavy drinking in pregnancy. Some of the symptoms at birth associated with heavy maternal alcohol use were poor neonatal habituation, decreased sucking pressure, increased tremulousness, irritability and remaining active a longer time (Streissguth *et al.*, 1981), sleep disorders (Rosett *et al.*, 1979), significant alterations in reflexive

[60] This figure was obtained by multiplying the mean number of cases (3.27) by the number of midwives (244).

behaviour, increased levels of activity and signs of CNS instability like tremors (Coles *et al.*, 1985).

The current research endeavoured to assess the encounter of midwives with some of these symptoms. For this purpose, midwives were asked the following question.

Q 5.b. How commonly have you come across the symptoms listed below in new-borns in the past year?

The symptoms included under this question were, “Disturbances in sleep patterns”, “Facial and body tremors”, “Kept their eyes open for a long time”, “Touched their hands to their faces frequently” “Poor sucking pressure”, “Takes longer to suck after contact with nipples” and “Restless, irritable and is active a longer time”.

A 4-point Likert scale was used to record the responses of midwives with 1 being “Very common” and 4 being “Never”. The data provided by all participating midwives with and without a client load (N = 445) were analysed, as the question was not related to client information. The frequency distribution of midwives according to their response against each symptom is given in Table 8.5. A high proportion of midwives participated in this question and on average 89% of midwives answered all the questions.

Comparing the frequency of responses against each listed symptom (Table 8.5), 17% of midwives reported having encountered “Disturbances in sleep patterns” “Very commonly” whilst less than 9% reported having encountered all the other symptoms “Very commonly”. Thirty percent of midwives reported having encountered the same “Commonly” in comparison to 8 to 22% for the other symptoms. The majority of midwives (38-67%) reported that they encountered all the above listed symptoms “Sometimes” in their practices. Only 10-15% of midwives reported never having encountered symptoms like, “Poor sucking pressure”,

Table 8.5

Midwives (%) reporting the occurrence of symptoms in new-borns commonly associated with heavy *in utero* exposure to alcohol

Symptoms	N	Very common	Common	Sometimes	Never
Disturbances in sleep patterns	404	17.1	30.2	47.8	5.0
Facial and body tremors	400	1.3	8.3	54.5	36.0
Kept their eyes open for a long time	384	2.1	9.4	47.7	40.9
Touched their hands to their faces frequently	381	8.9	17.8	37.5	35.7
Poor sucking pressure	405	4.0	17.3	67.2	11.6
Takes longer to suck after contact with nipple	395	2.8	16.7	65.8	14.7
Restless irritable and is active a longer time	402	5.5	22.4	61.7	10.4

"Takes longer to suck after contact with nipple" and "Restless irritable and is active a longer time".

Further analysis was done using HOMALS optimal scaling data reduction technique to investigate whether there was any relationship between these symptoms and their categories. The result of this analysis is represented as a two-dimensional graph (Fig 8.1) and discussed below. The categories of each symptom ranged from 1 being "Very common" to 4 being "Never". The 2 dimensional solution accounted for 75% of the (adjusted) inertia in the model.

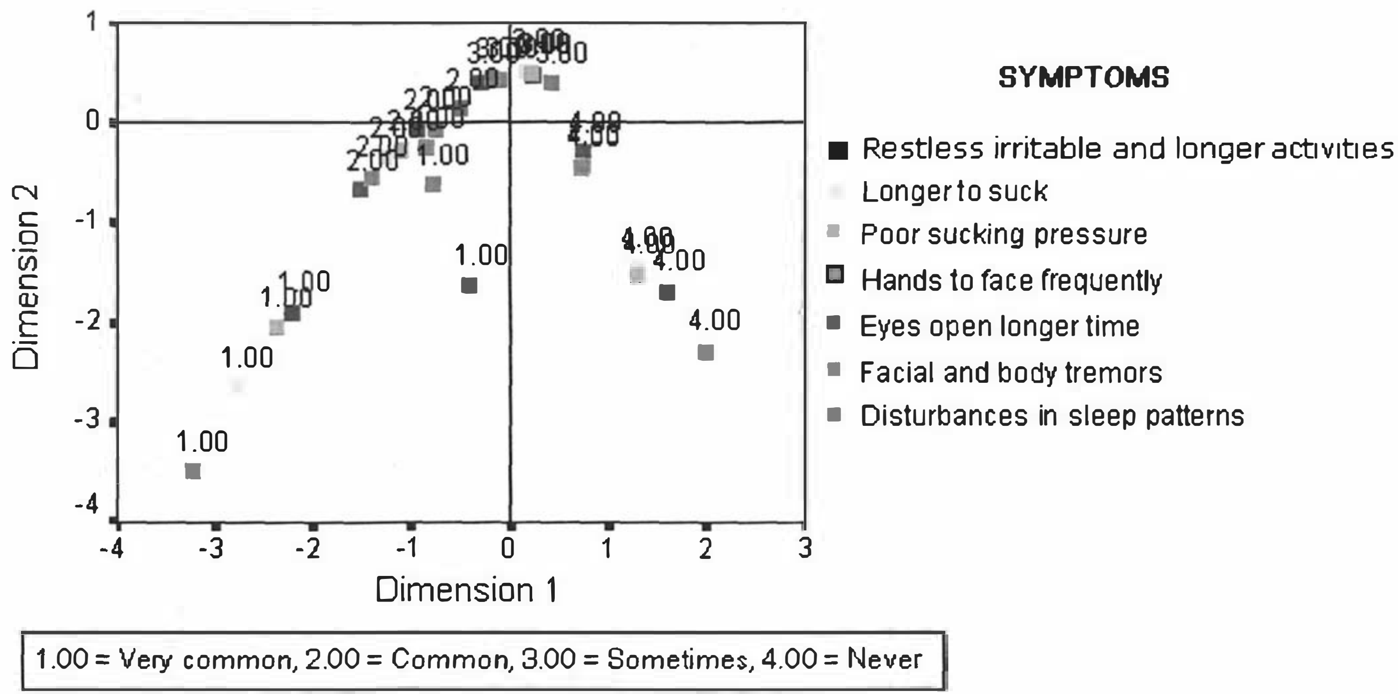
On observing the plot of Dimension 1 versus Dimension 2 (Fig 8.1) all the points, each one representing a category for a symptom listed, seem to lie in a "V" shape, with the angle just below the origin of the graphs. Categories of symptoms that lie close to the origin of the plot are of common occurrence and categories of symptoms that lie further away from the origin are more distinctive.

If two points representing individual symptoms are away from the origin, and in the same direction, then midwives had encountered the categories they represent together more often than simple chance would suggest. In general, this pattern suggests that midwives encountered either higher or lower levels of these symptoms together, but some of the symptoms were more commonly encountered than others.

The "Very Common" (1) occurrence of "Restless, irritable and longer activity", "Facial and body tremors", "Poor sucking pressure" and "Takes longer to suck after contact with nipple" stick out away from the origin, suggesting that their encounter by midwives was rare and distinctive but when seen, all the above symptoms were encountered together. The "Very Common" categories of "Disturbances in sleep patterns" and "Touched hands to face frequently" are closer to the origin, suggesting that they are more typically seen in the practices of midwives.

Figure 8.1

Two dimensional plot of the encounter of midwives with symptoms associated with *in utero* exposure to alcohol



The "Common" (2) category of "Touched hands to face frequently" lie closest to the origin indicating that midwives do encounter this symptom quite frequently. The "Common" category of "Eyes open a long time" is furthest from the origin and is encountered less typically by midwives. The "Sometimes" (3) category of all the listed symptoms lies closer to the origin indicating that midwives encountered all these symptoms but not frequently.

On the left hand side of the plot, the four "Never" (4) categories of "Disturbed sleep patterns", "Restless, irritable and longer activity", "Poor sucking pressure" and "Long to suck after contact with nipple" stick out away from the origin, suggesting that some midwives tend not to see infants with these symptoms but this is not typical. However, the "Never" category of "Eyes open a long time", "Facial and body tremors" and "Touched hands to face frequently" lie together and closer to the origin indicating that all these symptoms together are not encountered by majority of the midwives.

Results of the above analysis indicate that midwives more typically reported encountering the above symptoms associated with heavy exposure to alcohol *in utero* "Sometimes". These results also indicate that the "Very common" occurrence of symptoms characteristic of exposure to heavy alcohol *in utero* like "Restless, irritable and longer activity", "Facial and body tremors", "Poor sucking pressure" and "Takes longer to suck after contact with nipple" were encountered rarely, but when seen, were observed as a cluster of symptoms. This result indicates that the outcomes of heavy alcohol consumption in pregnancy are prevalent and are likely to be in proportion to the occurrence of heavy maternal drinking. The level of heavy drinking reported by midwives of this study was ~ 13% and Watson and McDonald (1999) reported that 10% of pregnant women of their study were drinking to intoxicating levels.

8.6 Encounter of midwives with common birth defects:

The current research aimed at assessing the encounter of midwives with noticeable birth defects. For this purpose, midwives were asked the following question.

Q 6c. How many cases would you have encountered of birth defects listed below during your current midwifery practice in New Zealand?

The specific objective of this question was to compare the encounter of midwives with foetal alcohol syndrome and peculiar faces with other obvious birth defects. One major limitation of collecting this information from midwives is the possibility of duplication as midwives provide postnatal care as a team. Hence more than one midwife may have given information for the same child. Hence, no effort has been made in the current research to validate these estimations with national or international prevalence rates of these birth defects. The birth defects included under this question were spina bifida, microcephaly, hydrocephaly, cleft palate/lip, polydactyly, syndactyly, club feet, Down syndrome, foetal alcohol syndrome and peculiar faces. Personal discussions with midwives suggested that midwives are quite familiar with infants born with peculiar faces, colloquially referred to as Funny Looking Kids (FLKs).

In a study by Little *et al.* (1990), that investigated the under-diagnosis of foetal alcohol syndrome and foetal alcohol effects, "Facies" characterised by typical dysmorphic features were found only in infants born to drinking mothers. It is possible that many of these infants although not diagnosed are actually affected with foetal alcohol syndrome. Hence both these categories were included separately and a description of peculiar faces as recorded in the literature by Jones *et al.* (1973) was also included.

The response of all participating midwives (N = 445) was included in this analysis, as the question was not specifically directed at clients. The mean number of cases of birth defects encountered by midwives[61] is depicted in Figure 8.2 and ranged from 0.8 to 1.4 cases per midwife in an average year. The mean number of cases of spina bifida (0.8), microcephaly (0.7), hydrocephaly (0.8), polydactyly (0.9) and syndactyly (0.8) were below 1 case per midwife in an average year. The mean number of cases of cleft palate/lip (1.1), Down syndrome (1.1), clubfeet (1.3), peculiar faces (1.4) and foetal alcohol syndrome (1.4) was above 1 case per midwife in an average year. However, as the question on birth defects did not ask specifically the encounter of midwives with birth defects at the time of birth, it is likely to also include cases seen when providing care for subsequent pregnancies.

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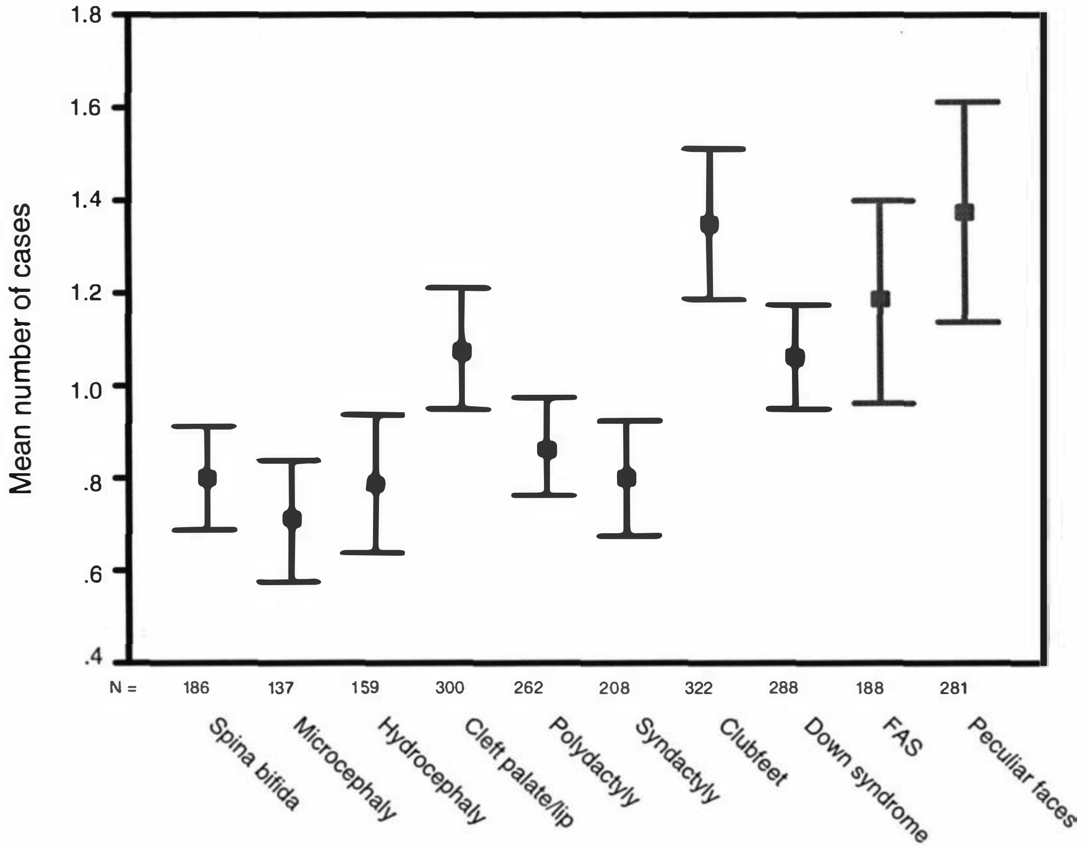
[61] Only midwives who had encountered the listed birth defects were included in the analysis

Figure 8.2

Mean number of cases of birth defects encountered by midwives in an average year



The proportions of midwives who encountered the listed birth defects in their current midwifery practice are given in Table 8.6. These proportions were lowest for microcephaly (33%), hydrocephaly (39%) and spina bifida (44%) and highest for clubfeet (77%) and peculiar faces (70%). The number of cases of birth defects encountered by midwives in an average year calculated by multiplying the mean number of cases with the number of midwives who encountered these birth defects is also given in Table 8.6. On comparing these figures it is observed that midwives encountered the highest number of "club feet" (419 cases) followed by peculiar faces (393 cases). With respect to foetal alcohol syndrome, the results of this study indicate that midwives (N = 188) encounter a mean number of 1.2 cases or 225 cases per year in New Zealand. This is a fairly high number of cases and it is possible that some midwives have actually given the information for foetal alcohol syndrome and peculiar faces for the same infant. In addition, as pointed out above, in some cases two or more midwives may be reporting the same affected child. However, despite these limitations, in combining the total number of cases of foetal alcohol syndrome and peculiar faces, the results of this study indicate that in an average year midwives of this study encounter 618 cases of infants with dysmorphic features in New Zealand. This figure is also very similar to the estimates provided by midwives of infants (N = 798) who they believed were affected by maternal alcohol consumption.

Table 8.6

Total cases of birth defects encountered by midwives in a typical year

Birth defect	Total N	Midwives reporting an encounter (%) N	Total number of cases*
Spina bifida	427	43.6 (186)	149
Microcephaly	416	32.9 (137)	96
Hydrocephaly	410	38.8 (159)	127
Cleft palate/lip	430	69.8 (300)	330
Polydactyly	425	61.6 (262)	236
Syndactyly	420	52.4 (208)	166
Clubfeet	421	76.5 (322)	419
Down Syndrome	429	67.1 (288)	374
Foetal alcohol syndrome	350	53.7 (188)	225
Peculiar faces	399	70.4 (281)	393

*** Calculated by multiplying the mean number of cases of birth defect by the number of midwives who encountered the birth defect.**

Leversha and Marks (1995a) reported an estimate of 200 – 3540 infants might be born with foetal alcohol syndrome per year in New Zealand. Morgan (1993) estimated a much lower rate (20 -114) of babies affected by foetal alcohol syndrome every year in New Zealand. Literature records that 30 to 40% of infants born to heavy drinkers in pregnancy show obvious characteristic features of foetal alcohol syndrome (Pietrantoni & Knuppel, 1991). The study of Watson and McDonald (1999) and the current study (see Section 6.8, Table 6.6) indicate that 10 to 13% of pregnant women drink heavily in pregnancy in New Zealand. On calculating the probable incidence figures of foetal alcohol syndrome from the above figures, we arrive at the estimate that 30 to 39 cases with obvious characteristics of foetal alcohol syndrome per 1000 live births[62] may be born in New Zealand each year. This estimate seems to be an overestimate when compared to that reported for foetal alcohol syndrome in the United States, which ranges from 1 in 750 live births (Streissguth *et al.*, 1981) to 1 in 1000 live births (Abel, 1995; Little *et al.*, 1990). Higher prevalence rates have been reported in France (1/100 live births) and in Sweden (1/600 live births) (cited in Little *et al.*, 1990). Similarly, a very high rate of prevalence (48/1000 live births) of foetal alcohol syndrome has been established for South African's Western Cape Province (Belata, 1998). On comparing the prevalence of drinking in pregnancy among New Zealand women, the results of the current research (36% ± 3%) and that (41%) reported by Counsell and colleagues (1994) are more in line with the drinking rates seen in those countries with higher prevalence of foetal alcohol syndrome than the United States (see Chapter 3, Section 3.4.2). The results of this study and the estimates provided by Leversha and Marks (1995) and Morgan (1993) all contribute in raising the awareness of researchers and health professionals to the risk for the prevalence of alcohol related effects in New Zealand. Diagnosis of these disorders at birth by trained New Zealand doctors may be the starting point for establishing the true incidence rates of alcohol related effects in New Zealand.

8.7 Conclusions:

The results of this study indicate that in a majority of practices of midwives alcohol consumption caused a "Moderate" level of concern. It also indicates that in some practices, alcohol consumption has caused "High" (23%) to "Extreme" (14%) levels of concern, indicating that these practices may have a higher proportion of heavy drinkers in pregnancy. The distribution of such practices in the four major regions and in the metropolitan regions of New Zealand was similar.

The results of this study also indicate that first trimester miscarriage, an outcome that has been associated with moderate to heavy drinking in early pregnancy was prevalent

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[62] Total live births for the year 1999 was 56,211 (Statistics, NZ 2000).

among the clients of midwives at an average rate of 6.4 cases in the year preceding the survey. There were no differences in the mean number of cases of miscarriage in the first trimester, according to type and region of practice. On investigating for a correlation between mean number of cases of miscarriage and the proportion of drinkers according to different styles of drinking in the clientele of midwives, a modest positive correlation was observed between prevalence of first trimester miscarriage and the proportion of clients of all drinking styles except "Occasional" drinking. The strength of the correlation increased in proportion according to the styles of drinking and was highest for the proportion of binge drinkers in the clientele of midwives. The results of this study raise concern as to how many miscarriages or spontaneous abortions in New Zealand may be the result of alcohol consumption.

With respect to the encounter of midwives with infants affected due to maternal alcohol consumption, on average midwives reported 3.3 cases in the year preceding the survey. On assessing midwives' encounter with symptoms in infants associated in the literature with heavy *in utero* exposure to alcohol, most midwives tended to see these symptoms "Sometimes" in the year prior to the study. However, further analysis indicated that although the "Very common" occurrence of distinctive symptoms of heavy alcohol exposure was rare, when they did occur these symptoms occurred together in the same practices. In assessing the encounter of midwives with some noticeable birth defects the mean number of cases of "Peculiar faces" seen by midwives was high in comparison to most of the other birth defects. Although the combined estimate of 618 cases a year of foetal alcohol syndrome and peculiar faces may have its limitations, it was well within the recent estimates provided by other New Zealand researchers. These results also draw attention to the fact that New Zealand may be at a higher risk for the prevalence of alcohol related disorders than other Western countries. The current study also highlights the need to improve diagnosis at birth in New Zealand and to maintain incidence figures of affected children and those at risk.

Chapter - 9

Methodology Adopted for Further Analysis of Data from the "*Nutrition during Pregnancy*" study.

9.1 Introduction:

Research interest on alcohol consumption among pregnant women in many Western countries has escalated since 1973, when Jones and Smith first coined the term "Foetal alcohol syndrome". However among New Zealand researchers, one cannot say that the issue of alcohol consumption in pregnancy has been met with the same enthusiasm. The "*Nutrition during pregnancy*" study (Hereafter known as the "Original study") funded by the Ministry of Health, New Zealand was a prospective study on a non-random sample (N = 504) of pregnant women. The objectives of this study were to provide baseline information on nutrient intakes, physical activity and anthropometric measurements in pregnant European, Maori and Pacific New Zealand women. It also aimed to provide information on eating patterns in the different cultural groups and to identify any nutritional areas of concern (Watson and McDonald, 1999). A research report by Flegal (1989) has highlighted the usefulness of dietary data sets in offering alcohol researchers a detailed picture of drinking behaviour of respondents. The study by Watson and McDonald (1999) is the only one of its kind in New Zealand that has collected detailed information on alcohol consumption patterns prior to pregnancy and in pregnancy. The only limitation of this study would be that it was done on a self-selected sample of pregnant women and the hence the results of this study cannot be extrapolated to the population at large. However, as pregnancy is a non-random event, it is impractical to execute such a detailed study during pregnancy on a random sample of pregnant women. An attempt was made to meet the overall objective of the current research by doing further analysis on data[63] collected by Watson and McDonald, (1999). For this purpose a request was made to the principal investigator for the dataset with the required variables (Appendix 12 a). The objectives of the original study (Appendix 12 b) were totally different from the current research and hence there was no overlapping

[63] Only a sub-set of the sample was used, which comprised of women who were drinkers prior to pregnancy (N = 408).

of interests of any nature. The methodology adopted by the original study is given in Appendix 12 c. All analyses done in the current research were executed only on women who were drinkers prior to pregnancy (N = 408) and are original in nature.

Overseas studies have indicated that pre-pregnancy drinking behaviour is highly predictive of drinking in pregnancy (US department of Health and Human Services, 2000; Bolumar *et al*., 1994). Literature also indicates that any reduction in drinking during pregnancy among those who continue to drink in pregnancy is likely to be proportional to pre-pregnancy drinking behaviour (Little *et al*., 1976). In the current research, an attempt has been made to draw out the demographic characteristic of usual drinking women according to their style and frequency of alcohol consumption. The study also investigated whether usual style and frequency of drinking had an association with drinking status in pregnancy.

The possibility of women who usually drink continuing to drink in the early stages of pregnancy, perhaps prior to recognition of pregnancy, has gained much research attention in recent times. A figure of 40-45% of women drinking in the early stages of pregnancy has been reported in overseas literature (Shaw and Lammer, 1999; Floyd *et al*., 1999). Overseas studies have also indicated that younger women, especially teenagers, are at risk for continuing a binge style of drinking into the early stages of pregnancy (Cornelius *et al.,* 1994; Jonathan *et al*., 1997). Information on the actual prevalence rate of drinking in the early stages of pregnancy is absent for New Zealand. However, the results of the survey of midwives (part of the current research and discussed in Chapter 6, Section 6.14) indicate the prevalence of women drinking prior to recognition of pregnancy. The current research aims to draw out the demographic characteristics of women who were drinking in the early stages of pregnancy according to their style and frequency of drinking.

