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SELF-REPORTED ORAL HEALTH AND ACCESS TO DENTAL  
CARE AMONG PREGNANT WOMEN IN WELLINGTON

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## ABSTRACT

Pregnancy can have important effects on oral health and pregnant women are a population group requiring special attention with regard to their oral health and their babies' health. International research shows that oral health care for pregnant women has been inadequate, especially in relation to education and health promotion and there is some evidence of disparities by SES and ethnicity. Improving oral health is one of the health priorities in the New Zealand Health Strategy (Ministry of Health, 2000) and the Ministry of Health (Ministry of Health, 2006a) has recently identified a need for more information on the oral health and behaviour of pre-natal women.

The aims of this study were to gain an understanding of pregnant women's oral health care practices, access to oral health care information and use of dental care services and to identify any difference by ethnicity and socio-economic position. A self-reported questionnaire was completed by 405 pregnant women (55% response rate) who attended antenatal classes in the Wellington region. The questionnaire was broadly divided into four parts: (1) care of the teeth when the woman was not pregnant; (2) care of the teeth and diet during the pregnancy; (3) sources of oral health information during pregnancy and; (4) demographic information. Data were analysed by age, ethnicity, education and income and odds ratios (OR) and 95% confidence intervals (95%CI) were calculated using logistic regression.

The majority of women in this survey were pakeha (80.2%), compared to 19.7% „Others“ (8.8% Māori, 1.9% Pacific, 8.6% other). Most of the subjects were aged 31-35 years (34.5%), of high SES (household income and education level). Half of the women reported having regular visits to the dentist previous pregnancy while a significant percentage of women saw a dentist basically when they had problems. The usual dental hygiene habits were maintained during pregnancy. However, during pregnancy more than 60% of women reported bleeding gums. Just 32% of women went to see the dentist during pregnancy and less than half had access to oral health information related to pregnancy. „Others“ (OR 0.38, 95% CI 0.15-0.91) and low income (OR 0.27, 95% CI 0.10-0.76) groups were significantly less likely to report access to oral health information compared to pakeha and high income groups (respectively). Women who went to see the dentist during pregnancy were more likely to receive

information on dental health. However, low income women were more likely to report the need to see a dentist (OR 2.55, CI 1.08-5.99).

Information on dental health and access to oral care should be prioritised to low income women, Māori, Pacific and other ethnic groups. Little attention has previously been given to oral health for pregnant women in New Zealand and there is a need to increase awareness of the importance of this area amongst health practitioners particularly Lead Maternity Carers and Plunket and tamariki ora nurses.

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## CHAPTER 1: INTRODUCTION

Pregnancy can have an important effect on oral health (Chai & Ngeow, 1998), and pregnant women are a population group with special needs in terms of oral health care. International research shows that oral health care for pregnant women has been inadequate, especially in relation to the areas of education and health promotion with some evidence of disparities by socio-economic status (SES) and ethnicity, for example in American, (Habashneh et al., 2005), Kuwait (Honkala & Al-Ansari, 2005), British, (Hullah, Turok, Nauta, & Yoong, 2007), and Australian studies (Thomas, Middleton, & Crowther, 2008). Improving oral health is one of the New Zealand health priorities with recognition being given to the needs of particular population groups including pregnant women (Ministry of Health, 2006a).

The aims of dental health care in pregnancy are: firstly, to establish a healthy environment through adequate plaque control and diet to expectant mothers; secondly, to provide information to pregnant women about the link between dental health and birth outcomes with the intention of providing sufficient knowledge to assist women to make healthy choices and; finally, to improve access to dental health care for all women. This has the potential to lead to better oral health outcomes, not only for the women themselves, but also for their families since caregivers are responsible for introducing good habits to their children, including eating a healthy diet and maintaining a sound level of oral hygiene (Berkowitz, 2003a). According to the Ministry of Health (Ministry of Health, 2006a), high levels of dental caries in childhood predict greater oral health disease levels in adulthood, even when other factors, such as hygiene and diet are taken into account. In addition, research has also shown that periodontal disease in pregnant women can affect pregnancy outcomes (Boggess et al., 2003; Jeffcoat et al., 2001; Lopez, Smith, & Gutierrez, 2002; Offenbacher et al., 2006).

There is some evidence of inequalities within socio-economic and ethnic groups in New Zealand in relation to access to oral health service and oral health information. According to the Ministry of Health, Māori, Pacific Islands and lower socio-economic groups are more likely to have poorer oral health compared to other population groups (Ministry of Health, 2006a).

Promoting oral health through education and preventive measures has been shown to improve oral health (Brambilla et al., 1998; Gunay, Dmoch-Bockhorn, Gunay, & Geurtsen, 1998; Zanata et al., 2003). Preventive measures such as exposure to fluoridation, prophylaxis, hygiene and dietary advice are also important in the control of conditions such as tooth decay and periodontal disease.

The New Zealand Government is aware of the necessity to integrate oral health into primary health services, through the involvement of a wider range of health professionals including maternity care providers (Ministry of Health, 2008a). The inclusion of oral health as a topic in antenatal care may be one way of promoting women's and baby's health and preventing potentially unfavourable outcomes for both.

The aim of this study is to gain an understanding of pregnant women's oral health care practices, access to oral health care information and use of dental care services. The objectives are: (1) to identify the sources and content of information about oral health available to pregnant women; (2) to assess women's usual oral health care practices and to document how these may change or differ during pregnancy and (3) to identify if oral health care and access to dental services differ among pregnant women by ethnicity and socio-economic position.

Chapter Two presents the literature review which is divided into two parts. The first section will cover the importance of oral health for pregnant women. This includes the direct and indirect implications of pregnancy on two key areas associated with oral health problems, periodontal disease and dental decay. Studies of the relationship between periodontal disease and low weight/preterm babies and preeclampsia are presented along with studies relating to the influence and contribution women make to the development of early childhood patterns of oral care. Literature on the implications of diet and the oral care practices and behaviour of pregnant women are also reviewed. The second section of the literature review seeks to provide an overview of the oral health care system in New Zealand and relevant studies that have been conducted here including work relating to inequalities in oral health by ethnicity and socio-economic status, and the importance of understanding the practices and behaviour of pregnant women which has implications both for their oral health and that of their child.

Chapter Three presents the methods of the study. The selection criteria used for participants and the antenatal education centres, are described, together with information about the data collection including the collection period, the sample size and the procedures employed. How the questionnaire was developed and information on the demographic indicators used in the study, including the socio-economic indicators and definitions of ethnicity, are also provided. The chapter concludes with a section on the data analyses and the process undertaken for ethics approval of the study.

The results section is presented in Chapter Four beginning with the sample characteristics response rates and the demographic characteristics of the study population. The results are presented by age group, ethnic group, education level and income group. Finally, the results of the multivariable logistic analyse are presented.

Chapter Five outlines the limitations and strengths of the study and discusses the findings. This section is presented in three main parts addressing oral health care and practices before and during pregnancy; the source and content of oral health information available to pregnant women and; the findings in relation to differences by SES, age and ethnicity, in access to oral health care. Finally, in Chapter Six, I outline the conclusions of the study and make recommendations for further research related to oral health in pregnant woman.

## **CHAPTER 2: LITERATURE REVIEW**

*“Oral health means more than good teeth; it is integral to general health and essential for well-being” (World Health Organization, 2003, p.3).*

The first part of this chapter is focussed on the international literature examining the importance of oral health for pregnant women. The second part of the chapter presents the New Zealand literature, relating to currently available data on the oral health status of the population. This includes information on the dental and oral health system as well as available information on inequalities in oral health care status in New Zealand.

### **2.1 Importance of oral health for pregnant women**

#### **2.1.1 Periodontal disease**

Periodontal disease is a significant cause of tooth loss and can be divided into gingivitis and periodontitis. Gingivitis is an inflammation of the soft tissues surrounding a tooth or gingiva. The process of gingival enlargement, however, helps to create a subgingival flora, and gradually apical advancement of sub-gingival plaque occurs. As soon as the destructive process extends to affect the alveolar bone and fibre attachment of the root surface, periodontitis is said to have developed. Thus, periodontitis is characterised by loss of connective tissue attachment. Chronic gingivitis is a condition that can be largely reversed by plaque control. On the other hand, the loss of fibre attachment is virtually irreversible (J. Murray, Nunn, & Steele, 2003).

Gingivitis and periodontitis are relatively common among pregnant women due to hormonal changes which facilitate an accentuated response to plaque (Chai & Ngeow, 1998). The prevalence of periodontal disease varies considerably in pregnant women with an estimated 30-100% prevalence of gingivitis and a 5-20% prevalence of periodontitis (Offenbacher et al., 2006). A Danish study (Christensen, Jeppe-Jensen, & Petersen, 2003) looked at the self-

assessment of gingival conditions in 1,935 pregnant women and found that 30% of the respondents reported one or more gingival symptoms during pregnancy such as bleeding gums when brushing, spontaneous bleeding from the gums, gum pain, and change in the colour of the gums/swollen gums. However, studies on the validity of self-reported gingival health have shown some underestimation of disease experience when compared to clinical evaluations where many people may not realise that gingival bleeding is a sign of inflammation (Gilbert & Nuttall, 1999).

Pregnancy does not cause gingivitis, but may aggravate pre-existing disease. The gingiva becomes dark red and swollen, and are more prone to bleeding. Women with pregnancy gingivitis may develop localised gingival enlargements (granuloma gravidico). The gingival changes usually resolve within a few months of delivery if local irritants are eliminated (Laine, 2002). Some studies also show that an increase of tooth mobility can occur during pregnancy due to alterations in the periodontal membrane (Rateitschak, 2006). By far the most important way of maintaining periodontal health is regular, thorough, physical removal of dental plaque with a satisfactory toothbrush (Rugg-Gunn & Hackett, 1993).

### ***Periodontal disease and low weight and preterm birth***

According to international research, periodontal disease also has the potential to affect pregnancy outcomes. It has been demonstrated that periodontal pathogens within dental plaque are capable of invading host periodontal tissues, resulting in recurrent bacteraemia, which spread to distant tissues and activate the hepatic acute phase response, especially during periods of disease progression (Offenbacher et al., 2006). The biological mechanism linking periodontal infection and preterm birth can begin with endotoxins resulting from gram-negative bacterial infections, which stimulate the production of cytokines and prostaglandins. It is known that prostaglandins and certain cytokines (interleukin-1b, interleukin-6 and tumor necrosis factor-alfa), in sufficient quantities, may stimulate labour (Jeffcoat et al., 2001).

Offenbacher and Beck (1996) were the first to report a potential association between oral infection and preterm low birthweight infancy. Preterm and low weight infancy is considered to be when birthweight is lower than 2,500g and labour before 37 weeks. This small case-

control study (124 women) found that women who had low birthweight infants as a consequence of either preterm labour or premature rupture of membranes, tended to have more severe periodontal disease than mothers with normal birthweight infants ( $P < 0.05$ ) (Offenbacher & Beck, 1996).

Jeffcoat et al. (2001) studied 1,313 pregnant women and the relationship between periodontal disease and preterm birth, adjusting for a range of risk factors including smoking, parity, race and maternal age. The study found that pre-existing periodontal disease in the second trimester of pregnancy increased the risk of preterm birth. Patients with severe or generalised periodontal disease had adjusted odds ratios (OR) of 4.45 with 95% confidence interval (95% CI) 2.16-9.18 for preterm delivery (before 37 weeks). The OR increased with increasing prematurity (OR 5.28, 95%CI 2.05-13.60) before 35 weeks, and OR 7.07, (95% CI 1.70-27.4) before 32 weeks (Jeffcoat et al., 2001).

Mitchell-Lewis et al (2001) cohort study examined 213 women for periodontal status (including dental plaque, calculus, bleeding on probing, and probing deep). In relation to pregnancy outcomes, a group of women receiving dental intervention prior to delivery were compared to a group who received periodontal intervention after delivery. The findings suggest that women who received basic periodontal therapy during pregnancy were at a substantially reduced risk of preterm, low birthweight babies. Pre-term low birthweight infants were born to 18.9% of the women who did not receive periodontal intervention, and 13.5% of those who received treatment, although this reduction did not reach statistical significance (Mitchell-Lewis, Engebretson, Chen, Lamster, & Papapanou, 2001).

Another cohort study from Chile (Lopez et al., 2002) investigated whether the women who had gingivitis and received treatment before birth ( $n=406$ ) reduced the risk of preterm low-weight children comparing to women who had periodontal ( $n=233$ ) disease and were treated after delivery. The study concluded that periodontal disease is an independent risk factor for preterm birth and low birth weight (relative risk (RR) 3.5, 95% CI: 1.7-7.3). Another American study also reported an independent effect of periodontitis on adverse pregnancy outcomes after adjustment for important risk factors. In this sample of postpartum women (83 women cases and 120 women controls) with relatively low levels of periodontal disease, this study found a significantly increased loss of periodontal tissue support in women who were delivered preterm (OR 2.75, 95% CI: 1.01-7.54) (Jarjoura et al., 2004).

However, Moore et al. (2004) in a prospective study (UK) of 3,738 subjects found no association with either preterm birth or low birthweight and periodontal disease in this population (Moore et al., 2004). Another British study by Davenport et al. (2002) examined 236 cases and 507 control mothers who gave birth at Royal London Hospital. They also found no evidence that maternal periodontal disease is associated with a reduction of premature low-birth-weight (OR 0.83, 95% CI: 0.68-1.00) (Davenport et al., 2002).