The study by Counsell and colleagues (1994) on a random sample of New Zealand pregnant women found that compared to abstainers, women who drank in pregnancy were likely to be older and those at risk for frequent drinking in pregnancy were of the higher socio-economic status. However, this study failed to obtain information on the style of drinking or the amount of absolute alcohol consumed on a typical occasion and hence their conclusions can be questioned. In the Seattle study, the amount of absolute alcohol consumed on a typical occasion in pregnancy was predictive of deficits in arithmetic and reading abilities even at 14 years (Streissguth *et al.*, 1994a). In the current research both the style and frequency of drinking in pregnancy were addressed. The study aimed to investigate whether there was an association between demographic characteristics of women who continued to drink in pregnancy and their style and frequency of drinking in pregnancy.

Recent literature[64] has highlighted the importance of adequate nutritional status of the mother prior to pregnancy, at conception and during pregnancy for favourable foetal outcome. In one of the earliest studies on infant outcomes of maternal alcohol consumption, Jones *et al.* (1973) raised the issue as to whether the anomalous morphogenesis[65] seen in infants born to alcoholic mothers was in effect an indirect consequence of maternal under-nutrition or a direct effect of a deficiency of a specific nutrient. Michaelis and Michaelis (1994) and Philips *et al.* (1989) have also raised the issue of maternal nutritional status as being one of the host factors that influences the pathogenesis of foetal alcohol syndrome. Hence to assess the risk for the prevalence of foetal alcohol syndrome and alcohol related effects in New Zealand, the current research aimed to investigate dietary intake behaviour as reflected by nutrient intakes, among pregnant women who were drinkers prior to pregnancy and during pregnancy.

Watson and McDonald (1999) in the original study collected detailed information on alcohol consumption patterns (self-reported) from a non-random sample of pregnant women. Information on alcohol consumption was collected using both a questionnaire administered at month 4, as well as from the diet records. Dietary data for this study were collected using one 24-hour recall and a four-day diet record in the fourth month and in the seventh month of pregnancy. All days of the week were evenly represented in the diet record collected by Watson and McDonald. (1999). Using standardised measures to determine volume and portion size of food consumed, data collectors administered one 24-hour dietary recall in the 4^{th} and the 7^{th} month of pregnancy. With respect to the 4-day diet record, participants were provided standardised cups and spoons to determine the volume and portion size of food and were asked to record this information in the diet record book provided. Overall nutrient intakes did not differ

[64] Proceedings of the first world congress on foetal origins of adult diseases, 2001
[65] Deviation in the formation of complex tissues resulting in congenital defects

significantly whether the data were collected by either of the methods (Watson and McDonald, 1999).

This further research aimed to draw out a demographic and nutrient intake profile of these pregnant women according to their drinking behaviour. For the purpose of this research, alcohol consumption reported in the questionnaire administered by a trained interviewer at around month four of pregnancy and the weighted average intakes of nutrients in month four and month seven obtained from the 24 hour recall and 3 day diet records (Watson and McDonald, 1999) were used for the further analysis executed to achieve the objectives outlined below (9.2). All variables on alcohol consumption for the current research were manufactured from the information contained in the original dataset. Variables on demographic characteristics were modified in some cases. With respect to age, women were coded to match the same age categorisation adopted in the midwives survey. However, due to small numbers teenagers and young adults were grouped together (16 - 25 years of age). With respect to education, women were categorised as "University / Polytech" and "No formal education" from the original information available. With respect to ethnicity, women were categorised as "European" and "Non-European" instead of "European", "Maori" and "Pacific" as was done in the original study. Women were categorised according to socio-economic status based on the "Occupational" categorisation adopted in the original study. Categorization according to marital status was done from the information available in the original study as "Single, "Married" and "Partnered" to match the categorisation used in the midwives survey. For achieving the second objective of the further analysis the weighted nutrient intakes in pregnancy were used from the original dataset.

9.2 Objectives of the research:

The objectives of this study were as follows:

1. **To draw out a demographic profile of pregnant women according to their drinking status and style and frequency of drinking.**

   Specific issues addressed under this objective were to:

i. Investigate whether there was an association between the demographic characteristics of usually drinking women and their style and frequency of drinking prior to pregnancy.
ii. Investigate whether the style and frequency of drinking prior to pregnancy of usually drinking women influenced their drinking status in pregnancy.
iii. Investigate whether there was an association between the demographic characteristics of usually drinking women who continued to drink in the early stages of pregnancy and their style and frequency of drinking prior to pregnancy.
iv. Investigate whether there was an association between the demographic characteristics of usually drinking women who continued to drink in pregnancy and their style and frequency of drinking in pregnancy.

2. To draw out a profile of nutrient intakes of pregnant women according to their drinking status and style of drinking.

Specific issues addressed under this objective were to:

i. Draw out a profile of nutrient intakes of "Usual" drinkers according to their style of drinking prior to pregnancy.
ii. Draw out a profile of nutrient intakes of "Usual" drinkers according to their drinking status in pregnancy.
iii. Draw out a profile of nutrient intakes of "Early pregnancy" drinkers according to their style of drinking prior to pregnancy.
iv. Draw out a profile of nutrient intakes of "Always a drinker" according to their style of drinking in pregnancy.

9.3 Methods adopted to achieve these objectives:

In the current research, pregnant women were categorised based on their response to the following questions administered in the original study by Watson and McDonald (1999).

The first question was:

"Before you were pregnant did you drink alcoholic drinks?"

Women who answered negatively to this question were categorised as "Non-drinkers" and those who answered positively to this question were categorised as "Usual" drinkers.

The "Usual" drinkers were further administered the following question:

"Has your consumption of alcoholic drinks changed since you became pregnant?"

Women who answered negatively to this question were labelled as "Always a drinker" and women who answered positively to this question were further administered the following question:

"How has it changed?"

Women who answered "Never Drink" were labelled as "Abstainers". Those who answered, "Don't drink now" were labelled as "Early pregnancy" drinker. Women who answered "Drink less", "Drink same" or "Drink More" were categorised under the "Always a drinker" group.

In the current research "Style of drinking" was defined according to the amount of absolute alcohol consumed on a typical occasion. The definitions used in this study for light, moderate and heavy drinkers were as follows:

Light drinker: 10g or less than 10g of absolute alcohol on a typical occasion

Moderate drinker: Above 10g and less than 40g of absolute alcohol on a typical occasion

Heavy drinker: 40g and above of absolute alcohol on a typical occasion

As the categorisation of style of drinking adopted in the current research was based on the amount of absolute alcohol consumed in a typical occasion, binge drinkers were also included in the heavy drinking category.

Details of drinking behaviour of "Early pregnancy" drinkers in pregnancy were not recorded in the original study and hence no information is available on their style of drinking in pregnancy. The study by Striessguth *et al.* (1994a) found that the amount of absolute alcohol consumed on a typical occasion prior to pregnancy and in pregnancy were highly correlated ($r = 0.80$). Hence, in the current research all analyses pertaining to "Early pregnancy" drinkers were done using data on drinking prior to pregnancy.

In the current research, "Frequency of drinking" was defined as follows:

Infrequent: Consuming alcohol less than once a month
Frequent: Consuming alcohol once a week or 1 – 2 times a month
Very frequent: Consuming alcohol 2-3 times a week or daily

For achieving the objectives of this study among women who were drinkers prior to pregnancy, analysis was executed on all "Usual" drinkers (N = 408). For similar analysis on women who were drinkers in pregnancy, the "Usual" drinkers were further categorised as "Abstainers" (N = 33), "Early Pregnancy" drinkers (N = 231) and "Always a drinker" (N = 144) according to their drinking status in pregnancy.

The Statistical Package for Social Sciences (SPSS) was used for all the analyses. For achieving the first objective, differences in the demographic profile (categorical variables) of pregnant women in the various categories were investigated using Chi-Square analysis. For achieving the second objective, differences in the intake of nutrients (continuous variables) in pregnancy among women of the above categories were investigated using non-parametric tests (Kruskal-Wallis).

Chapter -10: Results and Discussion, Objective: 1

Demographic Profile of Pregnant Women According to their Drinking status and Style and Frequency of Drinking.

10.1 Introduction:

The majority of women of childbearing age are usual drinkers of alcohol. Studies have attempted to characterise women who are at risk for drinking in pregnancy (Streissguth *et al*., 1983b; Bolumar *et al*., 1994; Counsell *et al*., 1994; Ebrahim *et al*., 1998; 1999; CDC, 2002). Some of these studies were able to draw the demographic characteristics distinct to women who were at risk for drinking in pregnancy. However, the study by Bolumar *et al*., 1994 found that only the amount of absolute alcohol consumed on a typical occasion prior to pregnancy was predictive of drinking in pregnancy. The results of the survey of midwives (part of the current research and discussed in Chapter 6, Section, 6.2) indicated that a higher proportion of younger women (14-25 years) consumed alcohol in pregnancy in comparison to adults (26-35) and older adults (above 35). Other studies have attempted to characterise women who are at risk for heavy drinking and binge drinking in pregnancy (Kaminski *et al*., 1978; Weiner *et al*., 1983; Rossett *et al*., 1983; Bell and Lumley, 1989; Lodewijckx and Goof, 1990; Stewart and Streiner, 1994; Cornelius *et al*., 1994; Jonathan *et al*., 1997; Watson and McDonald, 1999). The results of these studies vary and indicate that women at both ends of childbearing years are at risk for heavy (Including bingeing) drinking in pregnancy. In the current research, an attempt has been made to draw out the demographic profiles of pregnant women according to their drinking status, drinking style and drinking frequency prior to pregnancy and in pregnancy.

Pregnant women in this study were categorised into four groups according to drinking status, the criteria for which have already been discussed in depth in Chapter 9. Watson and McDonald as part of the original study collected all the data on the variables of interest of the current research, and carried out the original analysis on alcohol consumption levels prior to and during pregnancy (Watson and McDonald, 1999).

10.2 Background information of the study sample:

Prior to pregnancy 81% (N = 408) of pregnant women of this study were drinkers (Watson & McDonald, 1999). This estimate is similar to that obtained in the 1997 New Zealand Health Survey[66] for women of child bearing age (Statistics New Zealand, 1998). Watson and McDonald (1999) analysed the distribution of drinkers and non-drinkers in their sample according to various demographic characteristics. The distribution of these women according to their "Age group", "Educational status" and "Socio-economic status" did not differ between the drinkers and non-drinkers. However, the distribution of pregnant women of this study among drinkers and non-drinkers differed according to "Ethnicity" and "Marital status". A greater proportion of single, European women were drinkers prior to pregnancy (Watson and McDonald, 1999).

Table 10.1

Distribution of "Usual" drinkers according to drinking status in pregnancy

Type of drinker	Proportion of pregnant women % (N)
Abstainer (Usual drinker who stopped drinking in pregnancy)	8.1 (33)
Early pregnancy drinker (Usual drinker who stopped drinking at the time of the first interview)	56.6 (231)
Always a drinker (Usual drinker who continued to drink in pregnancy)	35.3 (144)
Total	100 (408)

[66] Results of this study with respect to drinking among various age groups are tabulated in Chapter 2: Table 2.1.

In the current research, pregnant women of the "*Nutrition during Pregnancy*" study who were drinkers prior to pregnancy (N = 408) were further categorised according to their drinking status in pregnancy (Table 10.1). Only 8 % (N = 33) of "Usual" drinkers actually abstained in pregnancy and 57 % (N = 231) continued to drink in the early stages of pregnancy but reported having stopped drinking around month four of pregnancy. About 35% (N = 144) of "Usual" drinkers of this study continued to drink in pregnancy.

10.3 Demographic characteristics of "Usual" drinkers:

In this section, the results of chi-square analysis, executed to explore for any association between demographic characteristics and "Usual" style of drinking are discussed (Table 10.2). With respect to age, the young adults (16-25 years) among "Usual" drinkers were more likely to be heavy drinkers than the older adults and adults (p = 0.000). These results are similar to those obtained from the 1997 New Zealand health survey, where 56% of women in the younger age group (15-25 years) had 5 or more drinks in a day and 45% were monthly binge drinkers (Statistics New Zealand, 1998).

With regard to educational status, women with no university or polytechnic qualification (other)[67] were more likely to be heavy drinkers (p = 0.004). Similar results have been recorded in other New Zealand studies done on the general population (Caswell, 1980; Martin *et al.*, 1992).

With regard to ethnicity, Non-European (Maori and Pacific) women were more likely to be heavy drinkers than European women (p = 0.000). The study by Caswell (1980) on drinking habits of Maori and Pacific women showed similar results. In the study by Dacey (1995) on drinking among Maori women, the median quantity consumed on a typical occasion was as high as 50 ml of absolute alcohol with 31% reporting as monthly drinkers and 14% as weekly drinkers.

With regard to socio-economic status, women solely on the "Benefit" and those of the "Lower" socio-economic status were more likely to be heavy drinkers than women of the "Higher" socio-economic status (p = 0.000).

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[67] This category included women with work training and those who stated "Other", "Not applicable" and "Don't know" against the question that asked about further education and training after school

Table 10.2

Demographic characteristics of "Usual" drinkers according to style of drinking prior to pregnancy.

(N = 408)

Demographic characteristics	Light % (N)	Moderate % (N)	Heavy % (N)
		Age	
16-25 years	7.4 (5)	27.9(19)	64.7(44)**
26-34 years	17.7(41)	60.6 (140)	21.6(50)
≥ 35 years	22.9(25)**	66.1(72)**	11.0 (12)
Statistics	$\chi^2 = 68.447$	$p = 0.000$	
		Education	
University/ Polytech	20.2 (43)*	60.6(129)*	19.2 (41)
No formal education	14.4 (28)	52.3(102)	33.3 (65)*
Statistics	$\chi^2 = 10.986$	$p = 0.004$	
		Ethnicity	
European	21.0 (65)**	64.1 (198)**	14.9 (46)
Non-European	6.1 (6)	32.7 (32)	61.2 (60)*
Statistics	$\chi^2 = 85.503$	$p = 0.000$	
		Socio-economic status	
High	23.6 (39)**	63.0 (104)**	13.3 (22)
Low	14.6 (29)	55.8 (111)	29.6 (59)**
Benefit	6.8 (3)	36.4 (59)	56.8 (25)**
Statistics	$\chi^2 = 39.138$	$p = 0.000$	
		Marital status	
Single	2.6 (1)	41.0 (16)	56.4 (22)**
Married	13.3 (10)	45.3 (34)	41.3 (31)**
Partnered	20.4 (60)**	61.6 (181)**	18.0 (53)
Statistics	$\chi^2 = 39.669$	$p = 0.000$	

* $p \leq 0.05$; ** $p = 0.000$

In this study, 62% of women from the "Lower" socio-economic group were adults and more than half of those in the "Benefit" group were young adults. In the 1988 survey of New Zealanders, the heavy drinking younger women were more from the lower socio-economic status (Wyllie and Caswell, 1988). Hence the question whether style of drinking is influenced more by "Age" rather than the "Socio-economic" status needs further investigation.

With respect to marital status, single women were more likely to be heavy drinkers than partnered women ($p = 0.000$). It was interesting to note that the married women of this study were also more likely to be heavy drinkers than partnered women. In the 1988 survey, married women tended to be older than single women and were largely frequent at-home drinkers consuming wine or spirits while single women were younger and consumed mainly spirits or beer, usually away from home at hotels/taverns, nightclubs, restaurants and at homes of friends (Wyllie and Caswell, 1989).

Among "Usual" drinkers of this study, a greater proportion of heavy drinkers were younger (16-25), single and non-European, on the benefit or of lower socio-economic status with no formal education.

As seen in Table 10.3 frequency of drinking was significantly different only according to "Age" group and "Socio-economic" status. Older women (above 35 years of age) and women of higher socio-economic status were more likely to be "Frequent" drinkers than the younger women of the lower socio-economic status ($p \leq 0.05$). The younger women (16-25) were more likely to be "Frequent" or "Infrequent" drinkers than the adult and older adult women of this study. The higher proportion of both "Frequent" and "Infrequent" drinkers among younger women observed in the current research is probably the consequence of the age categorisation adopted in the current research. The age categorisation of younger women (16-25 years) adopted in the current research comprises both the teenage (below 19 years) and the young adult group (above 19 and below 25 years). Both New Zealand (Caswell, 1980) and overseas literature (Cornelius *et al.*, 1994); Jonathan *et al.*, 1997) has indicated that teenagers are "Infrequent" drinkers and young adults are "Frequent drinkers (Martin *et al.*, 1992; Wyllie *et al.*, 1996).

Table 10.3

Demographic characteristics of "Usual" drinkers according to frequency of drinking prior to pregnancy (N = 408)

Demographic characteristics	Infrequent[1] % (N)	Frequent[2] % (N)	Very frequent[3] % (N)
	Age		
16-25 years	23.5 (16)*	32.4 (22)*	44.1 (30)
26-34 years	12.2 (28)	23.0 (53)	64.8 (149)*
≥ 35 years	14.5 (16)	18.2 (20)	67.3 (74)*
Statistics	$\chi 2 = 12.628$	$p = 0.013$	
	Education		
University/ Polytech	14.2 (30)	21.7 (46)	64.2 (136)
No formal education	15.3 (30)	25.0 (49)	59.7 (117)
Statistics	$\chi 2 = 0.965$	$p = 0.617$	
	Ethnicity		
European	13.3 (41)	22.0 (68)	67.7 (200)
Non-European	19.2 (19)	27.3 (27)	53.5 (53)
Statistics	$\chi 2 = 3.902$	$p = 0.142$	
	Socio-economic status		
High	10.4 (17)	20.7 (34)	68.9 (113)*
Low	16.5 (33)*	23.5 (47)	60.0 (120)
Benefit	22.7 (10)*	31.8 (14)*	45.5 (20)
Statistics	$\chi 2 = 9.845$	$p = 0.043$	
	Marital status		
Single	20.5 (8)	28.2 (11)	51.3 (20)
Married	10.7 (8)	24.0 (18)	65.3 (49)
Partnered	15.0 (44)	22.4 (66)	62.6 (184)
Statistics	$\chi 2 = 3.146$	$p = 0.534$	

$^*p \leq 0.05$

[1] Consuming alcohol less than once a month
[2] Consuming alcohol once a week or 1 – 2 times a month
[3] Consuming alcohol 2-3 times a week or daily

A greater proportion of adult women (26-35) in the current study were "Very frequent" drinkers than the younger women. Although the grouping according to "Age" was not identical, Martin *et al.* (1992) made similar observations in their study on types of New Zealand drinkers. In this study among light drinkers, "Frequent early evening" drinkers and "Daily family" drinkers comprised mostly of women above 35 years of age. The "Daily family" drinkers was also comprised of more women from a higher socio-economic status. Among moderate drinkers, 60% of the "Frequent social drinking" cluster had higher proportion of younger women (below 30 years of age) who had at least 4 drinking occasions per week.

10.4 Drinking status of "Usual" drinkers in pregnancy:

The distribution of pregnant women of this study according to their drinking status in pregnancy is tabulated in Table 10.1. Above 35% of "Usual" drinkers continued to drink in pregnancy and 57% were "Early pregnancy" drinkers and had stopped drinking prior to the first interview (~ 4 months).

Chi-square analysis was executed to investigate for an association between demographic characteristics and drinking status in pregnancy. The results of this analysis are documented in Table 10.4. There were no significant differences in the proportion of young adults, adults and older adults who "Abstained", were "Early pregnancy" drinkers or "Always a drinker" in pregnancy. Similarly, education and marital status did not have a significant association with drinking status in pregnancy.

Ethnicity of women of this study had a significant association with drinking status in pregnancy. A greater proportion of European women (38%) in comparison to non-European women (27%) of this study sample continued to drink in pregnancy (p = 0.035). Socio-economic status had a weak association (p = 0.076) with drinking status in pregnancy with higher proportions of high-income women (39%) continuing to drink in pregnancy in comparison to low-income (36%) and women on benefit (18%). An overseas study has found similar results where women of higher socio-economic status were at risk for drinking in pregnancy (CDC, 1995).

Table 10.4

Demographic characteristics of "Usual" drinkers according to drinking status in pregnancy (N = 408)

Demographic characteristics	Abstained % (N)	Early pregnancy % (N)	Always a drinker % (N)
	Age		
16-25 years	5.9 (4)	64.7 (44)	29.4 (20)
26-34 years	8.3 (19)	58.3 (134)	33.5 (77)
≥ 35 years	9.1 (10)	48.2 (53)	42.7 (47)
Statistics	$\chi2 = 5.436$	$p = 0.245$	
	Education		
University/ Polytech	9.0 (19)	58.0 (123)	33.0 (70)
No formal education	7.1 (14)	55.1 (108)	37.8 (74)
Statistics	$\chi2 = 1.217$	$p = 0.544$	
	Ethnicity		
European	9.1 (28)	53.1 (164)	37.9 (117)*
Non-European	5.1 (5)	67.7 (67)*	27.3 (27)
Statistics	$\chi2 = 6.698$	$p = 0.035$	
	Socio-economic status		
High	9.8 (16)	51.2 (84)	39.0 (64)
Low	6.5 (13)	57.5 (115)	36.0 (72)
Benefit	9.1 (4)	72.7 (32)	18.2 (8)
Statistics	$\chi2 = 8.456$	$p = 0.076$	
	Marital status		
Single	5.1 (2)	74.4 (29)	20.5 (8)
Married	5.3 (4)	61.3 (46)	33.3 (25)
Partnered	9.2 (27)	53.1 (156)	37.8 (111)
Statistics	$\chi2 = 7.682$	$p = 0.104$	

Chi-square analysis was also executed to investigate the drinking status of "Usual" drinkers in pregnancy (Table 10.5). A weak association ($p = 0.064$) was found between "Usual" style of drinking and drinking status in pregnancy. The distribution of light, moderate and heavy drinkers among "Abstainers", "Early pregnancy" drinkers and "Always a drinker" of this study were quite similar. However an upward gradation in the proportion of light, moderate and heavy drinkers among "Always a drinker" was observed with a greater proportion of heavy "Usual" drinkers continuing to drink in pregnancy. Similar results were observed in an overseas study (CDC, 2002) where usual heavy drinkers were at risk for continuing to drink in pregnancy.