Recently, Offenbacher et al. (2006) examined the role of potential confounders as established risk factors for preterm and low-birthweight conditions. They developed a multidisciplinary, longitudinal examination of maternal oral health and pregnancy outcomes in 1,020 women who received an antepartum and postpartum examination. They controlled for previous preterm deliveries, race, smoking, social domain variables, and other infections, in their adjusted models and found that maternal periodontal disease identified either early in pregnancy or during pregnancy, was a risk factor for preterm birth (RR 1.6, 95% CI: 1.1-2.3), independent of other risk factors (Offenbacher et al., 2006).

### ***Periodontal disease and preeclampsia***

Preeclampsia is a common hypertensive disorder of pregnancy, affecting 5-10% of pregnancies and contributing significantly to maternal and peri-natal morbidity and mortality. A prospective cohort study of 1,115 pregnant women in the USA concluded that maternal clinical periodontal disease at delivery is associated with an increased risk for the development of preeclampsia, independent of the effects of maternal age, race, smoking, gestational age at delivery, and insurance status. In addition, clinically active disease, as measured by presence of periodontal disease progression, is also associated with an increased risk for preeclampsia (Boggess et al., 2003).

Another systematic review of case-studies and cohort studies evaluated the association between periodontal disease and preeclampsia. A meta-analysis of six studies found an increased risk of preeclampsia in women with compared to women without, periodontal disease (OR 1.76, 95% CI: 1.43 – 2.18) (Vergnes, 2008). It is yet to be determined if the relationship between periodontal disease and preeclampsia is casual or simply associative.



## 2.1.2 Dental caries

Dental caries are an infectious and transmissible disease, and despite having a low mortality rate, are an important dental disease in childhood and remain the main cause of loss of teeth in adults (Rugg-Gunn & Hackett, 1993). Dental caries have an important impact on self-esteem, eating ability, nutrition, speech and health. In addition, it is a costly disease, in terms of treatment, because it is progressive and requires ongoing care throughout the lifetime (J. Murray et al., 2003).

The effect of pregnancy on the initiation and progression of caries is not clear. Studies suggest that it is mainly the environment of the tooth that is affected. The number of salivary cariogenic<sup>1</sup> microorganisms may increase in pregnancy, concurrently with a decrease in salivary pH and buffer effect (Laine, 2002) together with reduced plaque control. Additionally, gastric acids associated with morning sickness may lead to enamel demineralisation along with different eating patterns, such as an increase in the frequency of carbohydrates and/or a craving for more cariogenic foods (Chai & Ngeow, 1998).

A range of risk factors have been identified as being important in contributing to an individual's susceptibility to carious lesion formation and progression including xerostomia (low salivary flow), low buffering capacity and frequent snacking. Other social factors such as lower socio-economic status, non-regular dental care and living in an area which does not have fluoridated water together with use of non-fluoride toothpaste also play a role. Clinically, the person may be more likely to present with new lesions, premature extractions, anterior caries, multiple restorations, history of repeated restorations, no fissure sealants, multiband orthodontics and partial dentures (J. Murray et al., 2003).

### *Early Childhood Caries*

Another aspect of interest in pregnant women's oral health and awareness about this is related to early childhood caries. Early childhood caries (ECC) is a virulent form of dental caries that can destroy the primary dentition of toddlers and preschool children. The prevalence varies from population to population, however disadvantaged children, regardless of race, ethnicity

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<sup>1</sup> Cariogenic is an adjective used to refer to those organisms which cause tooth decay.

or culture, are most vulnerable (Berkowitz, 2003a). Studies have shown that infants acquire the microorganism (*Streptococcus mutans*) involved in the caries process from their mothers and only after the eruption of the primary teeth (Berkowitz, 2003b). Bacterial transmission is possible, for example, directly through kissing or indirectly, by objects such as spoons, pacifiers, and teats, if they have previously been contaminated with saliva from the mother, the father or other persons (Gunay et al., 1998). Early infection with *Streptococcus mutans* is a significant risk factor for future development of dental caries. If infant infection is delayed, the prevalence of dental caries may be reduced (Berkowitz, 2003a). Studies also show a positive correlation between a mother and child's oral health, especially related to dental hygiene and diet. Inappropriate diet and poor oral hygiene habits in the mother, increases the likelihood that their children will have similar physical and behaviour patterns (Fritscher, Araujo, & Figueiredo, 1998).

Diet plays a critical role in the clinical expression of caries infection. Children with early childhood caries tend to have more frequent and prolonged exposure to sugars from drinks, such as fruit juices or infant formulas. This type of feeding behaviour during sleep intensifies the risk of caries, as oral clearance and salivary flow rate are decreased during sleep (Berkowitz, 2003b). Studies show a positive relationship between the use of reservoir feeders and bottles as comforters and dental caries in young children. The dental profession rightly encourages breast-feeding, as breast-fed babies tend to have lower dental caries than bottle-fed babies, probably because of the lack of opportunity to add sugar to a bottle (Rugg-Gunn & Hackett, 1993). Breastfeeding also offers the ideal stimulus for the physiological development of both the muscular and skeletal components of the oro-facial complex. This seems to have a protective effect on the development of altered occlusion in deciduous dentition such as posterior cross-bite (Viggiano, Fasano, Monaco, & Strohmenger, 2007). Furthermore, dietary patterns begin to be established during the first year of life, and patterns of behaviour learnt during this time are more resistant to subsequent change. Thus, it is essential that health education starts with pregnant and nursing women. During weaning, it is especially important to develop good dietary habits, including limited consumption of sugar (Rugg-Gunn & Hackett, 1993).

Some studies worldwide have been investigating whether preventive measures regarding early childhood caries have an impact on the child's oral health. An Italian random control trial (Brambilla et al., 1998), evaluated whether the reduction of salivary *Streptococcus*

*mutans* levels in a sample of highly infected women via a minimal preventive regimen during pregnancy could influence the mother-to-child transmission of this organism. The preventive programme consisted of dietary counselling, one session of professional prophylaxis and oral hygiene instructions, and use of fluoride and chlorhexidine mouthwash. The fluoride and chlorhexidine treatment regime significantly reduced, by approximately six times, the salivary *Streptococcus mutans* level in the women from the experimental group. Thirty-four percent lower rates of salivary *Streptococcus mutans* were also found in the children from the experimental group compared to those in the control group.

Another prospective study from Germany (Gunay et al., 1998) used a preventive oral health programme in pregnant women and their children. The study was divided into three parts, first, starting during pregnancy (n=86), second, mothers and babies between 0-3 years (n=54 pairs), and third, mothers and pre-school children between 4-6 years (47 mothers and children participated). Mothers and children were examined and the salivary level of *streptococcus mutans* was collected. The preventive treatment consisted of oral hygiene instructions, professional tooth cleaning, topical fluoride varnish application, chlorhexidine mouth rinse, and dietary counselling. The control group consisted of 65 children with 3 years old and 45 children with 4 year old from various kindergartens. Mothers from the treatment group showed a significant improvement in oral health and a reduction of *Streptococcus mutans* colonization during the study. The study also showed that all the 3-year-old children in the treatment group had caries-free primary dentition, a salivary *streptococcus mutans* score of 0, and excellent dental hygiene. In the third phase, only 8.5% of the children in the treatment group had initial caries. The study showed that preventive dental care maintains/improves the oral health of pregnant women and creates good conditions for lasting oral health in children.

A Brazilian study (Zanata et al., 2003) investigated a group of young pregnant women (n=81), mostly teenagers, of low socio-economic and education level, and followed them until their infants were 2 years old. The control and experimental group of expectant mothers received clinical examination and an educational/preventive approach with counselling about diet and hygiene instructions. Both groups received primary care intervention (such as fillings) and the experimental group also received antimicrobial solution and topical fluoride. The groups were recalled at 6, 12 and 24 months after delivery with the same interventions repeated each time. Caries in the control group (33.3%) were higher than the experimental group (14.7%) when children were 2 years old.

### 2.1.3 Diet

Dietary factors are an important aspect related to oral health. A key dietary component has been the use of fluoride which has played a pivotal role in oral health promotion over the past 50 years. Fluoride promotes remineralisation and inhibits demineralisation of dental enamel during the caries process. Exposure to fluoride is important in preventing and controlling dental caries (Clarkson & Mcloughlin, 2000) and is most commonly sourced through drinking tap water. According to New Zealand Food and Nutrition Guidelines for pregnant and breastfeeding women, drinking fluoridated water is safe for pregnant women and for those not living in an area that has a fluoridated water supply, use of fluoride toothpaste for preventing tooth decay is recommended (Ministry of Health, 2006b). As a health promotion intervention in which there is no behavioural change component required, water fluoridation for the control of caries is very effective (J. Murray et al., 2003).

The arrangement of teeth in the mouth, their eruption time, and resistance to decay is influenced more by heredity factors than nutrition (Fitzsimons, Dwyer, Palmer, & Boyd, 1998). Diet has a much greater effect locally, in the mouth, on erupted teeth, than it does in the pre-eruptive stage, when the teeth are still forming (Rugg-Gunn & Hackett, 1993). That is because the presence of food in the mouth is essential for formation of dental caries. Food acts as a substrate for plaque micro-organisms. Diet influences the composition of plaque flora considerably. *Streptococcus mutans* are much more numerous when diets are rich in sugar and these organisms are particularly good at metabolizing sugars to acids. The relationship between dietary sugars and the development of dental caries has been investigated in a number of studies. No sugar has been shown to be more cariogenic than sucrose and, since it is the most widely available dietary sugar, it is not surprising that it has been the subject of greatest criticism (J. Murray et al., 2003; Rugg-Gunn & Hackett, 1993).

There is evidence to show that both the frequency of intake of sugars and sugar-rich foods and drinks, and the total amount of sugars consumed, are related to dental caries (J. Murray et al., 2003). There is also evidence that these two variables are strongly associated, thus, efforts to control one are likely to have an effect on the other.

### *Pregnancy and diet*

Energy requirements increase in pregnancy by about 12% (Ministry of Health, 2006b). This is because of the increase in maternal body weight, which is, on average 10-15% together with the energy costs of the growing foetus, and maternal physiological changes in pregnancy. A woman's dietary pattern may change little from the pre-pregnant or pre-breastfeeding diet, apart from an overall increase in intake, especially earlier in pregnancy. Some pregnant women also experience cravings for salty and sweet foods. A Wellington study (Benny, Benny, & Sin, 1991) on nutrition in pregnancy found that overall energy intake was similar between women, however there were variations in intake between the different ethnic groups and also considerable individual variation within the groups. For example, Pacific Island women consumed significantly more starch than Māori or pakeha women, and sugar consumption in Māori women was greater than for those of the other two ethnic groups.

Inadequate diets before pregnancy are likely to have consequences on the health of the mother and baby if these practices are continued during pregnancy and the breastfeeding period (Ministry of Health, 2006b). Recent surveys have shown that Māori and Pacific women are more likely than New Zealand European/Other women to have inadequate nutrient intakes including diets high in fat, sugar and salt (Ministry of Health, 2006b). One New Zealand study (Clissold, Hopkins, & Seddon, 1991) used a retrospective questionnaire completed for 183 women in the first few days postpartum to examine lifestyle changes during pregnancy. In this sample of women, mean pre-pregnancy dietary habits were found to be generally good with 34% of women reporting dietary changes during pregnancy. All food items showed an increase in frequency of consumption, and most increases were statistically significant. Women who changed their food consumption and dietary habits during pregnancy were significantly more educated than those who did not. Concern for their baby's and their own health were the main reasons given for change of behaviour during pregnancy, for example, in relation to smoking and alcohol consumption.

It has been suggested that pregnant and breastfeeding women are often receptive to information and very amenable to changing their lifestyle habits (Stevens, Lida, & Ingersoll, 2007). Because the nutrition recommendations during these times are similar to those for the adult population, it is an ideal opportunity to disseminate advice about good food choices, which may also have a positive influence on the family's diet (Ministry of Health, 2006b).

However, dietary advice is problematic since diet is extremely complex and generally involves an ever-changing combination of foods and behaviour. Giving dietary advice successfully therefore depends on far more than providing knowledge; it also requires understanding of the role of food in society and its significance for the individual. To change eating habits is one of the most difficult changes in behaviour to achieve, because of the all-pervasive nature of food (Rugg-Gunn & Hackett, 1993).

The relationship between nutrition and dental health is often overlooked during pregnancy, infancy, and early childhood for two reasons: most dietitians and paediatricians lack the training to make preventive or therapeutic oral health recommendations, and dental professionals may lack the dietary counselling skills to assess and provide appropriate nutrition interventions (Fitzsimons et al., 1998). Essentially, the main dietary aspect of dental health education is based on two key messages, reduce sugar consumption and drink fluoridated water. It is also exceptionally difficult to test the importance of just one single dietary item on dental caries because its effect is likely to go undetected amongst the many other sugar-containing foods and drinks which may be consumed (Rugg-Gunn & Hackett, 1993).

In general, the New Zealand food and nutrition guidelines recommend pregnant women: maintain a healthy body weight by eating well and by daily physical activity; eat well, include a variety of nutrients foods from each of the major food groups each day; eat plenty of vegetables and fruit, breads and cereals, preferably wholegrain, have milk and milk products in the diet, preferably reduced or low-fat options, include lean meat, poultry, seafood, eggs, nuts, seeds or legumes; prepare foods or choose pre-prepared foods, drinks and snacks with minimal added fat, especially saturated fat, that are low in salt and sugar; drink plenty especially water and; don't drink alcohol during pregnancy (Ministry of Health, 2006b).

## **2.1.4 Oral care**

### ***Plaque control***

Dental plaque is the non-mineralized, bacterial aggregation on the teeth and other solid structures in the mouth, which is so tenaciously adherent to the surfaces that it resists removal

by salivary flow or a gentle spray of water across its surface. Dental plaque is the most important risk factor for dental caries, because caries is the result of metabolic activities in this biofilm, and unless it is present, caries does not occur, regardless of any other factors. Dental plaque also occupies the central role as the major aetiological factor in the pathogenesis of periodontal disease (J. Murray et al., 2003). For this reason, control of plaque is a very important consideration in dentistry.

Furthermore, the objective of dental hygiene education is to produce a change in behaviour, which will result in a reduction of plaque accumulation, sufficient, if possible, to prevent the initiation and progression of dental caries and periodontal disease, and to make the patient as independent as possible of professional support (J. Murray et al., 2003). However, a dental hygiene pattern can be influenced by a number of variables. A study using a self-reported oral hygiene habits and dental attendance survey with 650 pregnant women in Kuwait show that women with higher education brush their teeth more compared to women with lower education levels (OR 1.46 and 95%CI 0.81-2.63). Women who had visited a dentist during the last six months (OR 1.57 and 95%CI 1.00-2.59) and those who had received tooth brushing instructions (OR 1.47 and 95%CI 0.88-2.46) were more likely to brush their teeth more than once a day compared with their peers (Honkala & Al-Ansari, 2005).

Preventive oral health practices can minimise the risk of tooth loss. This includes daily brushing with a soft toothbrush, flossing and using fluoride toothpaste (Fitzsimons et al., 1998). The selection of one or more adjunctive aids for teeth cleaning should be based upon local anatomy and the manual dexterity and compliance of the patient (J. Murray et al., 2003). In the case of a high level of cariogenic bacteria detected in the mouth, antibacterial therapy can also be used (Featherstone, 2000). Chlorhexidine is the most effective method of chemical plaque control. It has been shown to reduce the salivary bacterial count by 85-95% and, essentially, to prevent plaque accumulation and gingivitis development in people who, for some reason, are unable to brush their teeth (J. Murray et al., 2003).

### ***Tooth erosion***

Nausea and vomiting are among the most frequent, the most characteristic, and perhaps the most troublesome, symptoms of early pregnancy. Almost three-quarters of all women suffer from nausea, and for 1 in 10 women, the condition persists beyond the first trimester (E.

Murray et al., 2000). Overall, the prognosis for women experiencing mild to moderate symptoms is very good, and can favour a good pregnancy outcome because it may be that women increase their nutrient intake to alleviate symptoms, improve the quality of their diet, reduce energy expenditure or physiologically adapt to a reduced intake in a way that optimises placental growth or nutrient partitioning, which in turn, has positive benefits on foetal growth (Ministry of Health, 2006b).

However, morning sickness may also be associated with dental erosion. Dental erosion is defined as the progressive loss of enamel and dentine resulting from chemical attack, usually by acids other than those produced by plaque bacteria (Rugg-Gunn & Hackett, 1993). If reflux or vomiting occurs the advice is to rinse the mouth with just water, or water and sodium bicarbonate, or fluoride mouth rinses which help to neutralize the oral environment. People who have vomited often rush off to clean their teeth however this should be advised against since has been shown that if teeth have been subjected to an acid attack and are then brushed, up to five times as much enamel is removed (J. Murray et al., 2003).

### ***Visiting the dentist***

Controversy always surrounds the question of whether women should visit the dentist while pregnant. A recent American clinical trial study (Michalowicz et al., 2008) discussed safety outcomes, comparing rates of serious adverse events (such as spontaneous abortions/stillbirths, foetal/congenital anomalies and preterm deliveries) when women received dental treatment. The study found that dental treatment and use of topical and local anaesthetics are safe in pregnant women at 13 to 21 weeks" gestation.

The British Dental Association (1998), Australian Dental Association (2005) and American Dental Association (2006) agree that it is safe to have routine dental care during pregnancy, especially during the second trimester, when women normally experience less nausea and tiredness. However, extensive treatment should be postponed until after the baby is born for the comfort of the mother and safety of the foetus. The first trimester is the period when the foetus is more susceptible to environmental influences. In the last half of the third trimester, the women may be less comfortable sitting in the dental chair and there is a possibility that



supine hypotensive syndrome<sup>2</sup> may occur. On the other hand, emergency treatment should be carried out because the management of pain and elimination of infection are priorities for the woman's and baby's wellbeing (American Dental Association, 2006; Australian Dental Association, 2005; British Dental Association, 1998). The New Zealand Dental Association (2008) also advises pregnant women to visit dental health professionals during pregnancy. They suggest that pregnant women would benefit from more frequent professional cleaning during the second trimester or early third trimester of pregnancy with the removal of plaque and irritants that contribute to gingival problems (New Zealand Dental Association, 2008).

Further controversy surrounds dental procedures such as x-rays. Radiation exposure in these situations is generally extremely low, but precautions should be taken to minimize any unnecessary exposure and to maximise the effectiveness of the procedure (by using high speed film, filtration and proper collimation) and protective abdominal and thyroid shielding are recommended (British Dental Association, 1998). When general anaesthesia is necessary or there is uncertainty about the prescription of medication, the patient's obstetrician should be consulted. In summary, the most important object in planning dental treatment for the pregnant woman is to establish a healthy oral environment and to obtain optimum oral hygiene levels (American Dental Association, 2006).

Pregnancy is the time that conscientious approaches to preventive oral care should be increased. Women who are planning a pregnancy should see their dentist before becoming pregnant to get any necessary dental treatment completed. If a pregnant woman has not received dental care, health care professionals should recommend that she visit her dentist during the first trimester of pregnancy for assessment of oral health problems and preventive counselling (Fitzsimons et al., 1998).

Prevention has been proved as the best approach. A New Zealand cohort study (Thomson, 2001) examined the association between regular dental service usage and oral health among 26-years old adults. The study concluded that visiting the dentist for routine check-ups was associated with better long-term oral-health consequences compared to going only when there was a problem. Another qualitative study with Native American mothers and caregivers

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<sup>2</sup> Supine Hypotensive Syndrome occurs when in a semi reclining or supine position the gravid uterus compresses great vessels, particularly the inferior vena cava causing maternal hypotension, decrease cardiac output and eventually loss of consciousness.

emphasised that “*emergency care often results in negative experiences*” (Weinstein, Troyer, Jacobi, & Maccasin, 1999, p.124). Not only does pain control tend to be less effective in such situations, but patients have often got to the stage of being very uncomfortable (due to pain) prior to emergency treatment. Negative treatment experiences reinforce fear and lead to avoidance. Paradoxically, avoidance may then result in the need for additional dental care in both the short and long term (Weinstein, Troyer, Jacobi, & Moccasin, 1999).

A number of international studies have investigated, through self-reported surveys, the oral hygiene habits, dental attendance and attitudes to dentistry, of pregnant women (Gaffield, Gilbert, Malvitz, & Romaguera, 2001; Habashneh et al., 2005; Honkala & Al-Ansari, 2005; Lydon-Rochelle, Krakowiak, Hujoel, & Peters, 2004; Ressler-Maerlender, Krishna, & Robosin, 2005; Thomas et al., 2008). These studies have been useful in providing more information about pregnant women’s oral health status and factors related to access to oral health information and care. A number of studies suggest that the rate of dental attendance during pregnancy is still low in many countries (Gaffield et al., 2001; Habashneh et al., 2005; Lydon-Rochelle et al., 2004; Ressler-Maerlender et al., 2005; Thomas et al., 2008). In one study conducted in the UK where dental care is free throughout pregnancy and for 12 months after birth, only 32% of women (n=206 participants) visited a dentist antenatally (Hullah et al, 2007). Mothers from a lower social class were more likely to be non-frequent attenders for dental care and just 20% of these women reported that pregnancy had changed their attitude to dental care (Hullah et al., 2007).

Habashneh’s (2005) study of 625 women who had just given birth reported that approximately half of the mothers had visited the dentist during their pregnancy. Factors relating to having a dental visit during pregnancy included: being married, use of inter-proximal cleaning aids, and visiting the dentist every 6-12 months when not pregnant. Having dental insurance and being aware of the possible connection between oral health and pregnancy outcomes were also associated with an increased frequency of dental visits in this population of women (Habashneh et al., 2005).

In the United States, 31 states and New York City, are currently conducting the Pregnancy Risk Assessment Monitoring System (PRAMS) survey that seeks to understand women’s knowledge and attitudes regarding oral health and dental visits during pregnancy. Sample sizes are representative of all women who gave birth in each state that year. The frequency of

dental visits by pregnant women differs in each state, ranging from 23% -35%, but the results showed that older, married, white and primiparous women with higher household incomes, higher educational levels and insurance cover were more likely to go to the dentist during pregnancy (Gaffield et al., 2001; Lydon-Rochelle et al., 2004; Ressler-Maerlender et al., 2005).

In a recent study in Australia (Thomas et al., 2008), 388 women who gave birth at the Women's and Children's Hospital in Adelaide responded to a questionnaire about dental hygiene, their dental health knowledge, oral health experiences and self-care practices. Women with less education and lower socio-economic status were more likely to be at higher risk of poor periodontal health and were less knowledgeable about oral health and dental health than women from higher educational and socio-economic backgrounds.

## **2.2 Public health perspectives**

### *Oral health in New Zealand*

Improving oral health is one of the 13 priorities of the New Zealand Health Strategy (Ministry of Health, 2000) and one of the 12 priorities of the Māori Health Strategy (Ministry of Health, 2002). According to the Ministry of Health (2006a), there is a need to integrate a variety of services and health professionals to promote, to improve and to maintain oral health.

For this purpose, the Ministry of Health has developed a strategic document that targets priority groups and key action areas to address disparities in oral health (Ministry of Health, 2006a). The goals of this document emphasise prevention and early intervention with oral health integrated into general health frameworks. To implement these goals, the government encourages activities that will start at with the newborn, with oral health issues and oral hygiene education being provided to parents through linkage with providers of primary care. Promoting oral health in childhood will bring benefits, both by creating a healthy environment and encouraging good oral health practices that will persist throughout the individual's lifetime (Ministry of Health, 2006a). Thus, oral health care should ideally start from the time of pregnancy for woman, with the idea that good oral health care will consequently be passed on to their newborn infants and children.

Very little information is available specifically about pregnant women's oral health in New Zealand. According to the Oral Health Forum Proceedings Review (Dental Council of New Zealand, New Zealand Dental Association, & University, 2000), oral health data should be collected because there is a need to monitor trends in oral health and disease and to identify the key oral health issues currently, in order to plan for and allocate oral health care resources in the future. In addition, this data would assist in the evaluation of interventions, and could be used to estimate the population's treatment needs and, finally, to provide public visibility and improve promotion more generally of the importance of oral health issues.

Two national level surveys have been conducted in New Zealand. The first was the Survey of Adult Health in 1976 (Cutress, Hunter, & Hoskins, 1983) and the second, the Survey of Oral Health Outcomes in 1988 (Hunter, Kirk, & Liefde, 1992) . These surveys suggested a tendency towards a decrease in dental caries generally, but this decrease did not occur for all population groups. The dentally disadvantaged sections of the population, identified by Jamieson and Thomson (2002), are: people in the older age groups; ethnic minorities and low SES groups.

To update the status of oral health in New Zealand, the Ministry of Health has commenced another national survey "2008 New Zealand Oral Health Survey" which will collect information "*on the oral health status, beliefs, attitudes, knowledge and practices of children, adults and older adults in New Zealand*" (Ministry of Health, 2008b, p.1). This survey consists of a sample of 6000 adults and 2400 children completing both an interview and a simple dental examination. The New Zealand Oral Health Survey seeks to "*assess the oral health of the population; monitor the use of oral health services; develop oral health policies, programmes and services that better meet the needs of New Zealanders; and conduct additional research*" Ministry of Health, 2008b, p. 2).

### ***The New Zealand oral health care system***

In the New Zealand dental care system, fully-funded basic dental services are provided for children (2.5 to 12 years old) by the School Dental Service and for teenagers (13 years to 18 years old) by private practice dentists through the General Dental Benefits (GDB) (Thomson, 2001). Private practitioners provide most of the dental care for adults and public programs for adults are limited. Dental care assistance for adults is offered by Work and Income New

Zealand. For people receiving welfare assistance, it is offered to a maximum value of \$300 per year for emergency dental treatment. Other assistance available for adults is through the Hospital Outpatient Dental Service which offers basic treatment for low income adults who have a community services card (Thomson, 2001). The Accident Compensation Corporation (ACC) administers a scheme for injured people requiring oral health care as well (Thomson, 2001). Overall, state funding accounts for about 20% of the total cost of dental care (Hunter et al., 1992).