Table 10.5

Drinking status of "Usual" drinkers in pregnancy according to style and frequency of drinking (N = 408)

Usual drinking style	**Drinking status in pregnancy % (N)**		
	Abstained	***Early pregnancy***	***Always a drinker***
Light	4.2 (3)	67.6 (48)	28.2 (20)
Moderate	10.4 (24)	55.7 (128)	33.9 (78)
Heavy	5.7 (6)	50.9 (54)	43.4 (46)
	$\chi^2 = 8.906$	$p = 0.064$	
Usual drinking frequency			
Infrequent[1]	5.0 (3)	80.0 (48)*	15.0 (9)
Frequent[2]	12.6 (12)	61.1 (58)*	26.3 (25)
Very frequent[3]	7.1 (18)	49.4 (125)	43.5 (110)*
	$\chi^2 = 26.848$	$p = 0.000$	

[1] Consuming alcohol less than once a month
[2] Consuming alcohol once a week or 1 – 2 times a month
[3] Consuming alcohol 2-3 times a week or daily

Similar analysis showed a statistically significant ($p = 0.000$) association between "Usual" frequency of drinking and drinking status in pregnancy. A greater proportion of "Very frequent" drinkers (44%) were likely to continue to drink in pregnancy. In the previous section (10.3) it was observed that a greater proportion of "Very frequent" drinkers were older women of a higher socio-economic status (Table 10.3) who were more likely to be light drinkers (Table 10.2).

The results of this study also indicate that a greater proportion (80%) of "Early pregnancy" drinkers was usually consuming alcohol "Infrequently". In the previous section (10.3), it was observed that a greater proportion of "Infrequent" drinkers were of the 16-25 years age group (Table 10.4) and 65% of these women were heavy drinkers (Table 10.2). Hence, the younger women of the current study were more likely to drink in the early stages of pregnancy. The studies by Cornelius *et al.* (1994) and Jonathan *et al.* (1997) have shown that "Teenagers" are at high risk for binge drinking in the early stages of pregnancy. Although the younger women of the current research also encompass the young adults (20-25), it was found that they tended to be in danger of drinking in the early stages of pregnancy and therefore particularly at risk for causing foetal damage, especially as many of them were heavy drinkers.

The results of this study also indicate that older light drinking women of higher socio economic status were most likely to continue drinking in pregnancy. Similar results were seen in the Plunket study (Counsell *et al.*, 1994), where older women of higher socio-economic status were most at risk for drinking in pregnancy. In a study by the Centres for Disease Control and Prevention, the socio-demographic characteristics of women most likely to drink in pregnancy were white, married, more educated and of higher income level (CDC, 1995). The results of the above study also indicate that these women are at risk to be not detected by physicians for drinking in pregnancy (CDC, 1995).

10.5 Demographic characteristics of "Early pregnancy" drinkers:

The prevalence of drinking in the early stages of pregnancy or prior to recognition of pregnancy has not been researched as frequently as drinking in pregnancy. Many pregnant women probably stop drinking after recognising pregnancy and prior to their first antenatal visit. Fifty-six percent of "Usual" drinkers (N = 408) or 45.8% of all pregnant women (N = 504) of this study may be classified as "Early pregnancy" drinkers. The term "Periconceptional drinkers", commonly used in overseas literature has not been used in the current research, as the question used to collect this information in the original study is not congruent with the definition by Floyd *et al.*, (1999) and others (see Chapter 1, Section 1.3). However, the prevalence (45.8%) of drinking in early pregnancy among all respondents of this study was similar to overseas statistics reported by Floyd *et al.,* 1999 (45%) and Shaw and Lammer, 1999 (40%). If the "Early pregnancy" drinkers of this study were unaware of their pregnant state then it is possible that they continued their "Usual" drinking style during this period.

In the following section an attempt has been made to investigate whether there is an association between the demographic characteristics of "Early pregnancy" drinkers according to their "Usual"[68] drinking style and frequency. The results of this analysis are tabulated in Table 10.6. Educational status of pregnant women in this group had no association with their "Style of drinking". The associations between the other demographic variables and "Style of drinking" were similar to that of the "Usual" drinkers. A greater proportion (55%) of young adults (16-25) was heavy drinkers than the older adults (15%) and adults (16%). The adult women of this study were more likely to be moderate drinkers and the older adult women were more likely to be light drinkers ($p = 0.000$). Non-European (Maori and Pacific) women were more likely to be heavy drinkers (55%) than the European women ($p = 0.000$). A greater proportion of single women (45%) among the "Early pregnancy" drinkers were heavy drinkers than partnered (18%) and married (28%) women ($p = 0.007$).

With respect to frequency of drinking (Table 10.7), only "Age" of the "Early pregnancy" drinkers had a statistically significant relationship to "Usual" frequency of drinking. A greater proportion of adult (60%) and older adult (57%) women were "Very frequent" drinkers than young adults (32%) ($p = 0.012$). Floyd *et al.* (1999) found similar results with respect to age group, where women above 25 years of age were most at risk for frequent drinking in the periconceptional period.

In the current research, the young adult (16-25), single, non-European women of a lower socio-economic status were more likely to be heavy "Early pregnancy" drinkers. However, a greater proportion of adult and older adult women were "Very frequent"

[68] This analysis was done on "Usual" drinking style and frequency, as data on the drinking style and frequency in "Early pregnancy" were not collected in the original study.

Table 10.6

Demographic characteristics of "Early pregnancy" drinkers according to style of drinking prior to pregnancy.

(N = 230) [1]

Demographic characteristics	Light % (N)	Moderate % (N)	Heavy % (N)
	Age		
16-25 years	6.8 (3)	38.6(17)	54.5 (24)**
26-34 years	23.1 (31)	60.4 (81)**	16.4(22)
≥ 35 years	26.9(14)**	57.7 (30)	15.4 (8)
Statistics	$\chi^2 = 30.671$	$p = 0.000$	
	Education		
University/ Polytech	22.0 (27)	60.2(74)	17.9 (22)
No formal education	19.6 (21)	50.5 (54)	29.9 (32)
Statistics	$\chi^2 = 4.636$	$p = 0.981$	
	Ethnicity		
European	26.8 (44)**	62.2 (102)	11.0 (18)
Non-European	6.1 (4)	39.4 926)	54.5 (36)**
Statistics	$\chi^2 = 52.174$	$p = 0.000$	
	Socio-economic status		
High	29.8 (25)**	59.5 (50)	10.7 (9)
Low	17.5 (20)	57.0 (65)	25.4 (29)**
Benefit	9.4 (3)	40.6 (13)	50.0 (16)**
Statistics	$\chi^2 = 22.978$	$p = 0.000$	
	Marital status		
Single	3.4(1)	51.7 (15)	44.8 (13)*
Married	17.4 (8)	54.3 (25)	28.3 (13)*
Partnered	25.2 (39)*	56.8 (88)	18.1 (28)
Statistics	$\chi^2 = 13.995$	$p = 0.007$	

*** $p \leq 0.05$; ** p=0.000; [1] Analysis was done on 230 women as some information for 1 woman was missing**

Table 10.7

Demographic characteristics of "Early pregnancy" drinkers according to frequency of drinking prior to pregnancy.

(N = 230) [1]

Demographic characteristics	Infrequent % (N)	Frequent % (N)	Very frequent % (N)
	Age		
16-25 years	31.8 (14)*	36.4 (16)*	31.8 (14)
26-34 years	15.7 (21)	23.9 (32)	60.4 (81)*
≥ 35 years	24.5 (13)	18.9 (10)	56.6 (30)
Statistics	$\chi2 = 12.840$	$p = 0.012$	
	Education		
University/ Polytech	19.5 (24)	24.4 (30)	56.1 (69)
No formal education	22.2 (24)	25.9 (28)	51.9 (56)
Statistics	$\chi2 = 0.449$	$p = 0.799$	
	Ethnicity		
European	20.1 (33)	23.2 (38)	56.7 (93)
Non-European	22.4 (15)	29.9 (20)	47.8 (32)
Statistics	$\chi2 = 1.666$	$p = 0.435$	
	Socio-economic status		
High	16.7 (14)	25.0 (21)	58.3 (49)
Low	20.9 (24)	21.7 (25)	57.4 (66)
Benefit	31.3 (10)	37.5 (12)	31.3 (10)
Statistics	$\chi2 = 8.446$	$p = 0.077$	
	Marital status		
Single	27.6 (8)	31.0 (9)	41.4 (12)
Married	17.4 (8)	26.1 (12)	56.5 (26)
Partnered	20.5 (32)	23.7 (37)	55.8 (87)
Statistics	$\chi2 = 2.447$	$p = 0.654$	

$*p \leq 0.05$; [1] Analysis was done on 230 women as some information for 1 woman was missing

drinkers than the younger women. Analysis of the "Usual" drinking behaviour of adult and older adult women of this sample (Section 10.3) show that 66% (Table 10.2) of these women were moderate drinkers consuming 10-40 grams of absolute alcohol on a typical occasion.

The results of this analysis suggest that a high proportion of "Usual" drinking women of childbearing age are likely to drink in the early stages of pregnancy, many at levels that may cause foetal damage. Studies have associated maternal drinking during the early stages of pregnancy to lowered apgar scores (Russel and Skinner, 1988), long-term neurobehavioural deficits (Streissguth *et al.*, 1989) and craniofacial (Emhart *et al.*, 1987) and physical (Day *et al.*, 1989; Graham *et al.*, 1988) anomalies. Shaw and Lammer (1999) found an increased risk for cleft lip among infants born to mothers who consumed five or more drinks per occasion in this period.

10.6 Demographic characteristics of "Always a drinker":

This category of pregnant women comprised of "Usual" drinking women who continued to drink in pregnancy. About 35% (N = 144) of "Usual" drinking pregnant women (Table 10.1) in this sample continued to drink in pregnancy. In the study by Floyd *et al.* (1999) 21% of drinkers continued to drink in pregnancy. A New Zealand study (Counsell *et al.,* 1994) reported 41% of pregnant women continuing to drink in pregnancy. The results of the survey of midwives reported in Chapter 6 indicates that on average 37% of pregnant women among the clientele of midwives were drinkers in pregnancy.

In the current study (Section 10.4, Table 10.5), "Usual" drinking frequency had a statistically significant association to drinking behaviour in pregnancy. Women who were usually "Very frequent" drinkers were significantly more likely to drink throughout pregnancy ($p = 0.000$). The majority of these women were above 25 years and of a higher socio-economic status (Table 10.3).

An attempt was made in the current research to compare the style of drinking of "Usual" drinkers who continued drinking in pregnancy to that exhibited in pregnancy (Table 10.8). With respect to style of drinking, 14% of light, 54.5% of moderate and 31.5% of heavy "Usual" drinkers continued to drink in pregnancy. A higher proportion of "Usual" moderate drinkers (55%) than heavy (32%) drinkers continued to drink in pregnancy. The "Usual" heavy drinking group in the current research were predominantly young adults (65%) (Table 10.2) and earlier analysis has shown that this group of women are more likely to drink in the early stages of pregnancy (Table 10.5) and less likely to continue drinking in pregnancy. Similar results have also been documented in overseas literature (Cornelius *et al.*, 1994). A New Zealand study (Counsell *et al.*, 1994) has also found that older women are at risk for drinking throughout pregnancy. Although a higher proportion of "Usual" moderate drinkers of the current study continued to drink in pregnancy, they were more likely than heavy drinkers to change their drinking style and reduce the amount of absolute alcohol consumed on a typical occasion in pregnancy ($p = 0.000$). The majority of moderate drinkers of this study were older women of higher socio-economic status (Table 10.2). Similar results have been reported by Streissguth *et al.* (1983b), where a decrease in amount of alcohol consumed on a typical occasion was observed among older women of the higher socio-economic status.

Table 10.8

Distribution of women who continued to drink in pregnancy according to "Usual" drinking style and that exhibited in pregnancy (N = 144)

Usual drinking style (%)	**Proportion of women according to drinking styles in pregnancy % (N)**			**Total** % (N)
	Light	***Moderate***	***Heavy***	
Light (14.0)	100 (20)	0	0	100 (20)
Moderate (54.5)	61.1 (58)	24.4 (19)	1.3 (1)	100 (78)
Heavy (31.5)	37.8 (17)	28.9 (13)	33.3 (15)	100 (45)
Total (100)	66.4 (95)	22.4 (32)	11.2 (16)	100 (143)

The distribution of pregnant women of this study who continued to drink in pregnancy according to their drinking style and demographic characteristics is tabulated in Table 10.9. Overall, among women of this study who continued to drink in pregnancy, a majority (66%) were light drinkers, one-fifth (22%) were moderate drinkers and 11%

Table 10.9

Demographic characteristics of "Always a drinker" according to style of drinking in pregnancy.

(N = 144)

Demographic characteristics	Light % (N)	Moderate % (N)	Heavy % (N)
	Age		
16-25 years	25.0 (5)	20.0 (4)	55.0 (11)**
26-34 years	65.8 (50)	27.6 (21)**	6.6 (5)
≥ 35 years	85.1 (40)**	14.9 (7)	0
Statistics	$\chi^2 = 50.816$	$p = 0.000$	
	Education		
University/ Polytech	69.6 (48)	23.2 (16)	7.2 (5)
No formal education	63.5 (47)	21.6 (16)	14.9 (5)
Statistics	$\chi^2 = 2.088$	$p = 0.352$	
	Ethnicity		
European	73.3 (85)**	23.3 (27)	3.4 (4)
Non-European	37.0 (10)	18.5 (5)	44.4 (12)**
Statistics	$\chi^2 = 37.451$	$p = 0.000$	
	Socio-economic status		
High	71.9 (46)*	26.6 (17)	1.6 (1)
Low[1]	62.0 (49)	19.0 (15)	19.0 (15)*
Statistics	$\chi^2 = 39.432$	$p = 0.000$	
	Marital status		
Single	0	37.5 (3)	62.5 (5)**
Married	54.2 (13)	20.8 (5)	25.0 (6)
Partnered	73.9 (82)**	21.6 (24)	4.5 (5)
Statistics	$\chi^2 = 11.293$	$p = 0.010$	

*** $p \leq 0.05$; ** p=0.000**

[1] This group comprised of women on the benefit and of low socio-economic status.

were heavy drinkers. As the number of women drinking heavily in pregnancy was small, the results discussed below should be interpreted with caution. As seen among the "Usual" and the "Early pregnancy" drinker, among women of this group, the 16-25 year age group were more likely to be heavy drinkers ($p = 0.000$). Compared to young adults and older adults, a greater proportion of adult women (26-34 years) were moderate drinkers (28%) in pregnancy ($p = 0.000$). Compared to young adults and adults a higher proportion of older adult women (above 36 years) were light drinkers (85%) ($p = 0.000$). Educational status of these women was independent of their style of drinking in pregnancy. A higher proportion of non-European (Maori and Pacific) women (44%) were more likely than European women (3.4%) to be heavy drinkers in pregnancy ($p = 0.000$). As the number of women in the benefit group was small, for analysis relating to women who continued to drink in pregnancy, women of the benefit group were combined with those of the lower socio-economic status. The results of the above analysis indicate that a greater proportion of women of the lower socio-economic status (19%) tended to be heavy drinkers ($p = 0.000$). With respect to marital status, 63% of single women were heavy drinkers in pregnancy in comparison to married (25%) or partnered women (5%) ($p = 0.000$).

In the current research as categorisation of drinking styles was based on amount of absolute alcohol consumed on a typical occasion, binge drinkers (*ie* those who have consumed 5 drinks[69] or more on one occasion) and heavy drinkers (those who have consumed 4 drinks or more) are categorised together as "Heavy drinkers". The results of the current study indicate that younger adults, single women, women of a lower socio-economic status and non-European women were more likely to drink heavily in pregnancy. With respect to age group of women at risk for heavy or binge drinking in pregnancy, Bell and Lumley, (1989) found results similar to those of the current study with younger women being at risk for binge drinking in pregnancy. Other studies have found similar results with younger women being at risk for heavy drinking (Stewart and Streiner, 1994) and binge drinking (Cornelius *et al*., 1994) in pregnancy. In contrast, Kaminski *et al.* (1978), Weiner *et al.* (1983), Perham-Hester and Gessner, (1997) and Larroque and Kaminski, (1998) found older women to be at risk for heavy drinking in

[69] 1 standard drink in New Zealand has 10 g of absolute alcohol (ALAC)

pregnancy. Rosett and colleagues (1983) found heavy drinkers in pregnancy evenly distributed across all age groups.

With respect to marital status, a greater proportion of single women in this study were drinking heavily in pregnancy. Similar drinking habits of non-pregnant single women have been recorded in New Zealand literature (Caswell, 1980; Wyllie and Caswell, 1989; Martin *et al*., 1992). An overseas study found that being single was a risk factor for binge drinking in pregnancy (Ebrahim *et al*., 1999).

In the current research, with respect to socio-economic status, a higher proportion of women of lower socio-economic status were heavy drinkers. New Zealand literature on non-pregnant women has found that heavy drinkers were predominantly from the lower socio-economic status (Wyllie and Caswell, 1989; Martin *et al*., 1992). Some overseas studies have also documented that woman of the lower socio-economic status were at risk for heavy drinking in pregnancy (Kaminski *et al*., 1978; Weiner *et al*., 1983; Perham-Hester and Gessner, 1997 and Larroque and Kaminski, 1998).

A higher proportion of non-European women of the current study were heavy drinkers. New Zealand literature on drinking habits of non-pregnant women indicates that Maori and Pacific women (classified in the current research as non-European) are more likely to binge drink than their European counterparts (Caswell, 1980; Dacey, 1995). Watson and McDonald (1999) have also reported[70] that Maori and Pacific women of New Zealand were more likely to drink to intoxication prior to and in pregnancy. However, overseas studies have differed in their finding of "Race" being a risk factor for heavy drinking in pregnancy. Serdula *et al*. (1991) reported that Black women were more likely to report heavy drinking in pregnancy than White women. In contrast, other studies have found that race is not a risk factor for heavy drinking (Rosett *et al*., 1983) and binge drinking (Ebrahim *et al*., 1999) in pregnancy.

Chi-square analysis was also executed to investigate whether there was an association between demographic characteristics and frequency of drinking in pregnancy. As seen in Table 10.10, frequency of drinking in pregnancy had no association with any of the

[70] This is the same data set used for the current research.

demographic characteristics of women who continued to drink in pregnancy. Counsell *et al*. (1994) and Bell and Lumley, (1989) found that women of higher socio-economic status were frequent drinkers in pregnancy. Such an association was not found in this sample of pregnant women.

Table 10.10

Demographic characteristics of "Always a drinker" according to frequency of drinking in pregnancy.

(N= 144)

Demographic characteristics	Infrequent % (N)	Frequent % (N)	Very frequent % (N)
	Age		
16-25 years	25.0 (5)	70.0 (14)	5.0 (1)
26-34 years	39.0 (30)	53.2 (41)	7.8 (6)
≥ 35 years	31.9 (15)	55.3 (26)	12.8 (6)
Statistics	$\chi^2 = 3.070$	$p = 0.546$	
	Education		
University/ Polytech	35.7 (25)	58.6 (41)	5.7 (4)
No formal education	33.8 (25)	54.1 (40)	12.2 (9)
Statistics	$\chi^2 = 1.826$	$p = 0.401$	
	Ethnicity		
European	37.6 (44)	53.8 (63)	8.5 (10)
Non-European	22.2 (6)	66.7 (18)	11.1 (3)
Statistics	$\chi^2 = 2.296$	$p = 0.317$	
	Socio-economic status		
High	28.1 (18)	60.9 (39)	10.9 (7)
Low	40.0 (32)	52.5 (42)	7.5 (6)
Statistics	$\chi^2 = 2.767$	$p = 0.543$	
	Marital status		
Single	50.0 (4)	50.0 (4)	0
Married	32.0 (8)	64.0 (16)	4.0 (1)
Partnered	34.2 (38)	55.0 (61)	10.8 (12)
Statistics	$\chi^2 = 2.767$	$p = 0.597$	

It is interesting to note that among pregnant women of this sample, the demographic characteristics of heavy drinking women among "Usual" drinkers, "Early pregnancy" drinkers and "Always a drinker" categories were identical. That is, they were more likely to be of 16-25 years of age, single, non-European women of a lower-economic status. However, this does not nullify the dangers of moderate or light drinking, as literature to-date does not record a safe amount of alcohol in pregnancy.

10.7 Conclusions:

The results of this study indicate that all the demographic variables namely; age group, educational status, ethnicity, socio-economic status and marital status of the women drinking prior to pregnancy had a statistically significant association with "Usual" style of drinking. Heavy drinking women were more likely to be 16-25 years of age, single, non-European, with no formal education and of lower socio-economic status. However, usual frequency of drinking had a significant association only with the "Age group" and the "Socio-economic" status of women who were drinkers prior to pregnancy. Women of the 16-25 years age group of a lower socio-economic status were more likely to drink alcohol less than once a month whilst the adult and older adult women of the higher socio-economic status were more likely to drink daily or more frequently in a week.

Drinking status in pregnancy among women of this study was largely influenced by the frequency of drinking prior to pregnancy. The infrequent and frequent drinkers, usually consuming alcohol once a week or less, were more likely to drink in the early stages of pregnancy. The very frequent drinkers, usually consuming alcohol daily or more frequently in a week, were more likely to continue to drink throughout pregnancy.

Heavy "Early pregnancy" drinkers had similar demographic characteristics to those of "Usual" drinkers of this study. The majority of these women were younger women and consuming alcohol less than weekly. In recent years interest in women drinking during the early stages of pregnancy has gathered momentum. These women are likely to go un-noticed by maternity care givers as they would have usually stopped drinking prior to the first antenatal visit and are perceived to be "Low risk" drinkers. Among this group of women, although the young adults were more likely to be heavy drinkers, adult and older adult women were more likely to be very frequent moderate drinkers. The

"Early pregnancy" drinkers of this study were concerned for the well being of their baby and this is reflected in them having stopped drinking prior to the first interview. Nevertheless they are at considerable risk of having caused some damage to the foetus during this highly vulnerable period.

A similar association to that seen with "Usual" and "Early pregnancy" drinkers was found between style of drinking in pregnancy and the demographic characteristics of women who continued to drink in pregnancy. A majority of heavy drinking women who continued to drink in pregnancy were of the 16-25 year age group, single, of a non-European origin and of the lower socio-economic status.

Taking both the "Style of drinking" and "Frequency of drinking" into consideration a majority of drinking women of childbearing age are at risk for causing some foetal damage in pregnancy. In the general population of New Zealand only a small proportion of women are non-drinkers. Intervention strategies have to be developed and executed across the large proportion of usual drinkers in their reproductive years, as there is a high risk for the prevalence of foetal alcohol syndrome and other alcohol related effects in New Zealand.

Chapter -11: Results and Discussions, Objective: 2

Profile of Nutrient Intakes of Pregnant Women According to Drinking Status and Style of Drinking.

11.1 Introduction:

Pregnancy is a dynamic anabolic state, the outcome of which is largely influenced by maternal diet. When nutrient intakes fall below threshold, foetal growth and development is more affected than maternal health (King, 2000). Efforts to achieve good nutritional status prior to pregnancy and in pregnancy are critical for optimal foetal growth and development.

Alcohol is a nutritional teratogen with far reaching consequences. In a review of literature on nutritional teratogens alcohol was found to be the most potent (Pieters, 1985). Alcohol consumption can have both direct and indirect effects on the nutritional status of the mother and foetus. One of the indirect effects of alcohol consumption may be that it affects food choices and thereby nutrient intakes. Studies over the years have investigated this effect of alcohol consumption in a non-pregnant population (Kesse *et al.*, 2001; Fisher & Gordon 1985; Jones *et al.,* 982). The studies by Millen *et al.* (1995) and Brooks *et al.* (1989) have also indicated that heavy drinkers are more prone to have diets deficient in fruits, vegetables, starch, dairy products and dietary fibre. However, literature does not record the dietary intake behaviour of pregnant women who are drinkers.