According to Thomson (2001) there have been two critical transition points in the dental care system in New Zealand. The first was the transfer from the School Dental Service to care under the GDB Scheme, which has resulted in a significant drop in the use of the school dental service for teenagers. The second has occurred in the period when teenagers move from the GDB scheme to the adult dental care system with the majority of adults becoming “episodic” users that is, only going to a dentist when they have a problem. These “episodic” users tend to present with poorer dental health in comparison with “routine” users who generally have better, long term, oral health status (Thomson, 2001). One study using a self-reported scale of dental health (Dental Neglect Scale<sup>3</sup>) in a Dunedin population showed that the poorest dental health was among low occupational groups. The study found that most participants were infrequent users of dental services and attended for symptom-related reasons; received their last dental care from a public dental service; had poor self-rated dental care and; reported poor oral self-care (Jamieson & Thomson, 2002).

The latest data on oral health comes from the New Zealand Health survey 2006/2007 (Ministry of Health, 2008c). This is the fourth national population-based health survey carried out by the Ministry of Health. It collected information on the population’s oral health that is not available through health system records. The participants (12,488 adults aged 15 years and over) were asked questions related to access to dental care services. The results showed that half of the participants had visited an oral health care worker in the previous 12 months and 18 % had visited an oral health care worker more than one year but less than two years previously. Pacific, Māori and Asian ethnic groups were significantly more likely to visit an oral health care worker only when they had toothache. The main reason for not seeing a dentist when needed was cost, following by an inability to get an appointment soon enough

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<sup>3</sup> Dental Neglect Scale uses self-reported oral health status including how oral health impacts on life quality.

or at a suitable time. Almost half of the adults surveyed had had one or more teeth removed due to decay, an abscess, infection or gum disease, with older adults and Māori and Pacific people being much more likely to have a tooth removed. The results highlighted inequalities in dental health between socio-economic and ethnic groups in New Zealand (Ministry of Health, 2008c).

### ***Inequalities in health***

According to World Health Organization (2003), reducing risks to health will help to provide sustainable development and consequently reduce inequalities in society (World Health Organization, 2003). Social inequalities in health are the differences in the occurrence of illness, or death, between groups of people when classified on basis of some social indicator. Inequalities in oral health and in access to oral health services are well documented in New Zealand and are problems that need to be addressed, according to the Ministry of Health (Ministry of Health, 2006a).

In general, the factors affecting the oral health status of an individual can be categorized in two ways, at the individual level or at the system level. Individual level characteristics include: an individual's demographic and socio-economic constraints (income, education, occupation, gender), and other related characteristics such as racial/ethnic group, health beliefs, values, attitudes, knowledge and oral health behaviours (personal oral hygiene, use of fluoride, diet behaviour, and utilization of dental services). System-level factors include societal and environmental characteristics and the organization and resources of the oral health system (Cohen & Gift, 1995).

People with higher SES present with better health outcomes due to a number of factors. People from a professional background, for example, are more likely to attend dental check-ups, brush their teeth twice a day, and use an additional method (such as dental floss) for cleaning their teeth (J. Murray et al., 2003). They are less likely to have had teeth extracted and are less anxious about going to the dentist. People from lower socio-economic backgrounds are less likely to be able to take time off work to go to a dentist than people from a professional background (J. Murray et al., 2003). In addition, dental health surveys suggest that there is a social class gradient in relation to being given preventive dental care advice by a dentist (Nuttall et al., 2001). There is a greater than 50 per cent chance that a

person from a higher social class will have received some advice about tooth brushing or gum care from a dentist than someone from lower social class (J. Murray et al., 2003). Sugar consumption may be another factor that is linked to inequalities in oral health. There is evidence that the diet of the less advantaged consists of more processed foods and less fresh foods than the more affluent in society (J. Murray et al., 2003). For lower SES groups, certain types of sweets may also be an inexpensive way of pacifying or rewarding children (J. Murray et al., 2003).

Overall, higher occupational groups are better equipped to negotiate their way through the healthcare system thus creating an advantage over those unable to do so or who are less experienced in dealing with the health system (Nuttall et al., 2001). The cost of dental care is also a problem because it can be expensive to visit a dentist for those who do not have access to free dental care (Cohen & Gift, 1995). The geographic location of dental surgeries and transport options available from rural areas are examples of additional barriers to health care which have important implications for those living in more isolated areas (Cohen & Gift, 1995).

In New Zealand, a cohort study looked to find if there was any association between children's experience of socio-economic disadvantage and adult health (Poulton et al., 2002). It assessed the SES and infant health (such as pre-natal and post-partum complications) of children at birth and ages 3, 5, 7, 9, 11, 13, and 15 years. At age 26 years, these individuals were assessed for health outcomes (such as body mass index, blood pressure) including dental caries, plaque scores, gingival bleeding, and periodontal disease and associations between these variables and childhood and adult SES were examined. All dental health measures at age 26 years showed a graded relation with childhood SES. Individuals with low SES presented with a higher amount of plaque and gingival bleeding, and a higher proportion of periodontal disease and decayed surfaces. The adverse influence of low childhood SES was seen after controlling for infant health and current adult SES. Additionally, the results showed that low adult SES had a significant effect on poor adult dental health after controlling for low childhood status.

Another long standing New Zealand cohort study (Thomson et al., 2004) undertook a systematic dental examination for dental caries at ages 5 years old (922 children examined) and dental caries and tooth loss at 26 years old (930 adults examined), including the

collection of data on periodontal attachment loss and plaque level. Childhood SES was determined using parental occupation, and adults' SES was based on each participant's occupation at age 26 years. The study found that not only were oral health inequalities present at age 5 years, but they were also apparent at age 26 years when the early childhood SES categories were used, suggesting that early socio-economic inequalities in a number of important oral health indicators do persist well into the third decade of life. By age 18 years, only two study members had lost permanent teeth due to caries, whereas almost one-tenth of the cohort had done so by age 26 years, when profound socio-economics differences had re-emerged after being very much reduced during the years of schooling. This finding strongly suggests that, while universal access to dental health care from childhood through adolescence may act protectively to dampen the effect of SES inequity, the effect may not persist once that universal access ends.

A number of oral health inequalities have been identified from previous New Zealand studies and reports have found that Māori children experience more caries than do European children (Cohen & Gift, 1995). Māori adults have a greater number of missing teeth than adult New Zealanders of European descent and Māori and Pacific Islanders not only have a higher proportion of deep pockets, which indicates severe periodontitis, than do Europeans, but they also experience the process of periodontal diseases earlier and suffer from more severe cases. One study reported oral health inequalities between Māori pre-school children and their counterparts in the greater Wellington region (Thomson, Williams, Dennison, & Peacock, 2002). The authors suggest that such inequalities can be the result of major social, economic and political influences such as welfare state changes in 1990s which increased the gap between socio-economic and ethnic groups (Thomson et al., 2002). An earlier study (Thomson, 1993) described the association between ethnicity and dental caries experience in 5-year-old and 12/13-year old children. Māori children were more likely to have a higher number of caries than non-Māori with Pacific Island children being mid-way between the two, while non-Māori children were the most likely ethnic group to have no experience of caries compared to both Māori and Pacific Island children.

The New Zealand Survey of Adult Oral Health in 1976 showed that Māori had poorer oral health status than non-Māori. A more recent study reported that Māori used dental services less frequently than non-Māori, were more likely to require curative dental services (Cohen & Gift, 1995) and did not have the same dental health status for all age groups as non-Māori.



Māori face barriers to public dental care delivery systems, including financial restraints, (which is associated with diminished access to primary and preventive health service) and are over represented in the lower socio-economic deciles (Dental Council of New Zealand et al., 2000). Other barriers to accessing dental services include lack of knowledge regarding what dental health services are available (such as school dental program for children) or/and cost of transport to those services „The dental health project at Ratana Pa“ (Broughton J, 1995), described the poor dental health within this Māori community, where there was a high prevalence of caries and periodontal diseases. In addition, these conditions caused low self-esteem and poor social relations within this community. The results of this project showed the advantage of community based services for overcoming the barriers to access and cost of care, the importance of empowerment within the community, as part of ownership and control; and the consideration of cultural aspects such as the *whanau*<sup>4</sup> concept. The positive changes in the relationship with this population and those providing dental services and the benefits seen with improved self-esteem within the community were important outcomes of this project.

Oral health status is closely related to oral quality of life (Chen & Hunter, 1996), because the oral health status is a combination of the dentition status, which is the number of decayed, missing and filled permanent teeth (DMFT) and periodontal status, while oral quality of life is composed of dental symptoms, perceived oral wellbeing and level of oral function. As a consequence, the better oral health status, the better oral quality of life through enhanced physical functions, social function and self-esteem.

Bogges and Edelstein (2006) reviewed oral health issues during pregnancy and found that periodontal disease and caries in women of childbearing age were higher among women with low incomes as well as among racial and ethnic minority groups. Socio-economic factors, lack of resources to pay for care and lack of public understanding of the importance of oral health, were some of the underlying reasons cited as contributing factors to poorer oral health in low income women. Improved public policies that support comprehensive dental services for poor and minority women should be expanded, so that not only their own oral and general health is safeguarded, but also that of their children (Bogges & Edelstein, 2006). Issues relating to access to care may pose important barriers to women seeking health care for a

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<sup>4</sup> *Whanau* is the concept of family.

range of reasons with the cost of care being a major impediment (E. Murray et al., 2000). For low income people there is a close association between the cost of care and low uptake of health services (E. Murray et al., 2000). Other barriers include feeling ill-at-ease in conventional care settings which may result in delaying seeking care (E. Murray et al., 2000). They are made uncomfortable by the difficulties they experience in communicating with the staff, the frequent impossibility of following the advice they are given, and often, the reactions of health professionals (E. Murray et al., 2000). Partly because of problems of access and communication, women from lower social classes, as well as women from ethnic minorities, tend to be less well informed about the progress of pregnancy and birth, about potential problems, and about previous and curative care (E. Murray et al., 2000).

### ***Care of pregnant women***

*“Understand cultural differences in beliefs and practices relating to infant well-being are important for the successful delivery of health messages and health services to diverse populations”* (Abel, Park, Tipene-Leach, Finau, & Lennan, 2001, p.1136).

Health practices develop early in life which means that the family is a significant source of information for both health beliefs and behaviour. Family members can reinforce each others’ attitudes, beliefs, and values concerning health-related behaviours. Studies have shown that the sooner behaviours for effective oral hygiene, such as tooth brushing and flossing, are introduced in a person’s life, the higher the probability of successful long-term preventive behaviour (Cohen & Gift, 1995). Family environment also influences food preferences and the type and amount of food eaten. Parents and other caregivers are key figures in introducing children to oral health care.

In addition, key health professionals involved in the care of pregnant women also have an important role to play in terms of promotion oral health. One of the most obvious professionals is the midwife or Lead maternity Carer (LMC) who sees women throughout the course of her pregnancy and for up to 6 weeks post-partum. There were a total of 64,044 live born babies in New Zealand in 2007 with over 6,500 live births registered in the Wellington region (Statistics New Zealand, 2008a) and more than 70% of women had registered with an LMC, mainly midwives (Health Services Consumer Research, 2008). Midwives are the professionals who have the closest contact with pregnant women, and consequently the best

opportunity to give information about oral health care as well. In terms of follow-up care, Plunket is New Zealand's largest provider of support services for the development, health and wellbeing of children under 5 years of age (Ministry of Health, 2004). Thus, there is the potential opportunity for follow-on care in terms of health education and the inclusion of oral health care and information to women and their families.

While there is a worldwide increase in the amount of research about the importance of pregnant women's oral health, only two studies, to date, looking at this area have been conducted in New Zealand. Liefde (1984) reviewed the literature on pregnant women's dental health focussing on the need for special dental visits during pregnancy. This review also emphasised the avoidance of radiography and non-prescribed drugs during pregnancy (Liefde, 1984).

More recently, a qualitative study has been completed, focused on the oral health needs of Māori women during pregnancy. Makowharemahihi (2006) used three focus groups and four key stakeholder interviews at the Ora Toa health service (Te Runanga O Toa Rangatira Inc) at Porirua (PHO). The research used a Kaupapa Māori analysis, addressing issues such as inequality and inequity in dental and oral health care and their impact on Māori. The findings of the study suggested that current oral health services are not meeting Māori needs and participants reported a number of dental problems during their pregnancy including a lack of support and information about maternal oral health and barriers to accessing dental care (Makowharemahihi, 2006).

Epidemiological and observational studies have shown that women who receive antenatal care early in pregnancy, and who have more antenatal visits, tend to have lower maternal and prenatal mortality, and better pregnancy outcomes, however, it is low risk women who tend to attend antenatal care earlier in pregnancy (E. Murray et al., 2000). Antenatal care is essential for the wellbeing of the pregnant woman and her baby. It is also the perfect moment to promote healthy choices for her and her family and may include oral health issues. However, the majority of prenatal practices are not addressing their patients' oral health unless the patient presents with an acute dental condition according to Stevens et al. (2007). Pregnant women with limited health care resources often present with serious oral health issues during the prenatal period. These at-risk women frequently eat foods with a higher sugar content and floss and brush less often than recommended. They are also more likely to

have had little or no exposure to information regarding the importance of preventive oral health practices during pregnancy and early childhood (Stevens et al., 2007).

Particular cultural factors may also play an important role in planning dental health promotion among pregnant women. A New Zealand study (Abel, Park, Tipene-Leach, Finau, & Lennan, 2001) which involved 150 participants and used focus groups, collected information on the practices and beliefs of infant caregivers (under 12 months) from different ethnic groups. The aim was to find inter-ethnic similarities and differences in sources of support advice, infant feeding, infant sleep arrangements and traditional practices and beliefs. The findings show some cultural differences in the infant care and practices; most Pacific Island women taking part, for example, did not see a need to attend antenatal classes or to seek postnatal support from professional organisations because their families met their information and support needs. Thus, in this situation, the role of midwives or GPs may be particularly important for ensuring that adequate information is available in ways that meet the needs of all pregnant women. Māori participants in this study, who lived with or were closely linked to extended family members, were more likely to adopt western practices than those of their Pacific counterparts. Like the New Zealand-raised Pacific Island parents, some of these Māori women experienced mixed emotions because they valued the support and advice offered by family but at the same time felt restricted by their beliefs, expectations, and demands. The fact that Māori parents tended to rely more on maternity care professionals than did Pacific parents most likely reflects a number of factors including more familiarity with the New Zealand social and health systems and perhaps, less immediate access to family members for support (Abel et al., 2001).

Pakeha parents were the most likely ethnic group to attend antenatal classes and rely on health professionals, their partner and peers for support and advice both during pregnancy and after their babies were born. Differences in their approach to parenting according to age also emerged in the pakeha groups. Younger parents (under 25 years) tended to be more „intuitive“ in their approach to infant care and went with what „felt right“, while older parents were more inclined to follow expert advice and were more anxious to „do it right“(Abel et al., 2001).

## *Summary*

Oral diseases cover a range of conditions relating to the teeth and gums which collectively pose a significant public health problem because of their high prevalence in the population, the potential short and long-term impact of these conditions on an individual's quality of life. Additionally, it is important to note that oral diseases are preventable and that effective treatments for the majority of oral conditions are available. International studies confirm that women need special attention relating to oral health during pregnancy. Women experience physiological and hormonal changes in their bodies during pregnancy. This may have implications for a woman's oral health including an increased likelihood of periodontal disease, dental decay and tooth erosion. In addition, this has potentially important consequences for a woman's pregnancy since periodontal disease has been linked to giving birth to both preterm and low birth weight babies. Women also play a crucial role in encouraging preventive-oriented dental behaviours and eating habits in their newborn and growing infant. Good oral health in early life decreases the risk of later caries development, especially if caries-promoting habits such as frequent snacking on sweets and juices are minimised.

Working with a range of health professionals, including dentists, primary care providers, or through antenatal care are means of promoting dental health. LMCs are well positioned to provide information to pregnant women in relation to preventive oral health behaviours for themselves and their babies since they see women throughout the pregnancy and postpartum period.

There is a recognised need for more information about the oral health and oral health behaviour of pre- and post-natal women, and the New Zealand Ministry of Health is calling for more research to be carried out in this area. To date, there is no information about the frequency of pregnant women visits to the dentist, their habits or their behaviours. This present study will seek to present an overview about pregnant women's dental health practices and access to oral health information.

## **CHAPTER 3: METHODS**

### **3.1 Overview**

The research involves a cross-sectional survey to examine oral health care practices, access to dental care services and the availability of information for pregnant woman in the Wellington region. The objectives of the study are: (1) to identify the sources and content of information about oral health available to pregnant women; (2) to assess women's usual oral health care practices and to document how these may change or differ during pregnancy and; (3) to identify whether oral health care and access to dental services differ among pregnant women by ethnicity, age and SES.

### **3.2 Selection of participants and centres**

According to Statistics New Zealand (2008a), there were 6,876 live births in the Wellington region in 2007, born to mothers resident in New Zealand (Statistics New Zealand, 2008a).

All participants in this research were pregnant or recently post-partum women over 16 years old, attending antenatal classes in the Wellington region run by Parents Centres, the Wellington Maternity Project (MATPRO), Wellington High School Adult Community Education Centre, Newlands and Onslow College Adult and Community Education Programme, Tawa College Community Education and also women attending the breastfeeding classes at Wellington Hospital Women's Health Service. The data collection occurred during a six month period (June-November 2008), involving recruitment from 3 to 6 cycles of classes for each antenatal organisation. All these centres were contacted and agreed to the researcher using the antenatal classes as a means for recruitment of potential participants to the study. The women attending these antenatal classes were typically in the last trimester of their first pregnancy.

The Wellington Maternity Project (MATPRO) is part of the Wellington Independent Practice Association which provides a range of primary care services in the Wellington area. The

Wellington Maternity Project is a Wellington-based organisation that involves midwifery, general practitioner and consultant obstetrician Lead Maternity Carers (LMCs). MATPRO was contracted by the Ministry of Health to provide a fully-funded pregnancy and parenting programme. Courses are held in Porirua and Newtown (Wellington city). Each course has places for up to 12 pregnant women and involves a minimum of 12 hours education. The courses are run eight times or more a year in each location, depending on demand. Most people attending this programme are first-time mothers with their partner/support person. Aside from the hospital-funded programme in Paraparaumu this is currently the only free pregnancy and parenting education programme within the Capital and Coast District Health Board (C&CDHB). As there is high demand for this programme MATPRO encourages LMCs to only refer women to this course who would not be able to afford to attend another programme. In 2003, 20.5% of participants were Māori, 17.5% were Pacific, 8% were Asian, 7% were other/not stated, and 47% were European (Capital and Coast & District Health Board, 2004).

Parents Centres New Zealand Incorporated has 52 centres nationwide and is the largest parenting based infrastructure and network to support parents and their children 0 – 5 years in New Zealand. The organisation operates from a national support centre in Mana where it co-ordinates approximately 3500 volunteers who deliver Parents Centre programmes and support services nationally. Parents Centres are located in the Wellington region at: Wellington North (Karori/Khandallah), Wellington South (Island Bay), Mana, Kapiti, Lower Hutt and Upper Hutt. The classes run for seven weeks and cost between NZ\$120-160 (including annual membership and newsletter) (Parents Centre, 2008).

Adult Community Education (ACE) Centres antenatal classes use school facilities and they assist communities to meet identified learning needs with an accessible programme. Wellington High School Community Courses offers “Parents – To- Be” antenatal course four times per year, and runs pre-natal sessions for 6 weeks and 2 weeks post-natal costing NZ\$50 per person. The course is available for parents and/or a support person (Wellington High School ACE Centre, 2008). The other course is available through Newlands and Onslow College Adult and Community Education Programme which offers childbirth classes 4 times per year for pregnant women, fathers and support people. The course runs for 6 weeks and 2 weeks post-natal classes at a cost of NZ\$ 85 per couple (Newland College and Onslow College Adult and Community Education Programme, 2008). Tawa College Community

Education also offers Childbirth Classes 4 times per year for 6 weeks pre-childbirth, and 2 weeks postpartum. The course cost NZ\$60 per couple and runs for two hours once/week (Tawa College Community Education, 2008).

Wellington Hospital Women's Health Service offers free „Pregnancy Breastfeeding Classes“. The course takes place once a month (or more, depending on demand) and is divided into two classes for 2 hours, having up to 30 couples per class. The participants of these classes were also recruited for the current study (Wellington Hospital Women's Health Service, 2008).

### **3.3 Period of data collection**

Data collection ran from 10<sup>th</sup> June to 30<sup>th</sup> November 2008. The researcher collected data from Parents Centre antenatal classes in four different seven week cycles running in each of the Parents Centre venues (Wellington South, Wellington North, Lower Hutt, Upper Hutt, Mana and Kapiti). The average number of pregnant women in each class was ten (from a minimum of six to a maximum of fourteen). The researcher also went to three different cycles (six weeks each) of Newlands and Onslow College Adult and Community Education Programme antenatal classes with an average of nine women in the classes. Tawa College Community Education and Wellington High School Community Education antenatal classes were visited twice with an average of eight women in the Tawa class and ten women in the Wellington High School classes. MATPRO classes were visited monthly (four week classes) with an average of twelve women per class. Breastfeeding classes were visited monthly also (two week classes) with an average of fifteen women per class. In the six month period of data collection sixty eight different antenatal classes were visited by the researcher (Appendix 1).

### **3.4 Sample size**

The aim was to have sufficient statistical power to show significant differences between women from different ethnic groups who had access to dental health information during their pregnancy. The sample size for the proposed study was limited by the number of women attending antenatal classes in the Wellington region. The antenatal classes run by the chosen childbirth education organisations have been selected as being reasonably representative of



the general population. Based on approximately 380 participants, if the overall proportion of women who receive any information about dental health during their pregnancy is 10%, then there is a 95% probability that the survey will yield an exposure estimate in the range of 7% to 13%. If the proportion is 6% of Māori and Pacific women and 12% in Pakeha/European women, the study will have 90% power to detect such a difference.

### **3.5 Procedure**

It has been suggested that potential participants are more likely to take part in research if a face-to face approach is used (Holbrook, Green, & Krosnick, 2003). It is also an opportunity for the researcher to clarify and/or answer any questions concerning the study immediately. The researcher arranged with the childbirth educator from each of the classes to attend one antenatal session in order to explain the study and leave women with an information sheet and questionnaires usually at start at the classes. The questionnaires were self-completed by the women at home. Once completed, the questionnaire could be left at a „drop box“ at the antenatal class venue or posted back to the researcher in a pre-paid self addressed envelope. The researcher collected the completed questionnaires from the „drop box“ two weeks after handing out the questionnaire at the class. The childbirth educators at each centre also took responsibility for reminding women attending the classes to fill in the questionnaire and send it back to the researcher.

### **3.6 Questionnaire**

The questionnaire was broadly divided into four parts: (1) care of the teeth when the woman was not pregnant; (2) care of the teeth and diet during the pregnancy; (3) sources of oral health information during pregnancy and; (4) demographic information (Appendix 2).

### ***Questionnaire development and validation***

Demographic information collected through the questionnaire included, ethnic group, education level, and household income, based on standard definitions taken from the New Zealand Census 2001. Questions relating to oral care practices, including use of floss and mouth care products, frequency of brushing and visits to a dentist (both when pregnant and when not pregnant) have previously been validated in studies undertaken primarily in the United States (Gaffield et al., 2001; Habashneh et al., 2005; Lydon-Rochelle et al., 2004; Ressler-Maerlender et al., 2005; Stevens et al., 2007), Australia (Thomas et al., 2008), Denmark (Christensen et al., 2003), UK (Hullah et al., 2007), Kuwait (Honkala & Al-Ansari, 2005) and in the latest ongoing Ministry of Health Oral Health Research (Ministry of Health, 2008b). A food frequency diary based on the New Zealand Nutrition Survey questionnaire was adapted for use in this study (Ministry of Health, 1999). Additional information was sought on the type of dental health information given including caring for teeth and gums, diet and use of fluorides as well as the information sources e.g., dentist, dental healthcare worker, midwife, GP. These questions were developed specifically for use in the current study. A pilot questionnaire was applied to test the understanding of the questions for women prior to the final version being concluded.

### **3.7 Measuring socio-economic status**

There are different ways to measure socio-economic status of the population (Galobardes, Lynch, & Smith, 2007). Each different indicator will emphasize a particular aspect of social stratification in distinct stages of life, and the correlation within then underlining socio-economic stratification. In this research we used the combination of Education and Income indicators.

#### ***Education***

Broadly, measures of education level normally assess the individual knowledge related achievements. They show the social opportunities that the individual had and also the parent's choices and support. Education will also be important for an individual's future

employment and income. Education is relatively easy to measure in self-administrated questionnaires and response rates tend to be high (Galobardes et al., 2007).

In the 2006 Census (Statistics New Zealand, 2008b), a qualification is defined as “a formally recognised award for attainment resulting from a full-time (20 hours per week) learning course of at least three months, or from part time study that, when completed, is equivalent to three months full time, or from on-the-job training”. This information is collected from people aged 15 years and over, and combines highest secondary school qualification and post-school qualification, to derive a single highest qualification. For 2006 Census, new qualifications have been changed to include National Certificate of Educational Achievement (NCEA) and new classifications were adopted, based on the New Zealand Register of Quality Assured Qualifications.

In this research, the highest level of education reported by participants was classified in three different categories. The first category is „High School qualification“ (including less than high school) and equivalent according to 2006 Census (Statistics New Zealand, 2008c), to no qualification, level 1, 2, 3 and 4 certificates gained at school, and overseas secondary school qualification. The second category is „Tertiary qualification“ (including some tertiary education such as certificate, diploma or incomplete degree) which is equivalent to level 1, 2, 3 and 4 certificates gained post-school, level 5 and 6 diploma, and bachelor’s degree and level 7 qualification. The third category is „Postgraduate qualification“ which is equivalent to post-graduate and honours degree, master’s degree and doctorate degree.

### ***Income***

In spite of income related questions being a sensitive issue for people, it is the one of the most straight forward measures of material circumstances. Money and assets have an important effect on health because they provide health promoting environments, allow consumption of health enhancing commodities and facilitate access to health services. In addition, income can influence a person’s self-esteem, participation in society and can be a relative indicator for levels of poverty (Galobardes et al., 2007).

In this survey we ask about the total income of the household based on the NZ Census which defines “total household income is derived by aggregating the total personal income of all

members of the household”(Statistics New Zealand, 2008d). In the 2006 Census the grouped total household income classification is: \$20,000 or less, \$20,001-\$30,000, \$30,001-\$50,000, \$50,001-\$70,000, \$70,001-\$100,000, \$100,001 or more.