Evidence from recent research has highlighted the importance of adequate nutritional status of the mother prior to pregnancy, at conception and during pregnancy in programming the health of the foetus in adulthood[71]. Literature reviewed in Chapter 2 (Section 2.3.2), indicates that although the effects of alcohol on the foetus, especially the brain, are independent of the nutritional status of the mother (Abel & Grezerstein, 1979), poor nutritional status, particularly seen among heavy drinkers may be a contributing factor to unfavourable outcomes of pregnancy (Abel, 1995; Michaelis and

[71] Proceedings of the first world congress on foetal origins of adult diseases, 2000.

Michaelis, 1994; Philips *et al*., 1989). Although literature on the contribution of poor nutritional status in women consuming alcohol toward infant outcome is very scarce, animal studies (Weinberg *et al*., 1990) have indicated that maternal nutritional status and the interactive effects of ethanol and nutrition are important variables in determining both direct and indirect effects of ethanol on the foetus.

One of the objectives of the "*Nutrition during Pregnancy*" study was to provide baseline information on nutrient intakes among pregnant women (Watson & McDonald, 1999) . The purpose of the current research, which involved further analysis of the data from the "*Nutrition during Pregnancy*" study, was to draw out a profile of nutrient intakes of pregnant women according to their drinking status and style of drinking. The categorisation of the pregnant women of this study according to their drinking status and drinking styles have already been discussed and documented in Chapter 9. Watson and McDonald (1999) as part of the original study collected all the data on the variables of interest in the current research.

11.2 Nutrient intakes of "Usual" drinkers according to style of drinking prior to pregnancy:

In this section the nutrient intakes of pregnant women who were "Usual" drinkers prior to pregnancy have been analysed and discussed. Non-parametric test (Kruskal-Wallis H) was used to make comparisons of nutrient intakes between women who were light, moderate and heavy drinkers prior to pregnancy (Table 11.1). The mean intakes of total energy and the energy yielding nutrients per day were similar across all drinking styles and met the Australian Recommended Dietary Intakes (ARDI) for pregnant women. Total energy intake per day was similar across all the three drinking styles ($p = 0.233$) and ranged from a mean intake of 9175 Kilojoules to 9535 Kilojoules. Total protein intake per day was highest among light drinkers and lowest among heavy drinkers. However, this difference was not statistically significant ($p = 0.386$). A similar pattern was also seen in considering mean protein intake per kilogram of body weight. Percent of energy from protein was lower among heavy drinkers in comparison with light and

Table 11.1

Mean nutrient intakes (per day) of "Usual" drinkers according to style of drinking prior to pregnancy (N =408)

Nutrient	Mean nutrient intakes (SD)		
	Light N=71	*Moderate* N=231	*Heavy* N=106
Energy (kj) {9350-10800}‡	9535.36 (1874.5)	9175.43 (1797.9)	9508.33 (3422.9)
Protein (g) {51}‡	87.33 (20.6)	84.67 (19.6)	81.59 (27.6)
Protein (g)/ kg body wt	1.38 (0.4)#	1.33 (0.4)^	1.26 (0.46)τ
% Protein energy	15.46 (2.4)	15.62 (2.7)	14.63 (3.03)*
Total fat (g)	92.53 (24.2)	86.9 (24.8)	97.59 (48.6)
% Fat energy	36.60 (5.2)	35.48 (5.3)	37.98 (6.4)*
Monounsaturated fat (g)	28.79 (7.7)	27.52 (8.8)	31.04 (17.9)
% Mono-fat energy	11.45 (2.1)	11.21 (2.2)	11.99 (2.7)
Polyunsaturated fat (g)	11.32 (4.4)	11.07 (4.2)	11.82 (5.6)
% Poly-fat energy	4.41 (1.3)	4.53 (1.3)	4.72 (1.5)
Saturated fat (g)	42.19 (12.0)	38.8 (12.4)	43.63 (22.8)
% Sat-fat energy	16.71 (3.0)	15.82 (3.2)	16.90 (3.6)*
Cholesterol (mg)	293.01 (103.0)	279.31 (101.9)	324.78 (182.8)
Carbohydrate (g)	273.03 (58.3)	265.9 (54.0)	265.12 (88.1)
% Carbohydrate energy	48.10 (5.1)	48.90 (5.3)	47.48 (7.1)
Soluble sugars (g)	138.31 (39.7)	133.32 (37.3)	134.94 (55.6)
% Sol-sugar energy	1.45 (0.3)	1.46 (0.3)	1.44 (0.4)
Dietary fibre (g)	24.16 (7.5)	24.11 (7.1)	19.9 (9.1)*
Beta-Carotene (μg)	3813.86(1831.2)	3793.23 (2260.8)	3327.37 (2985.1)*
Retinol (μg RE) {750}‡	469.20 (151.4)	453.8 (278.8)	489.52 (344.9)
Thiamine (mg) {1}‡	2.48 (2.0)*	2.29 (2.2)	1.68 (0.9)
Total folate (μg) {400}‡	294.0 (88.2)	293.93 (90.3)	236.08 (104.7)*
Calcium (mg) {1100}‡	996.5 (398.9)	969.65 (380.2)	805.54 (383.6)*
Iron (mg) {22-36}‡	12.45 (3.0)	12.52 (3.2)	11.83 (4.2)

‡ Recommended dietary intakes for pregnant women, NHMRC, 1992.
* $p < 0.05$; # N= 69; ^ N = 222; τ N= 94

moderate drinkers ($p = 0.014$). Mean total fat intake did not differ ($p = 0.106$) according to drinking styles among "Usual" drinkers. However, the percentage of energy contributed by fat among heavy drinkers was higher than the light and moderate drinkers ($p = 0.005$). Mean intakes of monounsaturated fatty acid ($p = 0.325$), polyunsaturated fatty acids ($p = 0.571$), and saturated fatty acids ($p = 0.067$) did not differ among light, moderate and heavy drinkers. The percentage of energy from monounsaturated fatty acids ($p = 0.067$) and polyunsaturated fatty acids ($p = 0.360$) also did not differ among the different styles of drinkers. However, the percentage of energy from saturated fatty acids was higher ($p = 0.007$) among heavy drinkers. Mean intakes of cholesterol did not differ ($p = 0.136$) between "Usual" light, moderate and heavy drinkers.

Mean intakes of carbohydrate ($p = 0.232$) did not differ according to drinking styles. However, there was a marginal difference in the percentage of energy from carbohydrates with heavy drinkers having lower percentage of energy from carbohydrates ($p = 0.071$). Similarly there were no differences in the mean intakes of total soluble sugars ($p = 0.531$) and the percentage of energy from soluble sugars ($p = 0.667$) according to style of drinking. Heavy drinkers also had lower intakes of dietary fibre ($p = 0.000$), beta-carotene ($p = 0.003$), and total folates ($p = 0.000$) than moderate and light drinkers. The mean intakes of total folates and calcium among "Usual" heavy drinkers were well below the ARDI for pregnant women. Thiamine intake was highest ($p = 0.000$) among light drinkers, but the level of intake among moderate and heavy drinkers met ARDI for pregnant women.

Intakes of retinol differed marginally ($p = 0.056$) with heavy drinkers having the highest intakes. However all levels were within the ARDI for pregnant women. Dietary intakes of iron among all the 3 groups of women did not differ but were well below the ARDI for pregnant women. The mean intake of calcium ($p = 0.000$) was lower among heavy drinkers than light and moderate drinkers and all levels were well below the ARDI for pregnant women.

The results of this study indicate that dietary intake behaviour among pregnant women differs according to style of drinking practised prior to pregnancy. Heavy drinkers had lower intakes of fruits, vegetables, and dairy products and higher intakes of saturated fats. The differences in mean intakes of these nutrients were more marked between the light and the heavy drinkers and moderate drinkers had intakes similar to those of the light drinkers.

Literature on dietary intake behaviour of pregnant women according to drinking style is almost totally absent. However some studies have been done on the non-pregnant population. Jones *et al.* (1982) observed that drinking women added on alcohol-derived calories to their diets and had higher energy intakes than non-drinkers. Moderate drinking women also tended to consume fewer non-alcohol derived calories, particularly from carbohydrates, indicating a displacement of food energy from carbohydrates by energy from alcohol. Fisher and Gordon (1985) found similar results with decreased carbohydrate intake among drinking women. However, alcoholic energy did not displace food energy among drinkers and the total energy intakes among drinkers were higher than non-drinkers. Studies have also documented an inverse relationship between alcohol consumption and the intake of fruits and vegetables. Data from the Framingham study indicate that women with high alcohol intakes had lower intakes of fruits, vegetables, starch and dairy products and a high intake of snacks and cholesterol-rich foods. The cluster of women with lowest consumption of alcohol had high intakes of bread and other starches (Millen *et al.*, 1996). In a more recent study (Kesse *et al.*, 2001), increasing alcohol consumption was associated with decreased intakes of carbohydrate and beta-carotene. In general, drinkers had higher intakes of total energy, proteins, cholesterol, fatty acids, retinol, iron and vitamin E. Brooks *et al.* (1989) investigated the relationship between the types of drinker (abstainer, light, moderate and heavy) and dietary behaviour and found that the proportion of women of childbearing age (18-39 years) reporting low levels of dietary fibre intake increased with increase in the amount of absolute alcohol consumed per week. A higher proportion of heavy drinkers in this age group also reported a high level of fat intake.

Similar literature on pregnant women who continue to drink in pregnancy is very sparse. Stewart and Streiner (1994) found that the relative risk for unhealthy dietary habits among pregnant women who were drinkers was twice that of pregnant non-drinkers. This risk was more than five times among pregnant women who consumed more than 7 standard drinks per week in comparison to those who consumed less than 7 standard drinks per week. However, no further details or the definition for "Unhealthy dietary" habits was given by the authors of this study. The results of the current study are congruent with the above studies and indicate that style of drinking exhibited prior to pregnancy has a significant impact on nutrient intakes in pregnancy.

11.3 Nutrient intakes of pregnant women according to drinking status in pregnancy:

"Usual" drinking pregnant women in this study were categorised into 3 groups according to their drinking status in pregnancy. Among "Usual" drinkers 8.1% abstained in pregnancy, 56.6% were "Early pregnancy" drinkers and 35.3% continued to drink in pregnancy. In this section the results of the analysis that explored whether there were any differences in nutrient intakes in pregnancy, among these three groups of women are discussed (Table 11.2).

The mean intakes of total energy were similar (p = 0.382) among the three groups of women. However, the mean intake of total energy among "Abstainers" was below the ARDI for pregnant women. The mean intakes of protein (p = 0.513), fat (p = 0.103) and carbohydrate (p = 0.728) were similar among abstainers, early pregnancy drinkers and those who continued to drink in pregnancy.

The mean intakes of monounsaturated fats (p = 0.165), polyunsaturated fats (p = 0.063), saturated fats (p = 0.151) and cholesterol (p = 0.107) did not differ according to drinking status. Protein intake per kilogram of body weight (p = 0.789) and percent of energy from protein (p = 0.141) did not differ according to drinking status in pregnancy. Percent energy from fat (p = 0.122), monounsaturated fat (p = 0.372), polyunsaturated fat (p = 0.224) and saturated fat (p = 0.257) did not differ according to drinking status in pregnancy. Although not statistically significant, "Abstainers" had the lowest intake of fat and its other components.

Percentage of energy from carbohydrates did not differ (p = 0.267) among abstainers, early pregnancy drinkers and drinkers in pregnancy. The mean intakes of soluble sugars (p = 0.958) and percentage of energy from soluble sugars (p = 0.461) did not differ according to drinking status in pregnancy. Mean intakes of dietary fibre (p = 0.444),

Table 11.2

Mean nutrient intakes (per day) of "Usual" drinkers according to drinking status in pregnancy (N = 408)

Nutrient	Mean nutrient intake (SD)		
	Abstainer N = 33	*Early pregnancy drinker* N = 231	*Always a drinker* N =144
Energy (kj) {9350-10800}‡	8871.48 (1423.9)	9315.62 (2585)	9456.51 (2101.5)
Protein (g) {51}‡	85.67 (15.4)	83.95 (24.3)	84.81 (20.0)
Protein (g)/ kg body wt	1.37 (0.4)#	1.33 (0.4)^	1.30 (0.4)τ
% Protein energy	16.36 (2.7)	15.30 (2.9)	15.16 (2.6)
Total fat (g)	80.86 (22.0)	90.68 (36.8)	92.98 (27.4)
% Fat energy	34.11 (6.2)	36.27 (5.9)	36.90 (5.1)
Monounsaturated fat (g)	25.81 (7.9)	28.62 (13.3)	29.30 (9.6)
% Mono-fat energy	10.87 (2.3)	11.43 (2.5)	11.60 (2.1)
Polyunsaturated fat (g)	9.62 (3.0)	11.45 (5.2)	11.42 (3.9)
% Poly-fat energy	4.09 (1.1)	4.59 (1.5)	4.59 (1.3)
Saturated fat (g)	36.71 (10.3)	40.48 (17.5)	41.94 (13.9)
% Sat-fat energy	15.46 (3.1)	16.19 (3.5)	16.57 (3.0)
Cholesterol (mg)	251.13 (78.8)	289.88 (121.7)	309.70(147.1)
Carbohydrate (g)	261.40 (53.1)	267.83 (68.5)	267.37 (63.1)
% Carbohydrate energy	49.69 (6.4)	48.67 (5.9)	47.67 (5.4)
Soluble sugars (g)	132.14 (35.2)	134.82 (44.5)	134.98 (42.9)
% Sol-sugars energy	1.49 (0.3)	1.46 (0.4)	1.43 (0.3)
Dietary fibre (g)	23.69 (5.5)	23.19 (8.2)	22.70 (8.1)
Beta-Carotene (µg)	4257.32 (2268.6)	3623.14 (2603.3)	3604.27 (2098.7)
Retinol (µg RE) {750}‡	369.20 (115.2)	470.23 (305.7)	482.47 (264.3)*
Thiamine (mg) {1}‡	1.6 (0.6)	2.21 (2.2)	2.21(1.5)
Total folate (µg) {400}‡	288.91 (64.4)	279.43 (103.8)	275.5 (92.3)
Calcium (mg) {1100}‡	1099.61* (393.2)	1075.05 (570.5)	878.27 (311.3)
Iron (mg) {22-36}‡	12.01 (2.1)	12.30 (3.6)	12.45 (3.3)

‡Recommended dietary intakes for pregnant women, NHMRC, 1992; *$p \le 0.05$; # n = 32; ^ N = 219; τ N =134

beta-carotene ($p = 0.149$) and total folates ($p = 0.469$) did not differ significantly among abstainers, early pregnancy drinkers and drinkers in pregnancy. Although not statistically significant, "Abstainers" had the highest intakes and women who continued to drink in pregnancy had the lowest intakes of these nutrients. Mean thiamine intakes were similar ($p = 0.160$) across the three groups of women and were marginally higher than the recommendations of ARDI for pregnant women. Iron intakes were lower than the ARDI in all the groups and did not differ significantly with respect to their drinking status in pregnancy.

Retinol intake was significantly higher ($p = 0.026$) among women who continued to drink in pregnancy but was within the recommended range. Mean dietary calcium intakes differed according to drinking status and abstainers in pregnancy had the highest intake ($p \leq 0.05$). Only among the "Abstainers" did the mean intake of calcium nearly meet the ARDI for pregnant women. The results of this study indicate that nutrient intakes, except for retinol and calcium were independent of drinking status in pregnancy. However, it is interesting to note that women drinking in pregnancy had very low dietary calcium intakes. What is unclear from the current research is whether the lowered intake of dietary calcium is a direct effect of alcohol. There are no studies done on the human population to investigate this effect of alcohol. However, an animal experiment that studied the effects of prenatal exposure to alcohol on foetal calcium metabolism found that administration of alcohol in pregnancy to rats had a negative effect on dietary calcium intake (Keiver *et al*., 1997).

11.4 Nutrient intakes of "Early pregnancy" drinkers according to style of drinking prior to pregnancy:

More than half (56.6%) of "Usual" drinkers in this study were "Early pregnancy" drinkers. Data on nutrient intakes of these women were analysed according to their style of drinking prior to pregnancy. The results of this analysis are given in Table 11.3 and discussed below.

Table 11.3
Mean nutrient intakes (per day) of "Early pregnancy" drinkers according to style of drinking prior to pregnancy (N = 230)[1]

Nutrient	Mean nutrient intake (SD)		
	Light N = 48	*Moderate* N = 128	*Heavy* N = 54
Energy (kJ) {9350-10800}‡	9714.16 (1909.0)	9140.16 (2011.2)	9303.97 (3946.1)
Protein (g) {51}‡	89.87 (21.9)	83.61 (21.8)	78.65 (30.1)*
Protein (g)/kg body wt	1.44 (0.4)#	1.33 (0.4)^	1.21 *(0.5)τ
% Protein energy	15.63 (2.7)	15.47 (2.9)	14.59 (3.3)
Total fat (g)	93.41 (22.8)	86.24 (27.3)	98.12 (59.3)
% Fat energy	36.35 (4.8)	35.29 (5.8)	38.53 (6.6)*
Monounsaturated fat (g)	29.46 (6.6)	27.20 (9.9)	31.16 (21.8)
% Mono-fat energy	11.56 (2.1)	11.09 (2.5)	12.14 (2.9)
Polyunsaturated fat (g)	11.0 (3.8)	11.21 (4.7)	12.51 (7.0)
% Poly-fat energy	4.24 (1.0)	4.59 (1.5)	4.97 (1.6)
Saturated fat (g)	42.67 (11.9)	38.27 (13.5)	43.16 (27.1)
% Sat-fat energy	16.58 (2.9)	15.67 (3.5)	16.96 (3.8)*
Cholesterol (mg)	298.08 (94.1)	277.52 (114.4)	309.21 (154.7)
Carbohydrate (g)	279.40 (61.1)	267.58 (60.6)	256.17 (88.0)
% Carbohydrate energy	48.22 (4.8)	49.46 (5.7)	47.25 (6.8)
Soluble sugars (g)	143.6 (42.7)	134.3 (39.5)	127.90 (55.7)
% Sol-sugars energy	1.47 (0.3)	1.48 (0.3)	1.42 (0.4)
Dietary fibre (g)	23.91(7.5)	24.2 (7.7)	19.9 (8.9)*
Beta-Carotene (µg)	3918.27(1793.8)	3680.71 (2541.5)	3260.47 (3284.2)*
Retinol (µg RE) {750}‡	474.57 (157.1)	457.24 (307.5)	488.33 (389.7)
Thiamine (mg) {1}‡	2.54* (2.2)	2.3 (2.5)	1.70 (1.0)
Total folate (µg) {400}‡	298.81 (88.7)	296.6 (103.1)	221.57 (98.9)*
Calcium (mg) {1100}‡	1075.40 (430.2)	973.14 (419.7)	745.66 (384.9)**
Iron (mg) {22-36}‡	12.75 (3.0)	12.49 (3.5)	11.37 (4.3)

‡ Recommended dietary intakes for pregnant women, NHMRC, 1992; [1] Analysis was done on 230 women as some information was missing for 1 woman; * $p \leq 0.05$; ** $p = 0.000$; # N = 47; ^ N = 122; τ N = 49

Mean total energy intake ($p = 0.118$) did not differ according to style of drinking among early pregnancy drinkers and met the ARDI recommendations for pregnant women. However, total protein intake ($p = 0.043$) and protein intake per kilogram of body weight ($p = 0.029$) were significantly lower among heavy drinkers. Protein intake levels among the three groups of women met the ARDI for pregnant women. Percentage of energy from protein did not differ ($p = 0.083$) between light, moderate and heavy early pregnancy drinkers.

Intakes of total fat did not differ ($p = 0.169$) according to style of drinking among early pregnancy drinkers. However, percent of energy from fat differed significantly ($p = 0.017$) with heavy drinkers having the highest percentage of energy from fat. Mean intakes of monounsaturated fats ($p = 0.149$), polyunsaturated fats ($p = 0.563$), saturated fats ($p = 0.088$) and cholesterol ($p = 0.172$) did not differ according style of drinking among early pregnancy drinkers. Similarly mean percent energy from monounsaturated fats ($p = 0.107$) and polyunsaturated fats ($p = 0.059$) did not differ according to style of drinking. As was seen in the case of percent energy from total fats, the mean percentage of energy from saturated fats was highest ($p = 0.033$) among heavy drinking early pregnancy drinkers.

Mean total carbohydrate intakes did not differ ($p = 0.105$) according to style of drinking among early pregnancy drinkers. However, there was a marginal difference ($p = 0.067$) in the percentage of energy from carbohydrates with heavy drinkers having the lowest energy from carbohydrates. There were no statistically significant differences in the mean intakes of soluble sugars ($p = 0.131$) and percent energy from soluble sugars ($p = 0.484$). Heavy drinking early pregnancy drinkers also had the lowest intakes of dietary fibre ($p = 0.001$), beta-carotene ($p = 0.016$) and total folates ($p = 0.000$). The intakes of the above nutrients among moderate drinkers were quite similar to the light drinkers. The mean intake of thiamine was significantly higher ($p = 0.011$) among light drinkers but all the levels met the ARDI for pregnant women.

Mean intakes of retinol ($p = 0.211$) per day among early pregnancy drinkers did not differ according style of drinking and were within the ARDI for pregnant women. Mean iron intakes among all the three groups of women were lower than the ARDI for pregnant women and heavy drinking women had the lowest intake ($p = 0.051$)

compared to light and moderate drinkers. Calcium intake was also significantly lower (p = 0.000) among heavy drinking women. Only among light drinkers did calcium intakes nearly meet the ARDI for pregnant women. These results seem to indicate that heavy early pregnancy drinkers tend to include less fruits, vegetables and dairy products than light or moderate drinkers. These results are almost identical to those seen among "Usual" drinkers.

11.5 Nutrient intake of "Always a drinker" according to style of drinking in pregnancy:

About 35% of "Usual" drinkers continued to drink in pregnancy. In this section, the results and discussion of the analysis that explored for any differences in mean nutrient intakes among this group of women according to their style of drinking are discussed and tabulated in Table 11.4. Total mean energy intakes did not differ (p = 0.546) according to style of drinking in pregnancy and the levels were similar to the ARDI for pregnant women. Similarly total protein intakes (p = 0.912), protein per kilogram of body weight (p = 0.577) and percent of energy from protein (p = 0.335) did not differ among light, moderate and heavy drinkers in pregnancy. Heavy drinkers had a higher intake (p = 0.059) of total fat than moderate and light drinkers. They also had significantly higher intakes of monounsaturated fats (p = 0.016) and saturated fats (p = 0.048). There were no differences in the mean intakes of polyunsaturated fats (p = 0.110) and cholesterol (p = 0.122). Percent energy from total fat (p = 0.002), monounsaturated fat (p = 0.004) and saturated fat (p = 0.000) was highest among heavy drinkers in pregnancy. Percent energy from polyunsaturated fats was highest (p = 0.036) among moderate drinkers and lowest among heavy drinkers.

Total carbohydrate intakes did not differ (p = 0.976) according to style of drinking in pregnancy. There was a marginal difference (p = 0.058) in the percentage of energy from carbohydrates with heavy drinkers having the lowest levels. Similarly, there were no differences in the mean intakes of total soluble sugars (p = 0.986) and the energy contribution from soluble sugars (p = 0.437) according to style of drinking in pregnancy. Intakes of dietary fibre (p = 0.003) and folates (p = 0.011) were lowest among heavy drinking women in pregnancy.

Table 11.4
Mean nutrient intakes (per day) of "Always a drinker" according to style of drinking in pregnancy (N =143)[1]

Nutrient	Mean nutrient intake (SD)		
	Light **N = 95**	***Moderate*** **N = 32**	***Heavy*** **N = 16**
Energy (kj) {9350-10800}‡	9312.60 (1910.6)	9584 (2214.2)	10086.86 (2913.7)
Protein (g) {51}‡	84.61 (18.9)	85.60 (21.3)	84.45 (25.6)
Protein (g)/kg body wt	1.29 (0.4)#	1.38 (0.3)^	1.27 (0.5)τ
% Protein energy	15.39 (2.7)	14.96 (2.2)	14.20 (3.1)
Total fat (g)	90.03 (25.3)	93.18 (24.3)	111.48 (38.6)*
% Fat energy	36.29 (5.2)	36.65 (3.9)	41.45 (4.8)*
Monounsaturated fat (g)	27.92 (8.6)	30.11 (8.0)	36.34 (15.2)*
% Mono-fat energy	11.25 (2.0)	11.84 (1.6)	13.37 (2.5)*
Polyunsaturated fat (g)	11.16 (4.2)	12.40 (3.2)	11.10 (3.2)
% Poly-fat energy	4.52 (1.4)	5.00 (1.2)*	4.20 (0.8)
Saturated fat (g)	40.93 (12.9)	40.37 (12.9)	51.68 (18.2)*
% Sat-fat energy	16.44 (3.0)	15.74 (2.8)	19.19 (2.3)*
Cholesterol (mg)	289.00 (102.1)	302.49 (103.3)	452.75 (306.4)
Carbohydrate (g)	266.40 (59.1)	269.85 (67.6)	267.07 (81.2)
% Carbohydrate energy	48.20 (5.3)	47.42 (4.3)	44.68 (7.1)
Soluble sugars (g)	135.27 (44.0)	134.60 (40.6)	133.73 (44.7)
% Sol-sugars energy	1.45 (0.4)	1.41 (0.3)	1.33 (0.4)
Dietary fibre (g)	23.87 (8.6)	22.04 (6.5)	17.4* (5.6)
Beta-Carotene (µg)	3765.32(2051.9)	3385.12 (2249.3)	3030.81 (2116.5)
Retinol (µg) {750}‡	441.26 (153.9)	585.13 (468.8)	524.56 (167.7)
Thiamin (mg) {1}‡	2.28 (1.5)	2.37 (1.9)	1.42 (0.5)
Total folate (µg) {400}‡	285.46 (96.4)	274.21 (81.4)	215.24(67.8)*
Calcium (mg) {1100}‡	903.36 (310.5)	873.21 (316.5)	720.11 (275.1)
Iron (mg) {22-36}‡	12.28 (3.0)	12.79 (3.7)	12.68 (4.3)

‡ Recommended dietary intakes for pregnant women, NHMRC, 1992; * p **< 0.05; # N = 90; ^ N= 29; τ N = 14; [1] Data for 1 woman is missing**

There were no significant differences in the mean intakes of beta-carotene ($p = 0.198$) and thiamine ($p = 0.057$). Mean intakes of retinol ($p = 0.215$), calcium ($p = 0.084$) and iron ($p = 0.749$) did not differ among light, moderate and heavy drinkers in pregnancy. However, the intakes of calcium and iron were markedly below the ARDI for pregnant women. The results of this study seem to indicate that heavy drinkers take lower levels of fruits and vegetables and higher intakes of fatty foods. Calcium intake was lower among all women who continued to drink in pregnancy.

The 1997 National Nutrition Survey reports inadequate calcium intakes in women of all age groups. Intakes below the UK Lower Reference Nutrient Intakes were reported especially among 15-18 year olds (Horwarth *et al.*, 2001). This group of women also had the highest prevalence of low dietary folate intakes and are reputed for risky drinking behaviour. The results of the survey of midwives reported in Chapter 6 showed that more than 80% of teenagers (14-19 years) and nearly 50% of young adults (20-25 years) had consumed some alcohol in pregnancy. The results of further analysis of the "*Nutrition during Pregnancy*" study reported in Chapter 11, indicates that women of this age group (16-25 years) were more likely to be heavy drinkers and were at risk for drinking in the early stages of pregnancy.

The findings of this research highlight concern for heavy drinking women of childbearing age and all women who continue to drink during pregnancy. With respect to food habits and usual dietary intakes the line that separates pre-pregnancy and pregnancy behaviour is very thin. However, the demand for nutrients in pregnancy is enhanced with major changes in the metabolism of nutrients. A recent study has indicated the possible role of maternal calcium nutriture on the health of pregnant women, the concentration of calcium in breast milk and bone mineralisation and blood pressure of infants (Prentice, 2000).

More importantly, the cardinal features of foetal alcohol syndrome are poor physical growth, joint malformations (Jones *et al.*, 1973) and dental malalignments and malocclusions (Striessguth *et al.*, 1985). Alcohol consumption in pregnancy combined with low calcium intakes may increase the risk of affected children starting life with very poor teeth. Moreover, a recent review on the effects of hypervitaminosis A on bone has indicated that excess vitamin A stimulates bone resorption and inhibits bone formation (Binkley and Krueger, 2000). The theory of Duester (1991) discussed in Chapter 2, Section 2.3.1, indicate that alcohol can compete for the enzyme alcohol dehydrogenase, which is responsible for the oxidation of both vitamin A (retinol) and alcohol to their respective aldehydes. When alcohol is present, it is preferentially oxidised, thereby resulting in excess vitamin A, implying that alcohol consumption in pregnancy can affect foetal bone development. The detrimental effect of alcohol on foetal bone development may be further worsened by low dietary calcium intake among women of childbearing age.

Efforts are being made globally to increase the intake of folates in women of childbearing age to reduce the prevalence of neural tube defects. Folate deficiency is known to occur due to inadequate intake or due to faulty metabolism of folates. Studies have shown that both acute and chronic exposure to alcohol has an antagonistic effect on folate metabolism (Hillman and Steinberg, 1982). Moreover, pregnant women are at higher risk of developing folate deficiency than non-pregnant women due to increased demands placed on the supply of folates (Bailey, 2000). The functional role of folates pivotal to favourable pregnancy outcomes raises concern as to what the dual consequences are of low dietary folate intake and drinking in pregnancy. A recent study has associated low concentrations of dietary and circulating folate with increased risks of preterm delivery, infant low birth weight and foetal growth retardation (Scholl & Johnson, 2000). Much effort needs to be directed towards educating women of childbearing age on the far-reaching consequences of heavy drinking and drinking in pregnancy, to reduce the risk for the prevalence of foetal alcohol syndrome and other alcohol related effects in New Zealand.

11.6: Conclusions:

The observations made in this research indicate an effect of drinking style on the dietary behaviour of a pregnant sample. Among "Usual" drinkers, heavy drinkers had significantly ($p < 0.05$) lower intakes of dietary fibre, beta-carotene, total folates and calcium than light and moderate drinkers in pregnancy. The intake levels of folate and calcium among heavy drinkers were well below the Australian recommended dietary intakes for pregnant women.

Similar analysis on "Usual" drinkers according to their drinking status in pregnancy did not reveal statistically significant differences in nutrient intakes among "Abstainers", "Early pregnancy" drinkers and "Always a drinker" except for calcium. Mean calcium intake among women who continued to drink in pregnancy was significantly ($p \leq 0.05$) lower than the other two groups of women and was also markedly lower than the ARDI for pregnant women. As seen among "Usual" drinkers, the mean intakes of dietary fibre, beta-carotene, total folates and calcium among heavy "Early pregnancy" drinkers were significantly ($p \leq 0.05$) lower than the light and moderate drinkers. The level of dietary folate and calcium intakes among heavy drinkers were markedly lower than the ARDI for pregnant women.

Except for calcium, heavy "Always a drinker" women had lower ($p < 0.05$) mean intakes of similar nutrients to those seen among "Usual" and "Early pregnancy" drinkers. Mean calcium intakes did not differ according to the style of drinking among this group of women but all levels were well below the ARDI for pregnant women.

In summary ***"Usual"*** heavy drinking women and ***all*** women who continue to drink in pregnancy are at risk for compromised nutritional status with respect to key nutrients like calcium and folate resulting in unfavourable pregnancy outcomes, which may be accentuated by the direct effects of alcohol. The results of this study indicate the need to educate women drinkers of childbearing age on the dual consequences of alcohol consumption.

Chapter -12

Conclusions and Recommendations

12.1 Introduction:

The current research was executed to assess the risk of foetal alcohol syndrome and other alcohol related effects in New Zealand. This was achieved by two methods, the first being a survey of midwives in New Zealand. This survey was designed to be a baseline study exploring a number of issues relating to drinking in pregnancy. The second method by which the research assessed the risk was by further analysis of data from the *"Nutrition during Pregnancy"* study. The primary objective of this analysis was to explore the demographic make-up and the dietary intake profile of pregnant women with different types of drinking habits.

The first objectives of the two studies contributed towards assessing the prevalence of drinking among New Zealand pregnant women. As the survey of midwives was done on a representative sample of midwives from all regions of New Zealand, the data collected allowed assessment as to whether the prevalence of drinking differed in the major regions and in the metropolitan and provincial regions of New Zealand. The further analysis of data from the "*Nutrition during pregnancy*" study allowed the drawing out of the demographic characteristics of pregnant women who were drinkers prior to pregnancy, in early pregnancy and in pregnancy. The current research is the first in New Zealand to characterise women drinkers according to both style and frequency of alcohol consumption prior to pregnancy, in early pregnancy and in pregnancy. It is also the first research to report the prevalence of drinking in the early stages of pregnancy in New Zealand.

The secondary objective (third) of the survey of midwives contributed towards assessing the possible prevalence of various outcomes associated with heavy maternal drinking in the literature. These results gave an indication of the prevalence of alcohol related effects in New Zealand, showing that the prevalence is likely to be as high or higher than overseas rates. This is however, contrary to beliefs held by some overseas researchers and health professionals of New Zealand. The current research has contributed towards awakening health professionals, researchers and policy makers to the immediate need in New Zealand to develop and execute prevention strategies to reduce the prevalence of this totally preventable spectrum of disorders.

The second objective of the nutrition during pregnancy study was to assess the intake of nutrients in pregnancy according to drinking status in pregnancy and style of drinking in pregnancy. Although this was only an observational study, this research was the first to assess nutrient intakes in pregnancy according to style of alcohol consumption prior to pregnancy and in pregnancy. The current research also assessed nutrient intakes in pregnancy according to drinking status of "Usual" drinkers in pregnancy.

The second objective of the survey of midwives was to assess the attitudes and knowledge of midwives on alcohol consumption in pregnancy. Overseas studies have shown that primary maternity caregivers can play an active role in reducing the prevalence of drinking in pregnancy. Midwives of New Zealand provide care to the majority (66%) of New Zealand women and the current research was the first in New Zealand to assess their attitudes and knowledge and lay the foundation for midwives to play an active role in reducing the prevalence of drinking among their clientele. In the following section conclusions drawn from the results of both the above studies are discussed.

12.2 Conclusions:

The results of the current study indicate that a high proportion of New Zealand women continue to drink in pregnancy. The results of the survey of midwives indicate that a mean proportion of 36.8% (SEM 3%) of pregnant women among their clientele had consumed some alcohol in pregnancy. Significantly higher proportions of teenagers and young adults had consumed some alcohol in pregnancy in comparison to the adults and the older adults. There were no statistically significant differences in the mean proportions of total drinkers and drinkers within each age group in the four major regions of New Zealand. However, in comparing the prevalence of drinking in the metropolitan and provincial regions of New Zealand, a higher proportion of teenagers from the provincial regions in comparison to the metropolitan regions of New Zealand had drunk some alcohol in pregnancy.

The majority of drinkers among the clientele of midwives were occasional drinkers. About 13% of all pregnant women in the midwives' clientele were drinking at levels currently perceived to be harmful in pregnancy to the extent of being likely to produce overt alcohol related effects. There were no differences in the proportions of drinkers according to style of drinking between the 4 major regions and the metropolitan and provincial regions of New Zealand.

An interesting finding of this research was that midwives with a personal opinion of abstinence in their own pregnancy had significantly lowered proportions of teenage, young adult, adult and total drinkers in their clientele. Similarly, these midwives also had lowered proportions of heavy and regular binge drinkers than those who were lenient towards drinking in their own pregnancy. These results indicate that midwives who personally adopted the abstinence message have had a positive influence on their clientele with regard to the issue of alcohol consumption in pregnancy.

The results of the first objective of further analysis on data from the *"Nutrition during pregnancy"* study indicate that women of 16-25 years of age, single, non-European, with no formal education and of the lower socio-economic status were more likely to drink heavily prior to pregnancy, early stages of pregnancy and in pregnancy. It was interesting to note that in this sample of pregnant women, the demographic characteristics of heavy drinking women prior to pregnancy and in pregnancy were similar. The age group (14-19 and 20-25 years) most likely to drink in pregnancy among the clientele of midwives was similar (16-25) to the heavy drinkers of the "*Nutrition during pregnancy*" study. Studies on the non-pregnant population of New Zealand also indicate that women of this age group were at risk for binge drinking. The heavy drinking women of the "*Nutrition during pregnancy*" study also included binge drinkers as the categorisation of styles of drinking was based on the amount of absolute alcohol consumed on a typical occasion.

Overseas literature indicates that women of childbearing age are in danger of drinking in the early stages of pregnancy probably prior to recognition of pregnancy. The result of the survey of midwives on the prevalence of clients reporting of having drunk prior to recognition of pregnancy was 12.5%. However, as midwives do not record this information, this estimate is likely to be subjective and under-estimated.

On further analysing the data from the "*Nutrition during pregnancy*" study, the results indicate that 45.8 % of pregnant women in this sample were "Early pregnancy" drinkers. The prevalence rate observed is similar to that obtained (45%) in overseas studies (Floyd *et al*., 1999). One limitation of the "*Nutrition during Pregnancy*" study was that no data is available on the drinking behaviour of these women prior to the fourth month of pregnancy. However, overseas literature indicates that women who are unaware of their pregnant state are likely to continue their pre-pregnancy drinking behaviour during this period (US Dept of Health and Human Services, 2000).

Heavy "Early pregnancy" drinkers had similar demographic characteristics to those of "Usual" drinkers of the "*Nutrition during pregnancy*" study. The majority (80%) of these women were younger women and consumed alcohol once a week or less. These women are likely to go un-noticed by maternity care givers as they would have usually stopped drinking prior to the first antenatal visit and are perceived to be "Low risk" drinkers. Among this group of women, although the young adults were more likely to be heavy drinkers, a greater proportion of adult and older adult women were "Very frequent" moderate drinkers, consuming alcohol daily or more times weekly. The "Early pregnancy" drinkers of this study were concerned for the well being of their baby and this is reflected in them having stopped drinking prior to the first interview. Nevertheless they were at considerable risk of having caused some damage to the foetus during this highly vulnerable period.

The results of the current research highlight the danger of regular and heavy drinking among women of childbearing age as many continue to drink in the early stages of pregnancy. Literature reviewed and documented in Chapter 2 clearly indicates that maternal alcohol consumption during the embryonic period of pregnancy has far reaching deleterious effects on the development of the central nervous system. The results of this study also highlight the need for midwives, and probably all maternity caregivers in New Zealand, to record pre-pregnancy drinking behaviour and drinking behaviour prior to the first antenatal visit.

Drinking status in pregnancy among women of the "*Nutrition during Pregnancy*" study was largely influenced by the frequency of drinking prior to pregnancy. Women who usually consumed alcohol on one occasion per week or less prior to pregnancy were more likely to drink in the early stages of pregnancy. The majority of these women were of the 16 to 25 years age group. The very frequent drinkers, usually consuming alcohol daily or more frequently in a week, were more likely to continue to drink throughout pregnancy and a majority of these women were above 35 years of age. The study by Counsell *et al.*, (1994) on New Zealand pregnant women indicated that older women of this age group (> 35 years) were at risk for frequent drinking.

Considering both, the results of the "*Survey of midwives*" and that of the further analysis done on the "*Nutrition during pregnancy*" study, a greater proportion of younger women of New Zealand may be drinking infrequently but heavily in pregnancy especially, in the early stages of pregnancy. Considering the "Usual" style of drinking exhibited by younger women in the current research and in overseas studies (Cornelius *et al.*, 1994 and Jonathan *et al.*, 1997), it is most likely that these women were binge drinking in pregnancy. As literature documented in Chapter 2 is conclusive on the deleterious effects of heavy and binge drinking in pregnancy on the foetus, the results of this study indicate that younger women of New Zealand are at risk for having alcohol affected children.

However, on taking both, the "Style of drinking" and "Frequency of drinking" into consideration, as was done in the current research, a greater proportion of older women of New Zealand are light but frequent drinkers and continue to drink well into pregnancy. Hence, a majority of drinking women of childbearing age of New Zealand are at risk for causing some foetal damage in pregnancy, especially as literature does not document a safe amount or safe period in pregnancy for alcohol consumption. A recent study has also shown that children exposed to any alcohol were 3.2 times more likely to suffer from delinquent behaviour than children who were not prenatally exposed to alcohol (Sood *et al.*, 2001). In the general population of New Zealand only a small proportion of women are non-drinkers. Intervention strategies have to be developed and executed across the large proportion of usual drinkers in their reproductive years to prevent the prevalence of foetal alcohol spectrum disorders in New Zealand.

The survey of midwives also highlights the prevalence of high-risk women who may be abusers of alcohol especially in the upper North Island regions of New Zealand. The results of this research also highlight that some of these women may opt out of prenatal care in pregnancy. However, further research is essential to assess the actual statistics of women who opt out of prenatal care, their drinking status in pregnancy and the related outcomes of pregnancy.

With respect to the encounter of midwives with outcomes of heavy maternal drinking, the results of this study indicate that first trimester miscarriage, an outcome that has been associated with moderate to heavy drinking in early pregnancy was prevalent among the clients of midwives at an average rate of 6 cases per midwife. There were no differences in the mean number of cases of miscarriage in the first trimester, according to type and region of practice. On investigating for a correlation between mean number of cases of miscarriage and the proportion of drinkers according to different styles of drinking in the clientele of midwives, a modest positive correlation was observed between prevalence of first trimester miscarriage and the proportion of clients drinking "One drink a day" and above. The strength of the correlation increased in proportion according to the styles of drinking, being highest for the proportion of regular binge drinkers in the clientele of midwives. The results of this study raise concern as to how many miscarriages or spontaneous abortions are the result of alcohol consumption and the continued non-acceptance of the "Abstinence" message by New Zealand health professionals and researchers.

With respect to the encounter of midwives with infants affected due to maternal alcohol consumption, on average midwives reported 3 cases per midwife in the year preceding the survey. Prevalence of symptoms characteristic of heavy alcohol exposure in infants was rare. However, when they did occur these symptoms occurred together in the same practices. In assessing the encounter of midwives with some noticeable birth defects the mean number of cases of "Peculiar faces" seen by midwives was high in comparison to most of the other birth defects. Although the combined estimate of 618 cases a year of foetal alcohol syndrome and peculiar faces provided by midwives is subjective in nature, it is well within recent estimates provided by other New Zealand researchers. The incidence rate of "Peculiar faces" calculated from the estimates provided by midwives of this study and from the total proportion of heavy drinkers in pregnancy in the current research and from that reported by Watson and McDonald (1999) are similar at ~ 30 cases per 1000 live births in an average year. These results draw attention to the fact that although the risk of foetal alcohol syndrome may be high, formal diagnosis of foetal alcohol syndrome in New Zealand is almost non-existent.

Maternal nutritional status has also been indicated as one of the host factors that influence the pathogenesis of alcohol related effects (Michaelis & Michaelis, 1994; Philips *et al.*, 1989). Animal (Weinberg *et al.*, 1990) and human (Denkins *et al.*, 2000) studies have indicated that maternal alcohol consumption can affect maternal nutritional status and hence affect foetal development. These authors have also indicated that the interactive effects of maternal alcohol consumption and maternal nutritional status may have deleterious effects on foetal development. On drawing out a profile of nutrient intakes of pregnant women of various drinking styles, the results of further analysis of the "*Nutrition during pregnancy*" study indicate that heavy drinkers in pregnancy had significantly lower intakes of dietary fibre, total folates and beta-carotene, than moderate and light drinkers. Dietary calcium intakes of all women who continued to drink in pregnancy were well below the Australian Recommended Dietary Intakes for pregnant women. Women drinking heavily prior to pregnancy also had lower intakes of the above nutrients including calcium than the moderate and light drinkers. The results of the 1997 National Nutrition Survey also indicate a high prevalence of very low calcium intakes and low dietary folate intakes among the 15-18 year olds. As a majority of heavy drinkers in the current research were younger women (16-25), the results observed raise concern over the combined effect of compromised nutritional status and risky drinking behaviour commonly seen among these women, especially as the demands for essential nutrients like calcium and folate in pregnancy are high. In conclusion, the results of this study indicate a risk probably on par with, or higher than that seen in other Western countries for the prevalence of foetal alcohol syndrome and other alcohol related effects in New Zealand.

On combining the results on women most likely to drink in pregnancy and the effect of style of drinking on nutrient intakes in pregnancy, the results of the current research clearly indicate that younger women need to be targeted for education on the far-reaching consequences of heavy drinking on the outcome of pregnancy. A study by Cornelius *et al.* (1997) has shown that teenagers educated on foetal outcomes of maternal drinking were more likely to drink less prior to pregnancy, in the first trimester and less likely to drink to intoxication.

The survey of midwives also aimed at assessing the perceptions and knowledge of midwives toward drinking in pregnancy. The results of this study indicate that in comparison to other published studies of primary maternity caregivers (20% of obstetricians and gynaecologists, Diekman *et al.*, 2000 and 46% of general practitioners and obstetricians, Leversha and Marks, 1995) midwives (71%) were more likely to recommend abstinence in pregnancy.

The personal opinion of midwives on alcohol consumption in pregnancy had a statistically significant association with their professional attitudes toward drinking in pregnancy. Midwives who were likely to abstain in their own pregnancy were also more likely to recommend abstinence in all the three trimesters of pregnancy. This effect of the personal opinion of midwives was much more profound for the first and second trimesters of pregnancy. However, irrespective of their personal opinion, a high proportion (30%) of midwives considered third trimester drinking as safe, which is contrary to the findings of studies on the outcomes of maternal drinking.

On investigating the perception of midwives on a "Safe type" of alcohol in pregnancy, it was found that midwives were more likely to perceive beer and wine as a safer alcoholic drink than spirits. A high proportion of midwives who said that they would be lenient about drinking in their own pregnancy perceived beer or wine to be safe in pregnancy. However the perception of midwives on spirits being a safe drink in pregnancy was less affected by their personal opinion about drinking in pregnancy.