### **3.8 Measurement of ethnicity**

Ethnicity in the current study was based in the New Zealand 2001 Census (Statistics New Zealand, 2008e) which gives a multiple option based on a cultural affiliation concept, as opposed to race, ancestry, nationality or citizenship: “Which ethnic group do you belong to”. The options were: New Zealand European Pakeha, New Zealand Māori, Other European, Samoan, Cook Island Maori, Tokelauan, Niuean, Tongan, Indian, Chinese, Other.

### **3.9 Data entry and analysis**

Each questionnaire received an individual identification number to permit checking for any inconsistent responses. All data was entered on Microsoft Access and analysed using STATA software package. Descriptive analysis, such as chi-squared tests and t-tests were used to investigate differences between the exposure (ethnic, socio-economic) groups (Armitage, Berry, & Matthews, 2002). Multiple logistic regression was used to compare the prevalence of various „risk factors“ between groups, controlling for confounders such as ethnicity and socio-economic status (Pearce, 2004).

For analysis purposes the pregnant women in this research were sub-grouped into four age groups: 16-25 years, 26-30 years, 31-35 years and 36 + years group. Ethnicity was divided into Pakeha (which included New Zealand European and other European groups), and „Others“ group which included Māori, Pacific Islanders, Chinese, Indian and any other ethnic group. It was first anticipated to conduct specific analyses for Maori and Pacific Islands groups, however, the numbers of participants from these groups were too small. Education status was grouped as „High school“, which includes “less than high school“, „Tertiary“, which includes any tertiary education program like a certificate, diploma or incomplete degree and finally a „Post-graduate“ group. The household income was classified into three

groups: less than \$70,000 (or low income group), \$70,000 to 100,000 (or medium income group) and more than \$100,000 (or high income group).

The food frequency chart was an adaption of the New Zealand Food survey (Ministry of Health, 1999). The food items were grouped into five food groups: sugars (which include cakes, muffins, sweet pies, pudding, plain sweet biscuits, cream filled or chocolate biscuits, muesli bars, chocolate, other confectionary, jam and peanut butter), drinks (which include fruit juice, carbonated drinks, sports drinks, tea, coffee and flavoured milk), carbohydrates (which include fruit or iced buns, savoury or dry biscuits, breakfast cereal, rice, pasta, potato and kumara), fruit (which includes fresh fruit, sultanas and other dried fruit) and water.

### **3.10 Ethics approval**

Ethical approval for this study was obtained from the Massey University Human Ethics Committee: Southern A. An information sheet (Appendix 3) about the study was given with the questionnaire and a completed questionnaire implied consent.

## CHAPTER 4: RESULTS

### 4.1 Sample characteristics and response rates

In order to obtain the sample size required for the study, 68 antenatal classes were visited in the Wellington region. The numbers of pregnant women in each class ranged from 5 in the Wellington High School antenatal classes to 15 in the breastfeeding classes, MATPRO classes and Island Bay the Parents Centre classes (Appendix 1). Breastfeeding classes at Wellington Hospital normally had a higher number of participants (up to 30 couples), but some of the women there had already received the questionnaire in the antenatal classes. Those women were excluded from the number of questionnaires handed out in the classes. Some of the venues where the antenatal classes were hosted did not have storage facilities and the childbirth educators suggested not having the “drop boxes” option for the collection of the questionnaires. However, the majority of women, 95% preferred to post back the questionnaires, with just a few questionnaires being collected from the “drop boxes” at the centres.

A total of 730 questionnaires were handed out to pregnant women in those antenatal classes visited and a total of 405 questionnaires were answered and returned. Table 1 shows the response rate of 55.4%.

Table 1: Response rate

Returned the questionnaire	Number (n)	Percentage (%)
<b>Yes</b>	405	(55.4)
<b>No</b>	325	(44.5)

#### *Demography characteristics*

Table 2 describes the demographic characteristics of women who completed the survey by age, ethnicity, education and household income. The majority of expectant mothers in the study were 30 years old and over. The age groups were divided in four categories, 16 – 25 years old with 46 (11.3%) women, 26 – 30 years old with 111 (27.4%) women, 31 – 35 years old with 140 9 (34.5%) women and 36 years old or more with 108 (26.6%) women. The „Pakeha“ group (which included New Zealand European and other European groups) was the

most common ethnicity with 321 (80.2%) women, while „Others“ ethnic group had 79 (19.7%) of the women in the study. Within the „Others“ ethnic group there were 36 (8.8%) Māori, 8 (1.9%) Pacific and 35 (8.6%) were Indian, Chinese or any other ethnic group, and 5 (1.2%) of participants did not state their ethnicity.

For the socio-economic analyses the education groups were divided into „high school“ category (which includes also less than high school level), „tertiary“ education category (which includes some tertiary qualification such as a certificate, diploma or incomplete degree) and a „postgraduate“ category. Over half of the population studied had tertiary education 234 (57.7%), while 118 (29.1%) had a postgraduate qualification and just 47 (11.6%) had up to high school education and 6 (1.4%) did not state their education. In relation to household income, almost 60% (214, 59.4%) of the sample studied had a high income with NZ\$ 100,001 or more annual income, 94 (26.1%) had between NZ\$ 70 and 100,000 income, 52 (14.4%) had less than NZ\$ 70,000 annual household income and 45 (11.1%) did not state their household income.

Table 2: Demographics of women who completed the survey

Variable	Number (n)	Percentage (%)
<b>Age</b>		
16 – 25	46	(11.3)
26 – 30	111	(27.4)
31 – 35	140	(34.5)
36+	108	(26.6)
Not stated	0	(0)
<b>Ethnicity</b>		
Pakeha	321	(79.2)
Māori	36	(8.8)
Pacific	8	(1.9)
Others	35	(8.6)
Not stated	5	(1.2)
<b>Education</b>		
High school	47	(11.6)
Tertiary	234	(57.7)
Post-graduate	118	(29.1)
Not Stated	6	(1.4)
<b>Household Income</b>		
< 70,000	52	(12.8)
70,001 – 100,000	94	(23.2)
100,001 – or more	214	(52.8)
Not Stated	45	(11.1)

Both ethnic groups had similar level of education, tertiary education being the most frequent in each group, 56.7% „Pakeha“ and 66.6% „Others“ (table 3).

Table 3: Ethnicity by education

Education level	Pakeha n (%)	Others n (%)
<b>Post-graduate</b>	100 (31.1)	18 (23)
<b>Tertiary</b>	182 (56.7)	52 (66.6)
<b>High School</b>	39 (12.1)	8 (10.2)

The „Others“ group has a higher representation at the low income category (27.6% have household income less than \$70,000), while „Pakeha“ were more represented at medium and high incomes (table 4).

Table 4: Ethnicity by income

Annual household income in \$1000s	Pakeha n (%)	Others n (%)
<b>\$100 or more</b>	176 (60.2)	36 (55.3)
<b>\$70-\$100</b>	83 (28.4)	11 (16.9)
<b>Less than \$70</b>	33 (11.3)	18 (27.6)

„Pakeha“ expectant mothers are in general older than their counterparts, 64.7% are over age 30, compared to 44.2% of the “Other” ethnic group. “Others” are over-represented in the youngest age group (table 5).

Table 5: Ethnicity by age

Variables	Pakeha n (%)	Others n (%)
<b>16-25</b>	27 (8.4)	19 (24)
<b>26-30</b>	86 (26.7)	25 (31.6)
<b>31-35</b>	119 (37)	21 (26.5)
<b>36+</b>	89 (27.7)	14 (17.7)

### *General characteristics*

Table 6 displays the self-reported oral care factors and conditions of the interviewed women when they were not pregnant. Most women were satisfied with their mouth condition, 39.2%



describe good health and 35% very good health of teeth and gums. Half of the women had visited their dentist less than one year ago (50.1%), 20% one year ago, and 29.8% had visited their dentist 2 years or more ago when not pregnant. The main reasons for visiting the dentist were routine checkups (43.9%) followed by necessity of fillings (18.8%) and others (11.9%) such as wisdom teeth extractions, broken teeth and/or fillings and infections. Most of the women normally see a dentist once a year (39.7%), however 23.2% of the women see a dentist just when they have problems.

In relation to oral hygiene habits most of the women (81.1%) stated that they brush their teeth twice or more a day, 17% use dental floss once or more a day and 34% use mouth rinse,; the most common rinses were Listerine, Salvacol, and Colgate Plax.

Table 6: Pre-pregnancy oral care

Variables	Number (n)	Percentage (%)
<b>How would you describe the health of your teeth and mouth</b>		
Excellent	56	(13.8)
Very Good	142	(35)
Good	159	(39.2)
Fair	41	(10.1)
Poor	7	(1.7)
<b>Last visit to the dentist</b>		
Less than 1 year ago	203	(50.1)
1 year ago	81	(20)
2 years or more	121	(29.8)
<b>What was the main reason for visited the dentist</b>		
Bleeding gums	19	(4.7)
Cavities or needed filling	76	(18.8)
Loose teeth	3	(0.7)
Toothache	28	(6.9)
Sensitive teeth	18	(4.4)
Checkup	177	(43.9)
Check and/or clean	34	(8.4)
Others	48	(11.9)
<b>How often do you normally see a dentist</b>		
Once every 6 months	45	(11.1)
Once a year	161	(39.7)
Once every two years or more	98	(24.2)
Just when I have a problem or need treatment	94	(23.2)
Never	7	(1.7)

<b>How often brush your teeth</b>		
Twice or more a day	327	(81.1)
Once a day	72	(17.8)
Not every day	4	(0.9)
<b>How often floss your teeth</b>		
Twice or more a day	10	(2.4)
Once a day	59	(14.6)
Not every day	235	(58.3)
Never	99	(24.5)
<b>Use mouth rinse</b>		
Yes	137	(34)
No	266	(66)

The hygiene habits seem to be maintained when the women are pregnant (table 7). However, during pregnancy women seemed to be slightly more concerned about oral hygiene, 82.6% brushing their teeth twice or more a day and 18.5% flossing their teeth once or more per day.

Table 7: Comparing dental hygiene before and during pregnancy

Variables	Before pregnancy		Current Pregnancy	
	n	(%)	n	(%)
<b>How often brush your teeth</b>				
Twice or more a day	327	(81.1)	333	(82.6)
Once a day	72	(17.8)	68	(16.8)
Not every day	4	(0.9)	2	(0.5)
<b>How often floss your teeth</b>				
Twice or more a day	10	(2.4)	9	(2.2)
Once a day	59	(14.6)	66	(16.3)
Not every day	235	(58.3)	226	(56)
Never	99	(24.5)	102	(25.3)
<b>Use mouth rinse</b>				
Yes	137	(34)	119	(29.4)
No	266	(66)	285	(70.5)

Table 8 shows that women also reported changes in their eating habits during pregnancy, 60.7% reported eating more often, 56.3% reported an increase in the amount eaten, 42.9% said they were eating more sugar during pregnancy and 11.8% changed their habits such as eating more fruit, avoiding foods not recommended in pregnancy and eating more often, but small portions, etc. Half (51.4%) of the pregnant women stated that they vomited during their pregnancy, and, when vomited occurred, 33.5% said that they rinsed their mouth with water, 26.1% brushed their teeth and 17.2% ate or drank something straight after vomiting. The

major problem in their mouth noticed by the women during pregnancy was bleeding gums (n=247, 60.9%), sensitive teeth (n=61, 15%), toothache (n=22, 5.4%), and cavities (n=21, 5.1%).

Table 8: Current Pregnancy oral care

Variables	Number (n)	Percentage (%)
<b>How often brush your teeth</b>		
Twice or more a day	333	(82.6)
Once a day	68	(16.8)
Not every day	2	(0.5)
<b>How often floss your teeth</b>		
Twice or more a day	9	(2.2)
Once a day	66	(16.3)
Not every day	226	(56)
Never	102	(25.3)
<b>Use mouth rinse</b>		
Yes	119	(29.4)
No	285	(70.5)
<b>Changes eating habits</b>		
Eating more food	228	(56.3)
Eating more often	246	(60.7)
Eating more sugar	174	(42.9)
Other	48	(11.8)
No changes	40	(9.8)
<b>What did you do after vomiting</b>		
Brushed teeth	106	(26.1)
Rinsed mouth with water	136	(33.5)
Rinsed mouth with mouth rinse products	13	(3.2)
Drank/ate something	70	(17.2)
Did not do anything	17	(4.2)
Did not have vomiting	197	(48.6)
<b>Changes/Problems mouth</b>		
Bleeding gums	247	(60.9)
Cavities or needed filings	21	(5.1)
Loose teeth	8	(1.9)
Toothache	22	(5.4)
Sensitive teeth	61	(15)
Other	24	(5.9)
No changes	126	(31.1)

More than 60% of the population did not see a dentist or other dental healthcare worker during pregnancy. Of the women who had a dental visit, just 25.9% received information about care for teeth and gums, 5.2% received information about diet and 4.2% received information about fluorides. The main reasons for not seeing a dentist were the thought that

they did not need to see a dentist (37%), cost related (18.7%), the thought that it was not recommended to see a dentist when pregnant (14.5%), followed by other reasons such as “prefer to wait to after the baby is born” and “was not a priority”, followed by no time (5.6%) and afraid of dentists (4.9%) (table 9).