A very high proportion of midwives documented their keenness to receive various tools including education on the issue of alcohol consumption in pregnancy. This is indeed a true reflection of the commitment of midwives to play a role in reducing the risk for the prevalence of alcohol related birth defects in New Zealand.

Recent literature has documented the importance of adequate nutritional status in women prior to conception, at conception and during pregnancy on programming the health of the foetus for life. Events during pregnancy can predispose the infant to cardiovascular diseases, stroke, diabetes, osteoporosis, hormonally related cancers and immune dysfunction[71]. In a research paper by Sokol and Abel (1987), outlining research opportunities on alcohol related birth defects, the authors highlighted the need to explore any increased susceptibility of the alcohol-exposed foetus to other diseases in adult life. A recent animal experiment has related foetal alcohol exposure to insulin resistance in adult life (Lautt *et al.*, 2000). New Zealand has a rapidly growing incidence of maturity-onset or non-insulin dependent diabetes, which is characterised by development of insulin resistance. Other animal experiments have associated immune dysfunction in adult rats exposed to alcohol *in utero* (Jerrels & Weinberg, 1998; Seeling and Smart, 1998).

Literature to date does not reveal a safe amount of alcohol in pregnancy. As in the case of most neurotoxins, the human organism is markedly more vulnerable to alcohol exposure during the prenatal period than at any other point in life. Because of this apparent vulnerability and long-term permanent nature of alcohol related deficits, the best advice continues to be abstinence. In the 1999 report of the International Centre for Alcohol Policies, reviewing government policies on alcohol and pregnancies indicated that among the 16 Western countries, New Zealand and the United Kingdom were the only two countries that did not recommend "Abstinence" in pregnancy (ICAP, 1999). As the objective of the current study was not to assess the foetal effects of various levels of maternal alcohol consumption, no evidence could be provided for changing the current policy on alcohol in pregnancy held by the RCOG (UK), which is also widely accepted in New Zealand. However, studies (McLeod *et al.*, 1983; Mudler *et al.*, 1998), done on the acute effects of alcohol on foetal brain function highlight the need for health professionals to adopt and actively recommend abstinence as prudent to all their clients.

12.3 Recommendations:

Based on the findings of this research, the following recommendations are put forward by the researcher.

[71] Proceedings of the first world congress on the Foetal origins of Adult disease

1. Midwives and other maternity caregivers need to be educated periodically on recent research advances made in the field of alcohol teratogenicity.
2. Midwives and other maternity caregivers need to document drinking behaviour prior to pregnancy, prior to the first antenatal visit and in pregnancy.
3. As in the case of smoking in pregnancy, the statistics of alcohol consumption in pregnancy should be submitted for the annual review.
4. The statistics of alcohol consumption in pregnancy collected by midwives and other maternity care givers need to be part of the newly established Maternal and Newborn Information System, to help diagnose and provide the required care for alcohol affected children in New Zealand.
5. Midwives and other maternity caregivers should actively advocate abstinence as best in pregnancy.
6. Education should be provided to all women of childbearing age and pregnant women, especially younger women, on the multifaceted deleterious effects of regular alcohol consumption.

12.4 Suggestions for future research:

1. Repeat the survey of midwives in New Zealand in 2004 to evaluate baseline change in the prevalence of drinking among their clientele over the past five years. This research is important for two reasons, which are given below:

    a. Midwives continue to be the most preferred lead maternity caregivers in New Zealand.
    b. The legal drinking age in New Zealand has been lowered from 20 to 18 years, since the current research was executed.

2. Monitor the prevalence of drinking among New Zealand pregnant women as part of the periodic national surveys on alcohol consumption among New Zealanders.
3. Assess the direct and indirect effects of regular alcohol consumption on dietary intake behaviour and the nutritional status of women of childbearing age.
4. Investigate what role alcohol plays in disrupting the *in utero* milieu that may result in events that can predispose the foetus to diseases in adult life.

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Appendix 1

Booking Forms used by Maternity Caregivers in Two New Zealand Hospitals

Client To Complete

Queen Mary Admission Form

Health Care Otago

OTAGO DISTRICT HEALTH BOARD

PERSONAL DETAILS	National Number:
Title:	Previous Surnames:
Family Name:	Also Known As:
Given Names:	Date Of Birth:

ADDRESS:

	Telephone: Private: ____ Business: ____ Cellphone: ____	**Marital Status** ☐ Single ☐ Divorced ☐ Married ☐ Separated ☐ Widowed ☐ Defacto ☐ Unknown
Religion	**Patients General Practitioner:**	**Ethnicity**
Do you have any religious, personal or cultural beliefs, preferences/sensitivities about which we should be aware to help us meet your needs?	**If Transferred from Another Hospital** Name of Hospital: ____ **M.R.S.A. status checked** ☐ **Occupation/Previous Occupation:** **Employer:**	☐ Chinese ☐ Cook Is ☐ European ☐ Fijian ☐ Indian ☐ Niuean ☐ Maori* ☐ Samoan ☐ Other ☐ Tokelauan ☐ Tongan ☐ Other Pacific Is (Specify) * Iwi ____
Person to contact: A	**Other contact: B**	**Antenatal Care**
Name: Address: Relationship: Telephone: Private: Business:	Name: Address: Relationship: Telephone: Private: Business:	LMC: ____ ☐ Hospital ☐ Private Specialist: ____ Midwife: ____ G.P: ____

Contact in Emergency: ☐ A ☐ B Other:

REFERRAL SOURCE	**Country of Birth**	**If Non-Resident:**
☐ GP ☐ Emergency Dept ☐ Specialist ☐ Outpatient ☐ Midwife ☐ Inpatient ☐ Other Hospital ☐ Self-Referral Would you like referral to: ☐ Maori Liaison Co-ordinator ☐ Social Worker ☐ Other (please specify)	Birth Place: Period of Residence in New Zealand: Years ____ Months ____ **Resident Status:** ☐ Resident ☐ Non-Resident	(1) Have you Medical Insurance ☐ Yes ☐ No (2) I understand that if I am not eligible for a benefit under the Social Security Act 1964, I agree to pay the Board Charge for treatment received Signature __/__/__ Date **Overseas Address:** Sighted: ☐ Passport ☐ Visa ☐ Resident Permit

00001396

Practitioner To Complete

Queen Mary Admission Form

(Please Print) Person Responsible for this Booking:	I certify that the information contained in this admission form is accurate and I have been informed of the reasons for the data collection. Signature: .... Date: ....

Smoking (per day)	Alcohol (glass/week)	Substances	Medication Peri/ Pre-Conception	Current Medication	Allergies /Drug Reactions
☐ Nil ☐ 1-5 ☐ 5-10 ☐ 10+ ☐ Ex Smoker	☐ Nil ☐ 1-5 ☐ 5-10 ☐ 10 or more	☐ No ☐ Yes	Folic Acid Yes/No		No Yes

Gynae History	Past Medical History	Recent Contraception	Menstrual Cycle
No Yes (eg Cong. Abn., Infertility, Laparoscopy YEAR	☐ Rheumatic Fever ☐ UTI/Renal ☐ Cardiac Disease ☐ STD ☐ Hypertension ☐ Psychiatric ☐ Asthma ☐ Thyroid ☐ Epilepsy ☒ Coagulation ☒ Diabetes ☒ Autoimmune ☐ Other BLOOD TRANSFUSION NO YES	☐ No ☐ Yes .... **Family History** ☐ Hypertension ☐ Diabetes ☐ TB ☐ Multi Preg ☐ Deafness ☐ Other (incl Cong Abn) ☐ .... ☐ Adopted	☐ Regular ☐ Irregular .... **LMP** ..../........./......... ☐ cert ☐ uncert ☐ nk **Clinical EDD** ..../........./......... **Revised EDD** ..../........./......... Scan at .... weeks Other reason ....

Gravida: **Parity:**

Obstetric History		Pregnancy		Labour			Puerperium				
Place of Delivery	Delivery Date dd/mm/yy	Dur in Wks	Complications	Dur in Hrs	Mode	Complications	Alive NND SB IFD	Sex	Birth Wt (g)	Breast Feeding Months	Baby's Name

FIRST VISIT		Baby's Father
Height .... Weight .... (pre-pregnancy) BLOOD PRESSURE: ..../.........	Hb .... Ferritin .... Blood ABO .... Rhesus Pos Neg Antibodies Nil Pos Rubella ☐ immune ☐ non-immune Hep B ☐ neg ☐ pos VDRL ☐ neg ☐ pos HIV ☐ neg ☐ pos Smear ☐ normal ☐ abnormal Chlamydia ☐ neg ☐ pos	Family Name .... Given Name .... Father's Ethnicity ☐ Chinese ☒ Cook Island ☐ European ☐ Fijian ☐ Indian ☐ Niuean ☐ Maori ☐ Samoan ☐ Other ☐ Tokelauan ☐ Tongan ☐ Other Pacific Is

Maternity Record, Palmerston North Hospital

Booking Screen	Patient Identification		
Date	Family Name Title	NHI	Place Registration Bradma here
LMC's Name			
LMC = Hospital Employee or Private Care	Given Names		
Care = Primary / Secondary			
Referred by	Also Known as	DOB	
Other/Midwife/Doctor			
Registration Screen	**Maternity – Screen 1**		
Address	Smoking ☐ Nil	Blood Transfusion ■ No ☐ Yes	
	☐ 1 – 10 day	Current Medication ■ No ■ Yes	
	☐ 10+ day	If yes what drug 1:	
Home Phone	Alcohol ☐ Nil	If yes what drug 2:	
Work Phone	☐ 1-5 glasses/wk	Drug Allergies ☐ No ☐ Yes	
Marital Status	☐ 5-10 glasses/wk	If yes what drug 1:	
DOB	Substances ☐ No ☐ Yes	What Reaction 1:	
Birth Country	Gynae History ☐ No ☐ Yes	If yes what drug 2:	
Birth Town	Year	What Reaction 2:	
Religion	Year	Recent Contraception ■ No ☐ Yes	
Occupation	General Surgery ☐ No ☐ Yes	What Pill	
Nationality	Year		
Ethnicity	Year		
Contacts Name	**Patients Past Medical History**	**Patients Family Medical History**	
Address	☐ Rheumatic Fever	☐ Hypertension	
	☐ Cardiac	■ Diabetes	
	☐ Hypertension	☐ Tb	
Relationship	☐ Asthma	☐ Immigrant <5yrs (except W.Europe/N.America)	
Home Phone	☐ Epilepsy	☐ Household member with past Tb	
Work Phone	☐ Diabetics	☐ Maori or Pacific Islander	
NOK Name	☐ UTI/Renal	☐ Asian	
Address	☐ STD	■ Multi Pregnancies	
	☐ Psychiatric	☐ Deafness	
	● Thyroid	■ Cong Hips	
Relationship	☐ Coagulation	☐ Renal	
Home Phone	☐ Auto-Immune	☐ Cardiac	
Work Phone	☐ Tb	☐ Thalassaemia	
Patients GP	☐ Malignant Hyperthermia	☐ Malignant Hyperthermia	
If there is a "Shared-care Contract" with GP for Antenatal Care, Please use the ☺ symbol on Registration Screen	☐ Other	☐ Adppted	
		☐ Congenital Abnormalities	
		■ Other	

Pre-Natal Record

Maternity Record, Palmerston North Hospital

Obstetric History (in order of pregnancies) Maternity – Screen 2									G		P
Date of Delivery	Place of Delivery	Pregnancy		Labour and Puerperium		Alive SB NND IFD	Sex	Birth Weight (g)	Breast Feeding (months)		Problems
		Dur in Weeks	Complications	Dur in Hours	Complications						

Tick "History Complete" when finished

Maternity - Screen 3		
Antenatal Care GP	First Visit at week number	Antibodies ☐Nil ☐Pos ☐NK
Obstetrician	Height	Rubella ☐Imm ☐Non ☐NK
Midwife	Weight	Hep A ☐Neg ☐Pos ☐NK
Menstrual Cycle ☐ Reg ☐ Irreg	Protein	Hep B.A'g ☐Neg ☐Pos ☐NK
Length of Cycle /		Hep C ☐Neg ☐Pos ☐NK
LMP / /	Ketones	Hep E A'g ☐Neg ☐Pos ☐NK
LMP ☐Certain ☐ ????	B.P.	VDRL ☐Neg ☐Pos ☐NK
EDD / /	Hb	HIV ☐Neg ☐Pos ☐NK
USS Date Done / /	Blood Group	Smear ☐Neg ☐Pos ☐NK
Mat Est Weeks	Rhesus ☐Pos ☐Neg ☐NK	Chlamydia ☐Neg ☐Pos ☐NK
Revised EDD		MRSA ☐Neg ☐Pos ☐NK
Reason		Gp B Strep ☐Neg ☐Pos ☐NK
		MSU ☐Neg ☐Pos ☐NK

Obstetric Comments:

Signatures

Appendix 2

Recommendations of the Royal College of Obstetricians and Gynaecologists (U.K.)

Alcohol Consumption in Pregnancy (9)

INTRODUCTION

1. Aim

The aim of this guideline is to provide up-to-date information, based on clinical evidence, regarding the potential problems associated with excessive alcohol consumption during pregnancy.

2. Introduction and background

Despite repeated historical references to the deleterious effects of maternal alcohol consumption in pregnancy, it was not until 1968 that Lemoine and co-workers[1] described a constellation of fetal growth and development defects associated with maternal and paternal alcohol abuse. Since then a range of fetotoxicity has been associated with excessive and social maternal alcohol consumption.

3. Identification and assessment of evidence

The Cochrane Library and the Cochrane Register of Controlled Trials were searched for relevant studies, systematic reviews and meta-analyses. A search of MEDLINE and PUBMED (electronic databases) from 1966-1999 was also carried out. We were aiming to find studies looking at the harmful effects of alcohol, as such we looked for cohort and case-control studies.

The databases were searched using the relevant MeSH terms including all sub-headings. This was combined with a Key-Words search.

The definitions of the types of evidence used in this guideline originate from the US Agency for Health Care Policy and Research. Where possible, recommendations are based on, and explicitly linked to, the evidence that supports them. Areas lacking evidence are highlighted and annotated as 'Good Practice Points.'

4. Fetal alcohol syndrome

Jones and colleagues[2] were the first to coin the phrase "fetal alcohol syndrome" to describe the features associated with heavy maternal alcohol consumption. The diagnosis of fetal alcohol syndrome requires signs in all of the three following categories:

- Fetal growth restriction
- Central nervous system involvement (neurological abnormalities, developmental delay, intellectual impairment, head circumference below the 3rd centile, brain malformation).
- Characteristic facial deformity (short palpebral fissures, elongated mid-face, flattened maxilla).

Other abnormalities, affecting all systems in the body, have been described and are referred to as fetal alcohol effects. Fetal alcohol syndrome is a rare event with reported incidences of 1.3, 1.7, 1.95 per 1,000 live births in France, Sweden and USA respectively. The syndrome is not seen consistently in infants born to women who are heavy consumers of alcohol and occurs only in approximately 30-33% of children born to women who drank about 2gms per kilogram of body weight per day (equivalent to approximately 18 units of alcoholic drink per day). The differing susceptibility of fetuses to the syndrome is thought to be multifactorial and reflects the interplay of genetic factors,[3,4] social deprivation, nutritional deficiencies, tobacco and other drug abuse, along with alcohol consumption.

5. Screening for heavy alcohol consumption during pregnancy

Although 90% of women consume alcohol when they are not pregnant, the proportion decreases to 40-60% during pregnancy. Most women are able to abstain or decrease their alcohol consumption during pregnancy because for them it is not an addictive activity. However, obstetricians should be aware of the possibility of heavy alcoholic consumption during pregnancy because of the potentially serious effects on the fetus. The most effective way of detecting heavy alcohol consumption is the T-ACE questionnaire[5,6] which can be used to screen either the whole population or be targeted as those women with growth impaired fetuses. Only four questions are required as follows:

T *How many drinks does it take to make you feel high? (Tolerance)* (two points) (The patient is considered tolerant if it takes more than two drinks to make her feel high)

A *Have people annoyed you by criticising your drinking?* (one point)

C *Have you ever felt you ought to cut down your drinking?* (one point)

E *Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover (eye opener)?* (one point).

A total score of greater than or equal to two points is considered positive and correctly identifies over 70% of heavy drinkers during pregnancy

Blood markers of excessive alcohol consumption include alcohol, gammaglutamyl transferase, mean corpuscular volume, thiocyanate, whole blood-associated acetaldehyde and carbohydrate deficient transferrin are not as effective as the T-ACE questionnaire.

6. Social alcohol consumption

Moderate and occasional alcohol consumption which is socially acceptable is regarded as normal behaviour. Over 90% of the population consumes alcohol and the quantity and frequency of alcohol consumption by females of reproductive age is increasing. The consequences of this social activity on pregnancy has remained controversial because it is a difficult area to study for two main reasons:

- difficulty in measurement of alcohol consumption during pregnancy;
- difficulty in controlling for confounding factors, particularly social class and tobacco consumption.

B **Consumption of 120gms (15 units) or more per week has been associated with a reduction in birthweight.**

There are inconsistent data about the effect of social alcohol consumption on many pregnancy outcomes. Alcohol consumption of more than three drinks per week during the first trimester increases the risk of spontaneous abortion7 (O.R.=2.3; 95% C.I. ±1.1-4.5) but any effect on gestational length remains controversial. There is good evidence that social alcohol consumption does have a small negative effect on intrauterine fetal growth. Mills et al8 reported an 83gm decrement of birthweight per one to two drinks per day very similar to that found by Florey et al in the Euromac Study,9 i.e. a deficit of 66gms of birthweight per 120gms of alcohol (15 units) per week.

Evidence Level III

B **Consumption of 160gms (20 units) or more per week has been associated with intellectual impairment in children.**

Any impairment of neurodevelopment appears to occur at higher levels of alcohol consumption. The best information in this area comes from the Seattle Pregnancy and Health Study.10 The Seattle Group reported a decrement of five IQ points in children of mothers drinking greater than 250gms of alcohol per week, whilst at seven

Evidence Level III

years of age, children of mothers drinking greater than 165gms per week had a decrement of seven IQ points. Other impairments included attention and memory deficits, arithmetic and reading difficulties.

✓ **In pregnancy excessive alcohol consumers will require specific counselling and possible referral for specialist treatment. Clinics should consider providing a telephone contact number for women seeking advice and support for alcohol problems.**

✓ **There is no conclusive evidence of adverse effects in either growth or IQ at levels of consumption below 120gms (15 units) per week. Nonetheless it is recommended that women should be careful about alcohol consumption in pregnancy and limit this to no more than one standard drink per day.**

1 unit of alcohol approximately equals 8gms of absolute alcohol, which is equivalent to:

½ pint of ordinary strength beer, larger or cider
¼ pint of strong beer or larger
1 small glass wine
1 single measure of spirits
1 small glass sherry

References

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7. Florey C duV, Taylor D, Bolumar F, Kaminski M, Olsen J, ed. EUROMAC - A European concerted action: maternal alcohol consumption and its relation to the outcome of pregnancy and child development at 18 months. Int J Epidemiol 1992, 21 (supplement 1).
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Appendix

Clinical guidelines are: 'systematically developed statements which assist clinicians and patients in making decisions about appropriate treatment for specific conditions'. Each guideline is systematically developed using a standardised methodology. Exact details of this process can be found in 'Guidance for the development of RCOG green top guidelines' (available on the RCOG website). These recommendations are not intended to dictate an exclusive course of management or treatment. They must be evaluated with reference to individual patient needs, resources and limitations unique to the institution and variations in local populations. It is hoped that this process of local ownership will help to incorporate these guidelines into routine practice. Attention is drawn to areas of clinical uncertainty where further research may be indicated.

The evidence used in this guideline was graded using the scheme below and the recommendations formulated in a similar fashion with a standardised grading scheme.

Classification of evidence levels

Ia Evidence obtained from meta-analysis of randomised controlled trials.

Ib Evidence obtained from at least one randomised controlled trial.

IIa Evidence obtained from at least one well-designed controlled study without randomisation.

IIb Evidence obtained from at least one other type of well-designed quasi-experimental study.

III Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case studies.

IV Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities.

Grades of recommendations

A Requires at least one randomised controlled trial as part of a body of literature of overall good quality and consistency addressing the specific recommendation. (Evidence levels Ia, Ib).

B Requires the availability of well-controlled clinical studies but no randomised clinical trials on the topic of recommendations. (Evidence levels IIa, IIb, III).

C Requires evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates an absence of directly applicable clinical studies of good quality. (Evidence level IV).

Good Practice Point

✓ Recommended best practice based on the clinical experience of the guideline development group.

This Guideline was produced on behalf of the Guidelines and Audit Sub-Committee of the Royal College of Obstetricians and Gynaecologists by:

Professor D J Taylor FRCOG, Leicester

Appendix 3a

Preliminary Questionnaire

Assessment of risk of foetal alcohol syndrome and other alcohol related effects in New Zealand

Survey of Midwives

Time Started: _______ **Time Finished:** ________

1.a. Type of midwife:

Please circle the number beside one option that describes your practice as a midwife.

1. Independent midwife.
2. Shared care.
3. Labour-only care.
4. Antenatal care .
5. Post-Natal care.
6. Hospital-based midwifery care.
7. Any other. Please specify ____________________

8. Not Applicable
9. Don't Know

1.b. Experience:

You have been working as a midwife in New Zealand for,

Please circle the most appropriate option

1. Less than 2 years.
2. 2-5 years.
3. 5-10 years.
4. More than 10 years.

8. Not applicable
9. Don't know

1.c. How many clients have you had in the ***past year***?

Please provide a specific number. If unsure provide an approximate number.

1.d. How many clients have you had in the ***past month***?

Please provide a specific number. If unsure provide an approximate number.

1.e. What *number* of your clients in the ***past year*** can be categorised as follows:

If you know the actual numbers please stipulate in the first column. If you are unsure then please use the boxes provided and tick an appropriate range.

Age Group	Please stipulate actual number	1-5	6-10	11-20	21-40	41-60	61-80	81-100	>100
Teenage 14-18 yrs									
Young adults 19-25 yrs									
Adults 26-35 yrs									
Older adult < 35 yrs									

1.f. What *number* of your clients in the ***past month*** can be categorised as follows:

If you know the actual numbers please stipulate in the first column. If you are unsure then please use the boxes provided and tick an appropriate range.

Age Group	Please stipulate actual number	1-5	6-10	11-20	21-40	41-60	61-80	81-100	>100
Teenage 14-18 yrs									
Young adults 19-25 yrs									
Adults 26-35 yrs									
Older adult < 35 yrs									

2.a. To what ***level of concern*** would you categorise the ***issues*** listed below ***in your practice as a midwife:***

Please tick (✓) in the box of the most appropriate level of concern against each issue.

	Level of concern				
Issues	**Not caused Concern**	**Caused mild concern**	**Caused moderate concern**	**Caused high concern**	**Caused extreme concern**
Recreational drugs					
Prescription drugs					
Alcohol					
Smoking					
Very young pregnant teenager					
Older pregnant women (>40 years)					
Preparedness for motherhood					
Diet during pregnancy					
Other ___________					

2.b. Had you heard of foetal alcohol syndrome before receiving this survey?