Table 9: Oral healthcare advice during pregnancy

Variables	Number (n)	Percentage (%)
<b>Dental healthcare worker provided information about care for teeth and gums</b>		
Yes	105	(25.9)
No	35	(8.6)
Haven't seen a dentist or dental healthcare worker	265	(65.4)
<b>Dental healthcare worker provided information about diet</b>		
Yes	21	(5.2)
No	116	(28.7)
Haven't seen a dentist or dental healthcare worker	267	(66)
<b>Dental healthcare worker provided information about fluorides</b>		
Yes	17	(4.2)
No	121	(29.9)
Haven't seen a dentist or dental healthcare worker	266	(65.8)
<b>Reason for not seeing the dentist</b>		
Too expensive	76	(18.7)
Had no time	23	(5.6)
I am afraid of dentists	20	(4.9)
I thought it was not recommended	59	(14.5)
Other	33	(8.1)
I did not need to see the dentist	150	(37)

In the table 10, the source and kind of oral health care information accessed by pregnant women is described. 53.3% of the women have never received any information about dental health during their pregnancy. For women who had access to dental health information during pregnancy, the most common was from „media source“ (23.4%), mainly pregnancy books, the internet and others. The most popular cited pregnancy books were: “Bounty and Plunket book”, “NZ pregnancy book”, “Up the Duff”, “What to expect when you are expecting”, and

“Pregnancy for Dummies”. The women reported researching various pregnancy and babies” websites such as “baby centre” and “huggies” website”. Some women received information from dental care workers (14%) and Lead Maternity Care workers (12.5%).

The information was related basically to dental hygiene (20.2%), other topics related to things such as dental consultations and the possibility of bleeding gums (18.2%), diet (14.5%), and oral health diseases (12.5%). Most women (38.7%) reported no changes in any practices as a consequence of receiving information. However 8.4% changed their flossing habits and 7.9% their brushing habits when informed.

Table 10: Information about oral health

Variables	Number (n)	Percentage (%)
<b>Have you received any information about dental health</b>		
Yes, in this current pregnancy	175	(43.8)
Yes, in a previous pregnancy	11	(2.7)
No, never	213	(53.3)
<b>Where did you obtain/ who gave the information</b>		
Dental healthcare workers	57	(14)
Lead Maternity Carers	51	(12.5)
Media	95	(23.4)
Others	10	(2.4)
Have not received any information	192	(47.4)
<b>Information related to</b>		
Dental hygiene	82	(20.2)
Diet	59	(14.5)
Oral health diseases	51	(12.5)
Babies oral health	30	(7.4)
Association between oral problems and general health	29	(7.1)
Other	74	(18.2)
Have not received any information	196	(48.4)
<b>Changed practices as consequence of receiving information</b>		
Changed brushing	32	(7.9)
Changed flossing	34	(8.4)
Changed dietary habits	17	(4.2)
Went to see the dentist	20	(4.9)
Others	13	(3.2)
No changes	157	(38.7)
Have not received any information	172	(42.4)

The women in this survey reported they received antenatal care from their midwife (n=355, 87.6%), parental classes (n=251, 61.9%), obstetrician (n=104, 25.6%), and general practitioner (n=43, 10.6%). 131 (32.3%) of the women had seen a dentist for a check up or clean and 342 (84.4%) said that they thought that they did not really need to see a dentist (table 11).

Table 11: Antenatal Care

Variables	Number (n)	Percentage (%)
<b>Antenatal care from</b>		
Midwife	355	(87.6)
GP	43	(10.6)
Obstetrician	104	(25.6)
Parental classes	251	(61.9)
None	6	(1.4)
Other	26	(6.4)
<b>Have seen dentist for check up and/or clean</b>		
Yes	131	(32.3)
No	274	(67.6)
<b>Have needed to see a dentist</b>		
Yes	63	(15.5)
No	342	(84.4)

### *Food frequency*

Table 12 shows studied self-reported frequency of the food five specific food groups (sweets, drinks, carbohydrates, fruit and water) consumed 60.6% of women reported they ate sweets once a day, 45.5% had drinks once per day, 52.9% had carbohydrates once per day, 78.9% ate fruit and 91.9% drank water three or more times per day.

Table 12: Food frequency by items (sweets, drinks, carbohydrates, fruit, and water)

Variable	Less than once per day	Once per day	Twice per day or more
	n (%)	n (%)	n (%)
<b>Sweets</b>	108 (26.7)	245 (60.6)	51 (12.6)
<b>Drinks</b>	140 (34.6)	184 (45.5)	80 (19.8)
<b>Carbohydrates</b>	12 (2.9)	214 (52.9)	178 (44)
<b>Fruit</b>	24 (5.9)	61 (15.1)	319 (78.9)
<b>Water</b>	4 (1)	28 (7)	366 (91.9)

The food items were analysed separately by ethnicity, income, age and education. Table 13 shows the food frequency for sweet items. Most of the „Pakeha“ group (61.6%) ate sweets once per day, but 15.1% of the „Others“ group (ate sweets more often, twice or more per day. The lower (61.5%) and the higher (62.1%) income groups were most likely to have sweets once a day and the middle income group had a higher percentage (18%) of women who reported that they consumed sweets twice or more per day. The youngest group is the one who consumed more sweets at least once per day (73.9%), followed by 36 and plus years old group (63.5%), 31-35 year old group (59.2%) and 26-30 years old group (54%), the latter which reported eating sweets more often (18% had sweets twice or more per day). 63.2% of the tertiary education group reported they ate sweets at least once a day, and 14.8% of the high school education group had sweets twice a day or more.

Table 13: Food frequency sweet item by ethnicity, income, age and education

Variable	Less than once per day	Once per day	Twice per day or more
	n (%)	n (%)	n (%)
<b>Ethnicity</b>			
Pakeha	84 (26.1)	198 (61.6)	39 (12.1)
Others	23 (29.1)	44 (55.7)	12 (15.1)
<b>Income</b>			
<70,000	14 (26.9)	32 (61.5)	6 (11.5)
70-100,000	22 (23.4)	55 (58.5)	17 (18)
100 or more	56 (26.1)	133 (62.1)	25 (11.6)
<b>Age</b>			
16-25	8 (17.3)	34 (73.9)	4 (8.70)
26-30	31 (27.9)	60 (54)	20 (18)
31-35	37 (26.4)	83 (59.2)	20 (14.2)
36+	32 (29.9)	68 (63.5)	7 (6.5)
<b>Education</b>			
High school	13 (27.6)	27 (57.4)	6 (14.8)
Tertiary	54 (23)	148 (63.2)	32 (13.6)
Post-graduate	40 (33.9)	66 (55.9)	12 (10.1)

Table 14 describes the consumption of drinks reported by the studied population. Half of „Others“ group reported they had have drinks once a day, compared to 44.8% of „Pakeha“. However „Pakeha“ (21.5% twice per day) show a higher frequency of drinks per day. The higher income group had fewer drinks, than the other income groups. Most of the youngest groups (58.7%) had drinks at least once a day, and 20.7% of the 26-35 years old had drinks twice a day or more. The high school group had more drinks, more often than the other groups.

Table 14: Food frequency drinks item by ethnicity, income, age and education

Variable	Less than once per day	Once per day	Twice per day or more
	n (%)	n (%)	n (%)
<b>Ethnicity</b>			
Pakeha	108 (33.6)	144 (44.8)	69 (21.5)
Others	30 (37.9)	40 (50.6)	9 (11.3)
<b>Income</b>			
<70,000	14 (26.9)	28 (53.8)	10 (19.2)
70-100,000	28 (29.7)	45 (47.8)	21 (22.3)
100 or more	86 (40.1)	89 (41.5)	39 (18.2)
<b>Age</b>			
16-25	11 (23.9)	27 (58.7)	8 (17.3)
26-30	38 (34.2)	50 (45)	23 (20.7)
31-35	52 (37.1)	60 (42.8)	28 (20)
36+	39 (36.4)	47 (43.9)	21 (19.6)
<b>Education</b>			
High school	10 (21.2)	25 (53.1)	12 (25.5)
Tertiary	71 (30.3)	113 (48.2)	50 (21.3)
Post-graduate	57 (48.3)	45 (38.1)	16 (13.5)

In relation to carbohydrates consumption (Table 15), most „Pakeha“ (97.7%) reported that they consumed carbohydrates at least once a day, compared to 93.6% for the „Other“ group. The high income group consumed carbohydrates at least once a day (55.6%), but it is the low income group that consumed more often (57.6% twice a day or more). The youngest women reported having carbohydrates at least once a day (58.7%) and the oldest group reported they consumed more often (49.5% more than once a day). The same for the less educated group (57.4%) that had a high consumption of carbohydrates once per day, but the tertiary education group had this food group more often (44.8% twice a day or more).

Table 15: Food frequency carbohydrates item by ethnicity, income, age and education

Variable	Less than once per day	Once per day	Twice per day or more
	n (%)	n (%)	n (%)
<b>Ethnicity</b>			
Pakeha	7 (2.1)	177 (55.1)	137 (42.6)
Others	5 (6.3)	36 (45.5)	38 (48.1)
<b>Income</b>			
<70,000	2 (3.8)	20 (38.4)	30 (57.6)
70-100,000	3 (3.1)	48 (51)	43 (45.7)
100 or more	7 (3.2)	119 (55.6)	88 (41.1)
<b>Age</b>			
16-25	-	27 (58.7)	19 (41.3)



26-30	8 (7.2)	56 (50.4)	47 (42.3)
31-35	3 (2.1)	78 (55.7)	59 (42.1)
36+	1 (0.9)	53 (49.5)	53 (49.5)
<b>Education</b>			
High school	1 (2.1)	27 (57.4)	19 (40.4)
Tertiary	6 (2.5)	123 (52.5)	105 (44.8)
Post-graduate	5 (4.2)	63 (53.3)	50 (42.3)

Pregnant women seemed to have a high consumption of fruit (table 16), approximately 80% of both ethnic groups ate fruit twice per day or more, however, in the comparisons by income, the low income group consumed fruit less often than the other groups (71.1%). In addition, the youngest group and the high school educated group ate fruit less often than their counterparts.

Table 16: Food frequency fruit item by ethnicity, income, age and education

Variable	Less than once per day	Once per day	Twice per day or more
	n (%)	n (%)	n (%)
<b>Ethnicity</b>			
Pakeha	119 (5.9)	45 (14)	257 (80)
Others	5 (6.3)	12 (15.1)	62 (78.4)
<b>Income</b>			
<70,000	6 (11.5)	9 (17.3)	37 (71.1)
70-100,000	6 (6.3)	14 (14.8)	74 (78.7)
100 or more	9 (4.2)	31 (14.4)	174 (78.7)
<b>Age</b>			
16-25	4 (8.7)	11 (23.9)	31 (67.3)
26-30	5 (4.5)	18 (16.2)	88 (79.2)
31-35	7 (5)	17 (12.1)	116 (82.8)
36+	8 (7.4)	15 (14)	84 (78.5)
<b>Education</b>			
High school	5 (10.6)	6 (12.7)	36 (76.6)
Tertiary	17 (7.2)	35 (14.9)	182 (77.7)
Post-graduate	2 (1.6)	16 (13.5)	100 (84.7)

The frequency of water consumption was required in this survey to give an idea about the supposed frequency of exposure to fluorides from this source, by women. If the water that women drink has fluoride, it could be a protective factor against dental decay. Most of the population in this study (around 90%) reported they drank water twice per day or more (table 17).

Table 17: Water frequency by ethnicity, income, age and education

Variable	Less than once per day	Once per day	Twice per day or more
	n (%)	n (%)	n (%)
<b>Ethnicity</b>			
Pakeha	4 (1.2)	20 (6.2)	292 (92.4)
Others	0	8 (10.1)	70 (89.7)
<b>Income</b>			
<70,000	0	3 (5.7)	49 (94.2)
70-100,000	0	7 (7.6)	84 (92.3)
100 or more	4 (1.8)	13 (6)	194 (91.9)
<b>Age</b>			
16-25	0	5 (11.1)	40 (88.8)
26-30	2 (1.8)	4 (3.6)	103 (94.5)
31-35	0	10 (7.3)	127 (92.7)
36+	2 (1.8)	9 (8.4)	96 (89.7)
<b>Education</b>			
High school	0	4 (8.5)	43 (91.4)
Tertiary	4 (1.7)	16 (6.8)	211 (91.3)
Post-graduate	0	8 (6.9)	107 (93)

## 4.2 Results by age group

All age groups reported they had a good or very good (values between 30 – 40%) oral health prior to pregnancy. 43.2% of the youngest group (16 – 25 years old) reported having visited the dentist two years ago or more, while the older group (36 or more years old) reported more recent visits to dentist, 61% had visited the dentist less than one year ago. The main reason for seeing a dentist was for a general check up (32, 44.5, 47.4 and 43.5% respectively from the youngest to the oldest group) followed by cavities or a need for fillings. However, when asked about the usual frequency of visits to the dentist, 45.6% of the 16 – 25 age group reported seeing a dentist just when they had problems, while the other groups (about 40%) reported visiting the dentist once a year. The frequency of brushing teeth, flossing and use of mouth rinse products increased with increasing age (table 18).