Please circle the appropriate answer

1. Yes
2. No

2.c Had you heard of other alcohol related effects before receiving this survey?

Please circle the appropriate answer

1. Yes
2. No

(If your answer to Q.2.c is <u>no</u> please go to Q.2.e.)

2.d. If yes, please give your comments on what you think are the symptoms of other alcohol related effects:

2.e. Do you think that making decisions and giving/obtaining advice about drinking during pregnancy is:

Please circle the number beside the appropriate option(s).

1. Solely the mother's responsibility.
2. The responsibility of the primary maternity caregiver.
3. The responsibility of family and friends.
4. The responsibility of mother, primary maternity caregiver and the family.
5. Any other - please comment

____

____

3.a. How many cases of spontaneous miscarriages have you come across in the ***past year*** of your practice:

Time of pregnancy	unsure	never	1-2 cases/year	3-5 cases/year	6-10 cases/year	>10 cases/year
First six weeks						
6-12 weeks						
13-24 weeks						
above 24 weeks						

3.b. How frequently have you encountered the following birth defects in the ***past year*** of your practice in New Zealand?

Please tick (✓) in the appropriate box against each birth defect

Type of Birth Defect	unsure	never	1-2 cases/ year	3-5 cases/ year	6-10 cases/year	>10 cases/year
Spina Bifida						
Microcephaly						
Hydrocephaly						
Cleft Palate/lip						
Polydactyly						
Syndactyly						
Club feet						
Down Syndrome						
Fetal Alcohol Syndrome						
Peculiar faces*						

***Peculiar faces may include protruded forehead, sunken nasal bridge, short upturned nose, retracted upper lip, receding chin and deformed ears.**

3.c. How frequently would you have encountered the birth defects listed below during your ***career*** as a midwife in New Zealand:

Please tick (✓) in the appropriate box against each birth defect

Type of Birth Defect	unsure	never	1-2 cases/year	3-5 cases/year	6-10 cases/year	>10 cases/year
Spina Bifida						
Microcephaly						
Hydrocephaly						
Cleft Palate/lip						
Polydactyly						
Syndactyly						
Club feet						
Down Syndrome						
Fetal Alcohol Syndrome						
Peculiar faces*						

***Peculiar faces may include protruded forehead, sunken nasal bridge, short upturned nose, retracted upper lip, receding chin and deformed ears.**

4.a. Personally do you think that in pregnancy women should:

Please circle the number beside the appropriate option.

1. Abstain totally from alcohol.
2. Have an occasional drink if they choose to.
3. Have a drink a day if they choose to.
4. Have more than a drink a day if they choose to.

8. Not applicable
9. Dont know

4.b. As a ***professional*** what role do you think alcohol should play in the lives of pregnant women:

Please tick in the appropriate box and also fill in the last box against all your "Yes" answers

Criteria	unsure	Yes	No	If yes, how much alcohol would you consider safe
Can be consumed throughout pregnancy				
Can be consumed during first trimester of pregnancy				
Can be consumed during second trimester of pregnancy				
Can be consumed during third trimester of pregnancy				
Can be consumed while socialising				
Can be consumed to help in relaxing the mother				
Can be consumed to help prevent premature labour				
Stout (beer) can be consumed for its iron content				
Can be consumed to induce delayed labour				

Any other, please comment

____

4.c. From your knowledge and experience what would you consider a safe level of alcohol intake during pregnancy?

4.d. Would you consider the below listed types of alcohol safe to be consumed during pregnancy. If yes, how much would you consider safe:

Please tick in the appropriate box and also fill in the last box against all your "Yes" answers

Type of alcohol	Yes	No	How much
Beer			
Wine			
Spirits			
Any other ________			

5.a. How many of your clients of various ages in the ***past year*** could be categorised as drinkers:

Drinkers in the context of this research are defined as those having consumed any beverage alcohol during pregnancy. If you know the actual numbers please stipulate in the first column. If you are unsure then please use the boxes provided and tick an appropriate range.

Age Group	Please stipulate actual number	1-5	6-10	11-20	21-30	31-40	41-50	>51
Teenage 14-18 yrs								
Young adults 19-25 yrs								
Adults 26-35 yrs								
Older Adult < 35 yrs								

5.b. How many of your clients of various ages, in the ***past month*** could be categorised as drinkers:

Drinkers in the context of this research are defined as those having consumed any beverage alcohol during pregnancy. If you know the actual numbers please stipulate in the first column. If you are unsure then please use the boxes provided and tick an appropriate range.

Age Group	Please stipulate actual number	1-5	6-10	11-20	21-30	31-40	41-50	>51
Teenage 14-18 yrs								
Young adults 19-25 yrs								
Adults 26-35 yrs								
Older Adult < 35 yrs								

5.c. How many of your clients who drank alcohol, in the ***past year*** of your practice could be categorised as follows:

If you know the actual numbers please stipulate in the first column. If you are unsure then please use the boxes provided and tick an appropriate range.

Type of drinkers	Please stipulate actual numbers	None	1-5	6-10	11-20	21-30	31-40	41-50	>51
Occasional drinkers									
Have one drink a day									
Have more than 1 drink a day									
Occasional binge drinkers									
Regular binge drinkers									
Deny drinking, but you believe they do									

5.d. How many of your clients who drank alcohol, in the ***past month*** of your practice could be categorised as follows:

If you know the actual numbers please stipulate in the first column. If you are unsure then please use the boxes provided and tick an appropriate range.

Type of drinkers	Please stipulate actual numbers	None	1-5	6-10	11-20	21-30	31-40	41-50	>51
Occasional drinkers									
Have one drink a day									
Have more than 1 drink a day									
Occasional binge drinkers									
Regular binge drinkers									
Deny drinking, but you believe they do									

5.e. How many of your clients in the ***past year*** reported having drunk alcohol before realising they were pregnant:

If you know the actual numbers please stipulate in the first column. If you are unsure then please use the boxes provided and tick an appropriate range.

Type of drinkers	Please stipulate actual numbers	None	1-4	5-7	8-10	11-13	14-16	17-19	>20
Occasional									
Regular									
Binge									

5.f. How many of your clients in the ***past month*** reported having drunk alcohol before realising they were pregnant:

If you know the actual numbers please stipulate in the first column. If you are unsure then please use the boxes provided and tick an appropriate range.

Type of drinkers	Please stipulate actual numbers	None	1-4	5-7	8-10	11-13	14-16	17-19	>20
Occasional									
Regular									
Binge									

6.a. How many cases in a year do you see of women giving birth while heavily under the influence of alcohol?

6.b. Do you see any abnormalities in infants of the above-mentioned mothers at birth or later? Please comment.

6.c. How many cases do you see in a year of infants that you think have been damaged due to alcohol intake by the mother during pregnancy?

7.a. Alcohol intake is a very sensitive issue to talk with clients. What are the issues you face in effectively communicating the risks of alcohol intake during pregnancy to your client if you know for sure she is drinking or you suspect she is? Please comment.

7.b. Do you think that the following tools would help you in discussing this issue with your clients?

Please circle one appropriate answer against each tool

Training in effective communication	yes/no
Knowledge of how much alcohol is safe	yes/no
Training to recognise early symptoms in an infant exposed to alcohol *in utero*	yes/no

Any other suggestions you have will be appreciated

8.a. The place where you practice is a:

Please circle the number beside the answer which best describes your area.

1. Farming or rural area
2. Village (under 2,000 people)
3. Small town (2,000 - 9,999 people)
4. Large town (10,000 to 29,999 people)
5. Small city (30,000 to 49,999 people)
6. Medium city (50,000 to 99,999 people)
7. Large city (100,000 people or more)

8. Not applicable
9. Don't know

8.b. The area in which you practice is:

Please circle the number beside your area

1. Northland
2. Auckland
3. Thames valley
4. Bay of Plenty
5. Waikato
6. Tongariro
7. East Cape
8. Hawkes Bay
9. Taranaki
10. Wanganui
11. Manawatu - Rangitekei
12. Horowhenua
13. Wellington
14. Wairarapa
15. Nelson Bays
16. Marlborough
17. West Coast
18. Cantebury
19. Aorangi
20. Clutha-CentralOtago
21. Coastal-North Otago
22. Southland

Appendix 3b

Information Sheet (Pilot Study)

Assessment of risk of Fetal Alcohol Syndrome and Alcohol Related Effects in New Zealand

Information sheet for the participants of the pilot study

Dear Participant,

I request your participation in piloting the questionnaire developed to assess drinking habits of pregnant mothers and thereby assess the risk of fetal alcohol syndrome and alcohol related effects in New Zealand. There are no right or wrong answers, but your opinion is of extreme importance. The information sheet regarding the study is also enclosed. Your participation is vital to the study and will be most appreciated.

The purpose of the pilot study:

1. To evaluate the clarity and precision of the questionnaire
2. To estimate the approximate time taken to complete the questionnaire
3. To make relevant changes to the questionnaire based on the responses from the pilot study
4. To get a first hand experience of what issues the participants face with regard to completing the survey.

The role and rights of the participant:

1. Your participation in the pilot study will be most valued and appreciated.
2. The participant will have to sign the consent form before participation.
3. You have the right to decline to participate, choose not to answer any particular questions, withdraw from the study at any time during participation and ask any questions at any time about the study during participation.
4. To ensure complete confidentiality please do not put your name on the questionnaire.
5. The data from this study will not be analysed or presented in the report. These questionnaires will be destroyed after using it for improving the questionnaire.

Thank you very much for your time.

Signed: ....
Name: Mrs Sherly Mathew.
Date: 15/4/99

Appendix 3c

Consent Form (Pilot Study)

Assessment of risk of Fetal Alcohol Syndrome and Alcohol Related Effects in New Zealand

CONSENT FORM

I have read the information sheet and have had the details of the study explained to me. It has been explained to me that the data from the pilot study will not be used for the research. I understand that the information given by me will only be used to improve the quality of the questionnaire. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I understand I have the right to withdraw from the study at any time and to decline to answer any particular questions.

I agree to provide information to the researcher on the understanding that my name will not be used without my permission.

I agree to participate in this study under the above set conditions.

Signed: ....

Name: ....

Date: ....

Appendix 4a

Final Questionnaire

SURVEY OF PRACTISING MIDWIVES

If you are currently not practising as a midwife please do not fill in the questionnaire. We would appreciate if you could send back the blank form in the reply paid envelope.

Thank you for your participation. It will take about 30-45 minutes to complete this questionnaire. To answer these questions all you have to do is circle the appropriate numbers where indicated or tick (✓) in the spaces provided. If you have changed your type of midwifery practice then please answer according to your current type of practice. ***Please be assured that there are no right or wrong answers and your own personal opinions will be a valuable asset to this study.*** *To ensure anonymity please do not put your name on the questionnaire. When you have completed the questionnaire, please post it back in the reply-paid envelope. Your prompt reply will be most appreciated. On receiving your reply the completed questionnaire will be separated immediately from the envelope.* ***We ensure anonymity and complete confidentiality****. Please retain the information sheet with your participant number on it. We will notify the winner of the draw for $300 by post.*

Thank you once again for your time and we hope you enjoy participating in this study.

1.a. Type of midwife:

Please circle the number beside one option that best describes your current practice as a midwife.

1. Independent midwife.
2. Shared care.
3. Hospital-based midwifery care
4. Labour-only care.
5. Antenatal care.
6. Post-Natal care.
7. Any other. Please specify ______________________________

88. Not Applicable.
99. Don't Know.

1.b. Experience:

You have been working as the above said midwife in ***New Zealand*** for:

Please include only the number of years of your current type of practice and Circle the most appropriate option.

1. Less than 2 years.
2. 2-5 years.
3. 5-10 years.
4. More than 10 years.

88. Not applicable.
99. Don't know.

2.a. How many clients have you had in the ***past year***?

Please tick (✓) in the appropriate box.

Number of Clients

Below 10	**11-20**	**21-30**	**31-40**	**41-50**	**51-60**	**61-70**	**71-80**	**81-90**	**Above 90**
1	2	3	4	5	6	7	8	9	10

2.b. What *number* of your clients in the ***past year*** was categorised as follows?

Please tick (✓) in the appropriate box.

Number of Clients

Age Group ↓	None	1-5	6-10	11-20	21-40	41-60	61-80	81-100	> 100
Teenage 14-19 years	1	2	3	4	5	6	7	8	9
Young Adults 20-25 years	1	2	3	4	5	6	7	8	9
Adults 26-35 years	1	2	3	4	5	6	7	8	9
Older Adults > 35 years	1	2	3	4	5	6	7	8	9

2.c. What number of your clients in the ***past year*** was categorised as follows?

Please tick (✓) in the appropriate box.

Number of Clients

Income Group ↓	None	1-5	6-10	11-20	21-40	41-60	61-80	81-100	> 100
Benefit only	1	2	3	4	5	6	7	8	9
Middle Income	1	2	3	4	5	6	7	8	9
High Income	1	2	3	4	5	6	7	8	9

2.d. What number of clients in the ***past year*** was categorised as follows?

Please tick (✓) in the appropriate box.

Number of Clients

Marital Status ↓	None	1-5	6-10	11-20	21-40	41-60	61-80	81-100	> 100
Married	1	2	3	4	5	6	7	8	9
Partnered	1	2	3	4	5	6	7	8	9
Single	1	2	3	4	5	6	7	8	9

3.a. How many of your clients of various ages in the ***past year*** would have ***consumed any beverage alcohol*** during pregnancy:

Please tick (✓) in the appropriate box against each age category.

	Number of Clients							
Age Group ↓	**None**	**1-5**	**6-10**	**11-20**	**21-30**	**31-40**	**41-50**	**Above 50**
Teenage 14-19 years	1	2	3	4	5	6	7	8
Young Adults 20-25 years	1	2	3	4	5	6	7	8
Adults 26-35 years	1	2	3	4	5	6	7	8
Older Adults above 35 years	1	2	3	4	5	6	7	8

3.b. How many of your clients who ***consumed any beverage alcohol*** during pregnancy in the ***past year*** of your practice could be categorised as follows:

Please tick (✓) the appropriate box against each style of drinking.

	Number of Clients							
Type of drinkers ↓	**None**	**1-5**	**6-10**	**11-20**	**21-30**	**31-40**	**41-50**	**Above 50**
Occasional drinkers	1	2	3	4	5	6	7	8
Have one drink a day	1	2	3	4	5	6	7	8
Have more than 1 drink a day	1	2	3	4	5	6	7	8
Occasional binge drinkers	1	2	3	4	5	6	7	8
Regular binge drinkers	1	2	3	4	5	6	7	8
Deny drinking but you believe they do	1	2	3	4	5	6	7	8

3.c. What number of your clients in the ***past year*** reported having ***consumed any beverage alcohol*** before realising they were pregnant:

Please tick (✓) in the appropriate box against each type of drinking.

Type of drinking ↓	Number of Clients: None	1-4	5-7	8-10	11-13	14-16	17-19	20 and above
Occasional drinking	1	2	3	4	5	6	7	8
Regular drinking	1	2	3	4	5	6	7	8
Binge drinking	1	2	3	4	5	6	7	8

3.d. Do you see women giving birth ***while heavily under the influence of alcohol***?

Please tick (✓) in the appropriate box.

1. Yes   2. No

If your answer is "NO" then please go to Q 4a.

3.e. If yes, how many such cases have you seen in the ***past year***?

Please tick (✓) in the appropriate box.

Number of Clients

None	1-4	5-7	8 - 10	11-13	14 -16	17-19	20 and above
1	2	3	4	5	6	7	8

3.f. From your knowledge, please comment on the ***most likely type of antenatal care*** these women would have received during their pregnancy:

Please tick(✓) in the appropriate box.

Categories ↓	Number of Clients: None	Few	Some	Many	Nearly all
No antenatal care	1	2	3	4	5
Some antenatal care	1	2	3	4	5
Full antenatal care	1	2	3	4	5
Others____________	1	2	3	4	5

4.a. Had you heard of ***foetal alcohol syndrome*** before receiving this survey?

Please circle the appropriate answer.

1. Yes   2. No

4.b. Had you heard of ***other alcohol-related effects*** before receiving this survey?

Please circle the appropriate answer.

1. Yes   2. No

4.c. Personally, during pregnancy would you:

Please circle the number beside the most appropriate option.

1. Abstain totally from alcohol.
2. Have a drink about *less than once a month.*
3. Have a drink about once *a month.*
4. Have a drink about once *a week.*
5. Have a drink *a day.*
6. Have more than a drink a day.
7. Other, please specify_______________

77. Not applicable.
88. Do not want to answer.
99. Don't know.

4.d. Would you consider the ***types of alcohol*** listed below safe to consume during pregnancy? If yes how much would you consider safe?

Please tick in the appropriate box and fill in the last box against all your "Yes" answers.

			Options	
Type of alcohol	**No**	**Yes**	**If 'Yes' How many**	3
↓			**Units per occasion**	**Units perweek**
Beer	1	2		
Wine	1	2		
Spirits	1	2		

4.e. As a ***professional,*** what role do you think ***alcohol could play*** in the lives of pregnant women?

Please tick in the appropriate box and fill in the last box against all your "Yes" answers.

Options

Criteria ↓	**No**	**Yes**	**If 'Yes' how many**	
			Units per occasion	**Units per week**
Can be consumed throughout pregnancy.	1	2	3	4
Can be consumed during 1st trimester of pregnancy.	1	2	3	4
Can be consumed during 2nd trimester of pregnancy.	1	2	3	4
Can be consumed during 3rd trimester of pregnancy.	1	2	3	4
Can be consumed while socialising.	1	2	3	4
Can be consumed to help in relaxing the mother.	1	2	3	4
Can be consumed to help prevent premature labour.	1	2	3	4
Stout (beer) can be consumed for its iron content.	1	2	3	4
Can be consumed to induce delayed labour.	1	2	3	4

5.a. How many cases do you see in a year of infants that you think ***have been affected*** due to alcohol intake by the mother during pregnancy?

Please tick (✓) in the appropriate box.

Number of infants

None	1-4	5 - 7	8 - 10	11 - 13	14 - 16	17-19	20 and above
1	2	3	4	5	6	7	8

5.b. How commonly have you come across the symptoms listed below ***in new-borns*** in the ***past year?***

Please tick (✓) in the appropriate box against each symptom.

Symptoms ↓	Options Very common	Common	Sometimes	Never
Disturbances in sleep patterns.	1	2	3	4
Facial and body tremors.	1	2	3	4
Kept their eyes open for a long time.	1	2	3	4
Touched their hands to their faces frequently.	1	2	3	4
Poor sucking pressure.	1	2	3	4
Takes longer to suck after contact with nipple.	1	2	3	4
Restless, irritable and is active a longer time.	1	2	3	4

6.a. How many of your clients have experienced ***miscarriage*** in the ***past year*** of your practice?

Please tick (✓) in the appropriate box.

Number of miscarriages

Time of pregnancy ↓	**Not Sure**	**None**	**1-2 cases/year**	**3-5 cases/year**	**6-10 cases/year**	**Above 10 cases/year**
First six weeks	1	2	3	4	5	6
6-12 weeks	1	2	3	4	5	6
13-24 weeks	1	2	3	4	5	6
Above 24 weeks	1	2	3	4	5	6

6.b. How would you rate the ***issues*** listed below ***as to the level of concern*** they may cause ***in your practice as a midwife:***

Please tick (✓) in the box of the most appropriate level of concern against each issue.

Level of Concern

Issues ↓	**Do not cause Concern**	**Cause Mild Concern**	**Cause Moderate Concern**	**Cause High Concern**	**Cause Extreme Concern**
Recreational Drugs	1	2	3	4	5
Prescription Drugs	1	2	3	4	5
Alcohol	1	2	3	4	5
Smoking	1	2	3	4	5
Young Pregnant Teenager	1	2	3	4	5
Older Pregnant Women	1	2	3	4	5
Preparedness for motherhood	1	2	3	4	5
Diet during Pregnancy	1	2	3	4	5

6.c. How many cases would you have encountered of birth defects listed below during your ***current midwifery practice*** in New Zealand?

Please tick (✓) in the appropriate box against each birth defect.

	Number of Cases						
Type of birth defect ↓	**Don't know**	**Never**	**Below 5 cases**	**6-10 cases**	**11-20 cases**	**21-30 cases**	**Above 30 cases**
Spina Bifida.	1	2	3	4	5	6	7
Microcephaly.	1	2	3	4	5	6	7
Hydrocephaly.	1	2	3	4	5	6	7
Cleft palate/lip.	1	2	3	4	5	6	7
Polydactyly (abnornal Number of fingers and toes)	1	2	3	4	5	6	7
Syndactyly (webbing or joining of fingers and toes)	1	2	3	4	5	6	7
Club Feet.	1	2	3	4	5	6	7
Down Syndrome.	1	2	3	4	5	6	7
Fetal alcohol syndrome.	1	2	3	4	5	6	7
Peculiar faces*.	1	2	3	4	5	6	7

***Peculiar faces may include protruded forehead, sunken nasal bridge, short upturned nose, retracted upper lip, receding chin and deformed ears.**

6.d. Alcohol intake is a very sensitive issue to talk about with clients. Do you think that the following tools would help you in discussing this issue with your clients?

Please circle one appropriate answer against each tool

Training in effective communication.	1. Yes	2. No
Knowledge of how much alcohol is safe.	1. Yes	2. No
Training to recognise early symptoms in an infant exposed to alcohol *in utero.*	1. Yes	2. No
Education on alcohol in pregnancy for Midwives	1. Yes	2. No
Education on alcohol in pregnancy for Mothers	1. Yes	2. No

7.a. The ***place*** where you ***practiced in the past year*** was a:

Please circle the number beside the area that best describes your place of practice.

1. Farming or rural area.
2. Town.
3. City.

88. Not applicable.
99. Don't know.

7.b. The ***area*** in which you ***practiced in the past year*** was:

Please circle the number that best describes the area you practice.

1. Northland

2. Auckland
3. Thames valley
4. Bay of Plenty
5. Waikato
6. Tongariro
7. East Cape
8. Hawkes Bay
9. Taranaki
10. Wanganui
11. Manawatu - Rangitekei
12. Horowhenua

13. Wellington
14. Wairarapa
15. Nelson Bays
16. Marlborough
17. West Coast
18. Canterbury
19. Aorangi
20. Clutha-CentralOtago
21. Coastal-North Otago
22. Southland
23. Any Other, Please Specify__________

7.c. Do you wish to receive a summary of the results of the study?

1. Yes   2. No

You have reached the end of the questionnaire. Please check to see if you have answered all questions unless you have chosen not to answer specific questions. Please ensure that you mail back the completed questionnaire in the reply paid envelope immediately. Thank you very much for your time and willingness to participate in the study. Please feel free to add other comments you wish to make about the study on the following page.

Please write any further comments you wish to make:

Appendix 4b

Information Sheet

Assessment of risk of Fetal Alcohol Syndrome and Other Alcohol Related Effects in New Zealand

Information Sheet

About the researcher:

To introduce myself, I am Sherly Mathew. I am carrying out research for a Ph.D. programme in Nutritional Science, Institute of Food Nutrition and Human Health, Massey University, Palmerston North. I am a mother of 3 daughters aged 9, 6 and 2 years. My area of interest is *Human Nutrition* in general and *Nutrition in Pregnancy* in particular. Pregnancy, a process by which life is conceived, nurtured and brought out into the world, is a very vulnerable period for both mother and child. The common interest we share is to provide the best possible and complete care to the mother and her child. My Ph.D. supervisor is Associate Professor Kathryn Kitson, who can be contacted by phone on (06) 356 9099 Ext 7703, by FAX on (06) 350 5657 and by email at K.E.Kitson @massey.ac.nz

About the research:

Cause and symptoms of Fetal Alcohol Syndrome (FAS) and Alcohol Related Effects (ARE):

FAS and ARE are disorders that arise as a result of exposure to alcohol *in utero*. FAS is manifested as growth deficiency of prenatal origin, and exhibit a pattern of specific minor anomalies that include a characteristic face and affect the central nervous system. Alcohol Related Birth Defects (ARBD) and Alcohol Related Neurodevelopmental Disorders (ARND) are together categorised as Alcohol Related Effects (ARE), and this is manifested by some partial FAS characteristics and/or central nervous system dysfunction.

Justification of the need for this research in New Zealand:

This survey has been designed to contribute to the assessment of the level of risk in New Zealand for FAS and ARE.

In general, New Zealand women show similar drinking patterns to those of women in other Western countries.

Sufficient data are not available on drinking patterns of New Zealand women during pregnancy to assess the probable level of risk for FAS and ARE in New Zealand.

The incidence of combined rate of FAS and ARND in the western world may be as high as 9.1/1000 live births, and one could speculate that prevalence of alcohol related disorders in New Zealand children is likely to be as high as in other Western countries.

Why are you as a midwife being surveyed?

This survey is designed to gain from midwives their assessment of the drinking patterns of pregnant women and the possible levels of risk for and the incidence of other alcohol related effects in New Zealand. It also aims to ascertain from the midwives their perception of the incidence of FAS and ARE in New Zealand. We believe that midwives are the specialists of normal pregnancy and labour. The recent increase in midwifery practice indicates that more women prefer midwives as their Lead Maternity Care Giver. Anecdotal evidence has also suggested to us that midwives may be the health professionals that are most aware of this problem, but we believe it is important to gain quantitative information about what is being observed.

Long term outcome from this study:

- To provide information that could help educate public and professionals on the risk for fetal alcohol syndrome and other alcohol related effects in New Zealand, and to develop support services for the mother and child in concern.

The role and rights of the participant:

- **Your participation in the survey will be most valued and appreciated.**
- **It is assumed that filling in the questionnaire implies consent. However, you have every right to decline participation, to choose not to answer any particular questions, withdraw from the study at any time during participation and to ask any questions at any time about the study during participation.**
- **We have taken a random sample of midwives from the electoral roll. The serial number on the envelope will be used only for the purpose of follow-up in case of non-response. On receiving your reply, the completed survey form will be immediately separated from the envelope. To ensure anonymity *please do not put your name* on the questionnaire.**
- **Since your name is not on the questionnaire complete confidentiality is ensured.**
- **However, if you wish to receive a summary of the findings please indicate so in question 7c.**
- **Data collected will be presented in a collated form and individual comments will not be cited, unless so preferred by the individual midwife.**
- **All information given will be used only for this research and in any publications resulting from it.**

To show our appreciation for your participation in the study the envelopes from every completed and returned questionnaire will go into a draw and one lucky winner will receive $ 300 towards membership fees to a professional organisation they are associated with.

The Alcohol Advisory Council of New Zealand has provided funding to help support this research.

Appendix 5a

Application Submitted to the Massey University Human Ethics Committee

(Revised March 1999) **MUHEC**

MASSEY UNIVERSITY HUMAN ETHICS COMMITTEE

To: Ethics Secretary
Human Ethics Committee
AVC's Office (Research)
Turitea, Palmerston North Campus

OR

Committee Secretary
Human Ethics Committee
Principal's Office
Albany Campus

Please send/deliver this original application <u>plus</u> 11 copies (PN Campus) OR <u>plus</u> 8 copies (Albany Campus)

APPLICATION FOR APPROVAL OF PROPOSED TEACHING/RESEARCH PROCEDURES INVOLVING HUMAN SUBJECTS

APPLICANT(S):

Name: Mrs Sherly Mathew

Department: Institute of Food, Nutrition and Human Health

Contact Number: 06 3569099 Ext 7703

Status: PhD Student
(e.g. lecturer, PhD/masterate student)

Name of Employer: Massey University PhD Student

PROJECT:

Title: Assessment of risk of Fetal Alcohol Syndrome and Alcohol Related Effects in New Zealand

Status: Doctoral research Project
(e.g. staff research, doctorate/masterate)

Funding Source: Massey University (PhD Scholarship), Alcohol Advisory Council.

Clinical Trial Status: yes ☐ no ✓

ATTACHMENTS:
(e.g. Information Sheet(s), Consent Form(s), Questionnaire, etc)

Information sheet, consent form, questionnaire

SUPERVISOR(S):

Name: Associate Professor Kathy Kitson

Department: Institute of Food, Nutrition and Human Health

SIGNATURE(S):

Applicant(s): S Mathew

Supervisor(s): K E Kitson
(required for all projects involving student research, implies satisfaction with application)

DATE: 26.2.99

OFFICE USE ONLY

Received:

Decision:

1.3 PROCEDURES FOR RECRUITING PARTICIPANTS AND OBTAINING INFORMED CONSENT:

A. Pilot Study:

This will be conducted on a small sample (n = about 10). The purpose of this study is to assess the questionnaire and make any necessary improvements. The data from this study will not be analysed or used in the final report. We will attend the midwives monthly meeting held at Mercy Hospital and request their participation. The participants will need to sign the consent form (copy enclosed) before they participate in the pilot study.

B. The Survey:

The editor of the New Zealand College of Midwives Journal has verbally agreed to enclose the questionnaire along with the journal and send it to all the subscribers. The journal has a subscription rate of 87% of all midwives.

1.4 PROCEDURE IN WHICH RESEARCH PARTICIPANTS WILL BE INVOLVED:

A. Pilot Study:

The research participants will meet the group of midwives and explain to them the purpose of this study and invite participation.

B. The Survey:

The research participants will not have any direct contact with the participants. Any questions on the study will be answered by phone/fax or E-mail.

1.5 PROCEDURES FOR HANDLING INFORMATION AND MATERIAL PRODUCED IN THE COURSE OF THE RESEARCH INCLUDING RAW DATA AND FINAL RESEARCH REPORT(S):

The filled in questionnaires will be stored in duplicate in two different locked cabinets, one at the university and the other at the researcher's home. They will be accessed only by the researcher. All data will be analysed and presented in a collated form and no raw data will be presented.

2. ETHICAL CONCERNS:

2.1 ACCESS TO PARTICIPANTS:

Since we have no direct access to the participants, we do not have any ethical concerns regarding this issue for the actual survey. For the pilot study, we will need to approach the participants personally. However, the data from this study will not be analysed or reported.

2.2 INFORMED CONSENT:

The survey is executed using mail-in questionnaires. Hence the information sheet gives all the necessary details and no separate consent form is enclosed. Filling in the questionnaire implies consent and we do not see any ethical concerns. Participants of the pilot study will need to sign a consent form before they complete the questionnaire.

2.3 ANONYMITY AND CONFIDENTIALITY:

We do not have any ethical concerns regarding this issue since the participants are requested not to fill in their names. All data will be presented in a collated form and no individual comments will be cited, unless this is requested by an individual midwife. Data will be collated and analysed by the researcher and will be handled confidentially.

2.4 POTENTIAL HARM TO PARTICIPANTS:

We do not see any potential harm to the participants by taking part in the survey or the pilot study.

2.5 POTENTIAL HARM TO RESEARCHER(S):

We do not see any potential harm to the researcher(s) by conducting the survey or the pilot study.

2.6 POTENTIAL HARM TO THE UNIVERSITY:

We do not see any potential harm to the University, in allowing this survey to be carried out.

2.7 PARTICIPANT'S RIGHT TO DECLINE TO TAKE PART:

The participants have every right to decline taking part, under which circumstances they will not send back the questionnaire. They also have the right to not answer any particular question or type of questions.

2.8 USES OF THE INFORMATION:

The information will be used only for this research and for any publications and reports resulting from it.

2.9 CONFLICT OF INTEREST/CONFLICT OF ROLES :

As the researcher is a student, we do not have any ethical concerns regarding the above issue.

2.10 OTHER ETHICAL CONCERNS:

After participating in the survey, the midwives attitude towards the drinking mother may change and they may have queries about the subject. We will be prepared to offer help and referral to other agencies if needed.

3. LEGAL CONCERNS:

3.1 Legislation

3.1.1 INTELLECTUAL PROPERTY LEGISLATION:

We do not forsee any issues here but would appreciate advice from the committee if there is anything we have overlooked.

3.1.2 HUMAN RIGHTS ACT 1993:

We do not forsee any issues here but would appreciate advice from the committee if there is anything we have overlooked.

3.1.3 PRIVACY ACT 1993:

It has been stressed on the information sheet that the midwives should avoid putting down their names. The information on the clientele given by the midwife is as numbers and no names will be given. Hence we do not see any legal concerns in relation to the privacy act.

In the pilot study although there are no names being given the researcher will know the midwives personally. Care will be taken not to include any data in the analyses and to use the information gathered only for the improvement of the questionnaire, after which the pilot questionnaires will be destroyed.

3.1.4-6: HEALTH AND SAFETY, ACC, EMPLOYMENY CONTRACTS ACT:

We do not forsee any issues here but would appreciate advice from the committee if there is anything we have overlooked.

3.2 Other legal issues

None

4. CULTURAL CONCERNS:

We have not included questions specifically related to cultural issues, and do not believe that there are cultural concerns associated with the questionnaire. However we would appreciate guidance on this issue if there are any aspects of cultural sensitivity that we may have overlooked.

5. OTHER ETHICAL BODIES RELEVANT TO THIS RESEARCH:

5.1 ETHICS COMMITTEES:

We would appreciate advice as to whether this application needs to be sent to other ethics committees.

5.2 PROFESSIONAL CODES:

Not applicable.

6. OTHER RELEVANT ISSUES:

None

Appendix 5b

Letter of Approval from the Massey University Human Ethics Committee to Conduct the Research

Massey University
COLLEGE OF BUSINESS

Department of Human
Resource Management
Private Bag 11 222,
Palmerston North,
New Zealand
Telephone: 64 6 356 9099
Facsimile: 64 6 350 5796

23 April, 1999

Mrs Sherly Mathew
Institute of Food, Nutrition and Human Health
MASSEY UNIVERSITY

Dear Sherly

Re: Human Ethics Application - MUHEC 99/25
"Assessment of risk of Fetal Alcohol Syndrome and Alcohol Related Effects in New Zealand."

Thank you very much for your letter of the 19th April and the attached information sheet.

The information that you have provided now meets the requirements of the Human Ethics Committee and the ethics of your proposal are approved.

However, I suggest that you spend some time with your supervisor redoing the information sheet so that it is more in line with the requirements of the Human Ethics Committee. You may like to discuss your information sheet with me as well, so that I can make some suggestions to you.

Kind regards,

Yours sincerely

Professor Philip Dewe
Chairperson
Human Ethics Committee

Appendix 6

Summary of Results sent to Midwives who Participated in the Study

Assessment of risk of Foetal Alcohol Syndrome and other Alcohol related effects in New Zealand

Summary of results

At the outset we wish to express our gratitude and thanks to you for having made this valuable study a success. We hope the results of this study will be useful in your profession and practice. Four hundred and forty five midwives nationwide responded to this study of which 64% (N = 285) were midwives with their own client load and 36% (N=160) were midwives who did not have their own client load. Analysis on the data with regard to clients has been restricted to only those midwives who had their own client load. Results are discussed under three major headings, which in effect were the primary objectives of this study.

Alcohol consumption during pregnancy:

- 36 % of all pregnant women consumed some alcohol during pregnancy.
- 82% of teenagers, 48% of young adults, 26% of adults and 27% of older adults continued to drink in pregnancy.
- 24% of all pregnant women consumed alcohol occasionally, 7% had about one drink a day, 4% had more than a drink a day, 5% were occasional binge drinkers and 3.7% were regular binge drinkers in pregnancy.

Based on the estimate of midwives about 36% (± 3%) of women continue to drink in pregnancy. Most of these women are likely to be occasional drinkers. However, literature on alcohol in pregnancy does not reveal a safe amount of alcohol that can be drunk. The percentage of teenagers and young adults who were drinkers was higher than that of the adults and older adults among the midwives' clientele.

Awareness of Foetal Alcohol Syndrome, other Alcohol Related Effects and the role of alcohol during pregnancy among midwives:

Responses from all midwives who participated in the study were included in the analysis.

- 99.8% of midwives had heard about foetal alcohol syndrome and 88% about other alcohol related effects.
- 65% of midwives said that they would personally abstain from drinking any alcohol in pregnancy as against 32% who said they might drink some alcohol if they were pregnant. 3% of midwives did not answer this question.

- ❖ Personal opinions about drinking alcohol in pregnancy had a statistically significant relationship with the perception of midwives as professionals on the role of alcohol in pregnancy.
- ❖ The same was true in the case of the perception of midwives about safe types of alcohol in pregnancy, especially with beer and wine.
- ❖ Midwives who were likely to totally abstain from alcohol in their own pregnancy were also likely to perceive that alcohol had no role to play in all trimesters of pregnancy. They were also more likely to perceive that there was no safe type of alcohol in pregnancy.

Education for midwives on alcohol in pregnancy:

Education of the health professionals in New Zealand is absolutely crucial to prevent the disorders associated with drinking in pregnancy. The results of responses to questions about the importance of education approaches are shown below.

Education	N	% of Midwives who wanted education
General education for midwives on alcohol in pregnancy	432	93.5
Knowledge of how much alcohol is safe	426	90.6
Training in effective communication	419	78.8
Training to recognise early symptoms in infants exposed to alcohol	426	93.2

We wish to take this opportunity to once again thank you for your time and contribution to this study. Please contact us if you have any queries. I hope we can work in partnership to reduce the risk for harm due to *in utero* exposure to alcohol in New Zealand.

Yours Sincerely,

Sherly Mathew (Researcher) and Associate Professor Kathy Kitson (Supervisor)

Appendix 7a

Letter of Support for the Research from the Alcohol Advisory Council of New Zealand

ALCOHOL ADVISORY COUNCIL
OF NEW ZEALAND
KAUNIHERA WHAKATUPATO WAIPIRO O AOTEAROA

9 September 1999

Greetings Midwives

The Alcohol Advisory Council is committed to supporting initiatives to reduce harm associated with fetal exposure to alcohol.

ALAC funds **Fetal Alcohol New Zealand**, a trust established in 1998 to promote and guide good practice in the management of fetal alcohol syndrome and fetal alcohol effects, to provide information, advocacy and support that will assist those working with and affected by fetal alcohol syndrome and fetal alcohol effects and to work towards the prevention of fetal alcohol syndrome and fetal alcohol effects.

ALAC has also supported Professor Kathy Kitson and Sherly Mathew in the development of this study: ***Assessment of fetal alcohol syndrome and other alcohol related effects in New Zealand.***

Seeking information from you for this study recognises the central place midwives hold in New Zealand's maternity health services. We appreciate the pressures on your time and acknowledge the time involved in participating in studies such as this.

This study will make a very important contribution to our understanding of the impact of alcohol on women during pregnancy and I encourage you to support it with your responses. Your participation is particularly important.

Best wishes.

Yours sincerely

Valerie Norton

Valerie Norton
Manager research and evaluation

Ian MacEwan

Ian MacEwan
Manager treatment development

LEVEL 13, 36 CUSTOMHOUSE QUAY
PO BOX 5023, WELLINGTON, NEW ZEALAND
TELEPHONE 04 472 0997 FACSIMILE 04 473 0890

www.alcohol.org.nz

Appendix 7b

Letter of Support for the Research from Foetal Alcohol New Zealand Trust

FETAL ALCOHOL NEW ZEALAND

PO Box99 407
Newmarket
Auckland
Tel. 09-520 7037
Fax 09-520 4152
Email: fanz@ihug.co.nz

5 July 1999

Message of support for research project
"Assessment of fetal alcohol syndrome and other alcohol related effects in New Zealand".

The Fetal Alcohol New Zealand Trust (FANZ) mission statement is "Strengthening knowledge, skills and action to reduce the prevalence and harm of fetal exposure to alcohol". FANZ is supportive of this research study aimed at assessing the risk of prevalence of fetal alcohol syndrome and other alcohol-related effects in New Zealand.

Preventing FAS and ARE and reducing the harm to those who are affected cannot begin to be effectively addressed in New Zealand until we establish the likely level of risk that exists. That information will provide a platform on which to assess likely prevalence and alert those whom can influence changes. Midwives, as the most likely maternity caregiver, are in a unique position to ascertain the risk behaviours of pregnant women.

A survey in 1995 of medical practitioners (Leversha & Marks, 1995) showed that less than 50% routinely screened for alcohol use during the first anti-natal visit. It is important not only to understand the risk factors but also to ensure women are well informed prior to and during pregnancy. In this way the study itself has the potential to be a positive intervention.

Without knowledge of risk levels, FAS and ARE will likely remain the hidden disability it currently is in New Zealand, leaving many families isolated and frustrated without appropriate care. In many cases fetal alcohol affected adults, because of their own neurological disorders, are at increased risk of drinking during pregnancy thus perpetuating the cycle. Knowledge of risk factors will help in the process of breaking the inter-generational cycle and get those at higher risk, the urgent intervention and care they need.

Your participation and commitment to this research is not only desirable, it is critical.

Yours Faithfully

C Rogan

Christine Rogan
Coordinator

Appendix 8a

First Reminder Letter

Assessment of risk of Fetal Alcohol Syndrome and other Alcohol Related Effects in New Zealand

Dear Respondent,

"Let us strive together to provide the best care to the mother and the precious life within her"

We hope that you have received the questionnaire titled "Assessment of risk of Fetal Alcohol Syndrome (FAS) and Alcohol Related Effects (ARE) in New Zealand".

This study aims to obtain from midwives their perspective of drinking behaviour of pregnant women. Preventing FAS and ARE and reducing the harm to those who are affected cannot begin to be effectively addressed in New Zealand until we establish the likely level of risk that exists. Midwives, as the most likely maternity caregiver, are in a unique position to ascertain the risk behaviours of pregnant women.

As we have randomly selected only some midwives from each region, your response is of utmost importance to enable us to draw conclusions nation wide. We are very keen to include your responses in the study and we have realised that you have not yet replied, perhaps due to your busy schedule. We apologise for any inconvenience caused if this letter has crossed in the post with your completed questionnaire.

The questionnaire is designed so that all you need to do is either tick or circle an option you think is appropriate. We would appreciate if you could give it your urgent attention, so that your views will be included in the study. The number on your reply envelope will only be used for the purpose of follow-up in case of non-response and the questionnaire will be separated immediately from its envelope on receiving it. The numbered envelopes will then be used for the draw for $300. Anticipating your earliest reply and once again we assure complete anonymity and confidentiality.

The Alcohol Advisory Council of New Zealand and Fetal Alcohol New Zealand support this study.

Yours sincerely,

Sherly Mathew (Researcher) and Kathy Kitson (Associate Professor),
Institute of Food Nutrition and Human Health.

Appendix 8b

Second Reminder Letter

Assessment of risk of Fetal Alcohol Syndrome and other Alcohol Related Effects in New Zealand

Dear Respondent,

"Let us strive together to provide the best care to the mother and the precious life within her"

Recently we sent you a questionnaire titled "Assessment of risk of Fetal Alcohol Syndrome (FAS) and Alcohol Related Effects (ARE) in New Zealand". We also hope that you received our follow-up letter requesting your participation for we are very keen to include your views in the study.

This study aims to obtain from midwives their perspective of drinking behaviour of pregnant women. Preventing FAS and ARE and reducing the harm to those who are affected cannot begin to be effectively addressed in New Zealand until we establish the likely level of risk that exists. Midwives, as the most likely maternity caregiver, are in a unique position to ascertain the risk behaviours of pregnant women.

We have realised that you have not yet replied perhaps due to your busy schedule. We apologise for any inconvenience caused if this letter has crossed in the post with your completed questionnaire.

The questionnaire is designed so that all you need to do is either tick or circle an option you think is appropriate. As we have randomly selected only some midwives from each region, it is extremely important that you give the questionnaire your urgent attention, so that your views will be included in the study. We have enclosed another questionnaire that you could use in case you have misplaced the former one. We once again remind you that the numbers on your reply paid envelope is only to be used for follow-up and the questionnaire will be separated from the envelope immediately on receiving it. The numbered envelopes will then be used for the draw for $300. Anticipating your earliest reply and once again we assure anonymity and complete confidentiality.

The Alcohol Advisory Council of New Zealand and Fetal Alcohol New Zealand support this study.

Yours sincerely,

Sherly Mathew (Researcher) and Kathy Kitson (Associate Professor)
Institute of Food Nutrition and Human Health.

Appendix 9

Number of Registered Midwives in 1999

Marion McLauchlan, 08:31 AM 6/24/99 , Number of Midwives

From: Marion McLauchlan <marionm@nursingcouncil.org.nz>
To: "'S.Mathew@massey.ac.nz'" <S.Mathew@massey.ac.nz>
Subject: Number of Midwives
Date: Thu, 24 Jun 1999 08:31:51 +1000

Dear Sherly
1.The number of midwives who renewed annual practising certificates for the year 1998 - 1999 and who identified their main type of work as midwifery was 1,868.00.
2. For information on midwives who are members of the NZCOM contact www.midwives.org.nz

3. You will need to contact the NZNO for the number of midwives who are members of that organisation

Yours sincerely

Marion McLauchlan
Deputy Registrar/Midwifery Adviser
Nursing Council of New Zealand
PO Box 9644
Wellington
Ph (04) 3859589 Fx (04) 8018502

Appendix 10

Map of New Zealand Depicting the Four Major Regions


New Zealand
North Island
Northern Region
Central Region
Southern Region
South Island
Kaitaia
Kaikohe
WHANGAREI
Dargaville
Warkworth
Orewa
Helensville
North Shore
AUCKLAND
Papatoetoe
Manurewa
Papakura
Pukekohe
Thames
HAMILTON
TAURANGA
Whakatane
Tokoroa
ROTORUA
Te Kuiti
Taupo
Taumarunui
NEW PLYMOUTH
Gisborne
Wairoa
NAPIER
Hawera
HASTINGS
WANGANUI
Feilding
PALMERSTON NORTH
Dannevirke
Levin
Paraparaumu
Masterton
Motueka
Porirua
Upper Hutt
Lower Hutt
Richmond
NELSON
WELLINGTON
Westport
Blenheim
Greymouth
Hokitika
Rangiora
CHRISTCHURCH
Ashburton
Timaru
Waimate
Queenstown
Alexandra
Oamaru
Te Anau
CHATHAM ISLANDS
Gore
DUNEDIN
Balclutha
INVERCARGILL