The oral hygiene pattern does not differ significantly from before to during pregnancy. However the 26-30 years old group had a lower oral hygiene pattern during pregnancy compared to the other age groups. In respect of eating habits, 69.5% of the youngest age group stated eating more food during pregnancy, while the middle age group reported eating more often (61.2 and 70% respectively to age increase) and the oldest age group reported eating more sugar (47.2%) (table 19).

In relation to the action taken straight after vomiting, the youngest group brushed and rinsed their teeth with water (43.4%). The other groups are correctly more likely just to rinse their teeth (36.9, 31.4 and 28.7% respectively from youngest to oldest age group). Bleeding gums was the main problem noticed in the mouth during pregnancy in all age groups. It is reported in 66.4% of the 31-35 years old, 60.1% of the 36 or over years old, and 56.7% of the 26-30 years old, and 56.5% of the 16-25 years old group. The second problem reported by women in all groups was sensitive teeth (table 19).

Tables 20 and 21 describe data referring to oral health information. The oldest group was more likely to have access to information regarding the care of teeth and gums, while the youngest group was more likely to access information about diet and fluorides. The reason for not seeing a dentist varied between groups. 45.6% of the 16-25 years old group did not see a dentist mainly for economic reasons followed by the thought that it was not

recommended to see a dentist during pregnancy (21.7%). For the 26-30 and 31-35 age groups the first reason was economic and the second reason was a belief that it is not recommended to see a dentist during pregnancy. For the oldest group the main reason was the idea that they should not see a dentist during pregnancy (13.8%).

The majority of the oldest group (52.4%) reported access to dental health information during pregnancy, while 45% of the 31-35 age group, 40.9% of the 26-30 age group and just 28.2% of the 16-25 age group accessed oral health information in their pregnancy. The main source of information was “Media” for all groups. Of similar importance was the information received from dental healthcare workers in the oldest group and 26-30 groups. The youngest group and the 31-35 group reported they received information from lead maternity care workers. All age groups accessed more information related to dental hygiene. At the same level of importance was “diet information” and “oral health diseases information” for youngest group and “dental hygiene” and “oral health diseases” for 31-35 group. The youngest group was more likely to change brushing habits when given advice about dental care, while the oldest group were more likely to change flossing habits when advised. In all questions related to “oral information” the youngest group were significantly more likely to not have access to dental health information during pregnancy (table 21). This is probably connected to the fact that the older groups are more likely to see the dentist for a check up and/or clean during pregnancy (table 22).

In summary, older age groups visit the dentist more regularly, especially for checkups. The main reason for not going to the dentist when pregnant it is because they believed that this is not recommended. As a consequence of more regular contact with dental health care workers, older age groups present with better hygiene patterns and received more information about how to care for teeth and gums from these professionals and they are more likely to improve flossing habits if advised. They are more likely to seek dental health information through books/magazines and on the internet. On the other hand, almost half of the youngest age group reported seeing a dentist just when they had problems (such as toothache and/or cavities). It is important to note that some of the women in this age group reported having been to the dentist just before turning 18 years old, when they are excluded from government funding and probably have to pay for the next dental visit. The main reason that the younger group had not seen the dentist was economic. This group received more information from

their LMC, especially about diet and they were more likely to change brushing habits if advised.

Table 18: Pre-pregnancy oral care by age

Variables	16-25		26-30		31-35		36+	
	n	(%)	n	(%)	n	(%)	n	(%)
<b>How would you describe the health of your teeth and mouth</b>								
Excellent	6	(13)	14	(12.6)	16	(11.4)	20	(18.5)
Very Good	14	(30.4)	48	(43.2)	47	(33.5)	33	(30.5)
Good	20	(43.4)	39	(35.1)	55	(39.2)	45	(41.6)
Fair	6	(13)	7	(6.3)	19	(13.5)	9	(8.3)
Poor	-	-	3	(2.7)	3	(2.1)	1	(0.9)
<b>Last visit to the dentist</b>								
Less than 1 year ago	19	(41.3)	54	(48.6)	64	(45.7)	66	(61.1)
1 year ago	7	(15.2)	27	(24.3)	33	(23.5)	14	(12.9)
2 years or more	20	(43.4)	30	(27)	43	(30.7)	28	(25.9)
<b>What was the main reason for visited the dentist</b>								
Bleeding gums	2	(4.3)	6	(5.4)	5	(3.6)	6	(5.5)
Cavities or needed filling	13	(28.2)	25	(22.7)	24	(17.2)	14	(12.9)
Loose teeth	1	(2.1)	-	-	1	(0.7)	1	(0.9)
Toothache	4	(8.7)	7	(6.3)	8	(5.7)	9	(8.3)
Sensitive teeth	2	(4.3)	2	(1.8)	9	(6.4)	5	(4.6)
Ck	15	(32.6)	49	(44.5)	66	(47.4)	47	(43.5)
Ck and/or clean	2	(4.3)	9	(8.1)	9	(6.4)	14	(12.9)
Others	7	(15.2)	12	(10.9)	17	(12.2)	12	(11.1)
<b>How often do you normally see a dentist</b>								
Once every 6 months	1	(2.1)	13	(11.7)	14	(10)	17	(15.7)
Once a year	14	(30.4)	46	(41.4)	56	(40)	45	(41.6)
Once every two years or more	8	(17.3)	17	(15.3)	46	(32.8)	27	(25)
Just when I have a problem or need treatment	21	(45.6)	32	(28.8)	23	(16.4)	18	(16.6)

Never	2	(4.3)	3	(2.7)	1	(0.7)	1	(0.9)
<b>How often brush your teeth</b>								
Twice or more a day	36	(78.2)	86	(78.9)	112	(80)	93	(86.1)
Once a day	7	(15.2)	23	(21.1)	28	(20)	14	(12.9)
Not every day	3	(6.5)	-	-	-	-	1	(0.9)
<b>How often floss your teeth</b>								
Twice or more a day	-	-	1	(0.9)	6	(4.2)	3	(2.7)
Once a day	6	(13)	12	(11)	20	(14.2)	21	(19.4)
Not every day	18	(39.1)	70	(64.2)	81	(57.8)	66	(61.1)
Never	22	(47.8)	26	(23.8)	33	(23.5)	18	(16.6)
<b>Use mouth rinse</b>								
Yes	15	(32.6)	37	(33.9)	47	(33.5)	38	(35.1)
No	31	(67.3)	72	(66)	93	(66.4)	70	(64.8)

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Table 19: Current pregnancy oral care by age

Variables	16-25		26-30		31-35		36+	
	n	(%)	n	(%)	n	(%)	n	(%)
<b>How often brush your teeth</b>								
Twice or more a day	37	(80.4)	87	(79.8)	115	(82.1)	94	(87)
Once a day	8	(17.3)	22	(20.1)	25	(17.8)	13	(12)
Not every day	1	(2.1)	-	-	-	-	1	(0.9)
<b>How often floss your teeth</b>								
Twice or more a day	-	-	2	(1.8)	6	(4.2)	1	(0.9)
Once a day	9	(19.5)	11	(10)	24	(17.1)	22	(20.3)
Not every day	16	(34.7)	68	(62.3)	77	(55)	65	(60.1)
Never	21	(45.6)	28	(25.6)	33	(23.5)	20	(18.5)
<b>Use mouth rinse</b>								
Yes	14	(30.4)	25	(22.5)	46	(32.8)	34	(31.7)
No	32	(69.5)	86	(77.4)	94	(67.1)	73	(68.2)
<b>Changes eating habits</b>								
Eating more food	32	(69.5)	59	(53.1)	79	(56.4)	58	(53.7)
Eating more often	25	(54.3)	68	(61.2)	98	(70)	55	(50)
Eating more sugar	15	(32.6)	47	(42.3)	61	(43.5)	51	(47.2)
Other	4	(8.7)	11	(9.9)	16	(11.4)	17	(15.7)
No changes	5	(10.8)	14	(12.6)	9	(6.4)	12	(11.1)
<b>What did you do after vomiting</b>								
Brushed teeth	20	(43.4)	25	(22.5)	34	(24.2)	27	(25)
Rinsed mouth with water	20	(43.4)	41	(36.9)	44	(31.4)	31	(28.7)
Rinsed mouth with mouth rinse products	-	-	2	(1.8)	6	(4.2)	5	(4.6)
Drank/ate something	10	(21.7)	15	(13.5)	31	(22.1)	14	(12.9)
Did not do anything	4	(8.7)	4	(3.6)	6	(4.2)	3	(2.7)
Did not have vomiting	11	(23.9)	59	(53.1)	66	(47.1)	61	(56.4)



**Changes/Problems mouth**

Bleeding gums	26	(56.5)	63	(56.7)	93	(66.4)	65	(60.1)
Cavities or needed filings	4	(8.7)	5	(4.5)	7	(5)	5	(4.6)
Loose teeth	-	-	1	(0.9)	3	(2.1)	4	(3.7)
Toothache	4	(8.7)	5	(4.5)	7	(5)	6	(5.5)
Sensitive teeth	8	(17.3)	18	(16.2)	15	(10.7)	20	(18.5)
Other	2	(4.3)	5	(4.5)	11	(7.8)	6	(5.5)
No changes								

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Table 20: Oral healthcare advice by age

Variables	16-25		26-30		31-35		36+	
	n	(%)	n	(%)	n	(%)	n	(%)
<b>Dental healthcare worker provided information about care for teeth and gums</b>								
Yes	6	(13)	26	(23.4)	34	(24.2)	39	(36.1)
No	7	(15.2)	7	(6.3)	11	(7.8)	10	(9.2)
Haven't seen a dentist or dental healthcare worker	33	(71.7)	78	(70.2)	95	(67.8)	59	(54.6)
<b>Dental healthcare worker provided information about diet</b>								
Yes	3	(6.5)	6	(5.4)	6	(4.2)	6	(5.6)
No	9	(19.5)	27	(24.3)	38	(27.1)	42	(39.2)
Haven't seen a dentist or dental healthcare worker	34	(73.9)	78	(70.2)	96	(68.5)	59	(55.1)
<b>Dental healthcare worker provided information about fluorides</b>								
Yes	3	(6.5)	6	(5.4)	6	(4.2)	2	(1.8)
No	9	(19.5)	27	(24.3)	39	(27.8)	46	(42.9)
Haven't seen a dentist or dental healthcare worker	34	(73.9)	78	(70.2)	95	(67.8)	59	(55.1)
<b>Reason for not seeing the dentist</b>								
Too expensive	21	(45.6)	21	(18.9)	21	(15)	13	(12)
Had no time	4	(8.7)	7	(6.3)	7	(5)	5	(4.6)

I am afraid of dentists	2	(4.3)	8	(7.2)	7	(5)	3	(2.7)
I thought it was not recommended	10	(21.7)	15	(13.5)	19	(13.5)	15	(13.8)
Other	3	(6.5)	11	(9.9)	11	(7.8)	8	(7.4)
I did needed to see the dentist	16	(34.7)	43	(38.7)	55	(39.2)	36	(33.3)

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Table 21: Information about oral health by age

Variables	16-25		26-30		31-35		36+	
	n	(%)	n	(%)	n	(%)	n	(%)
<b>Have you received any information about dental health</b>								
Yes, in this current pregnancy	13	(28.2)	45	(40.9)	63	(45)	54	(52.4)
Yes, in a previous pregnancy	-	-	1	(0.9)	4	(2.8)	6	(5.8)
No, never	33	(71.7)	64	(58.1)	73	(52.1)	43	(41.7)
<b>Where did you obtain/ who gave the information</b>								
Dental healthcare workers	5	(10.8)	15	(13.5)	14	(10)	23	(21.3)
Lead Maternity Care workers	6	(13)	14	(12.6)	15	(10.7)	16	(14.8)
Media	7	(15.2)	21	(18.9)	44	(31.4)	23	(21.3)
Others	1	(2.1)	3	(2.7)	3	(2.1)	3	(2.7)
Have not received any information	27	(58.7)	58	(52.2)	64	(45.7)	43	(39.8)
<b>Information related to</b>								
Dental hygiene	9	(19.5)	22	(19.8)	21	(15)	30	(27.7)
Diet	9	(19.5)	16	(14.4)	17	(12.1)	17	(15.7)
Oral health diseases	3	(6.5)	12	(10.8)	21	(15)	15	(13.8)
Babies' oral health	4	(8.7)	5	(4.5)	11	(7.8)	10	(9.2)
Association between oral problems and general health	3	(6.5)	4	(3.6)	13	(9.2)	9	(8.3)
Other	4	(8.7)	20	(18)	32	(22.8)	18	(16.6)
Have not received any information	29	(63)	61	(54.9)	65	(46.4)	41	(37.9)
<b>Changed practices as consequence of receiving</b>								

**information**

Changed brushing	5	(10.8)	7	(6.3)	11	(7.8)	9	(8.3)
Changed flossing	1	(2.1)	9	(8.1)	12	(8.5)	12	(11.1)
Changed dietary habits	2	(4.3)	5	(4.5)	5	(3.5)	5	(4.6)
Went to see the dentist	2	(4.3)	7	(6.3)	6	(4.2)	5	(4.6)
Others	2	(4.3)	-	-	8	(5.7)	3	(2.7)
No changes	11	(23.9)	47	(42.3)	55	(39.2)	44	(40.7)
Have not received any information	27	(58.7)	50	(45)	56	(40)	39	(36.1)

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Table 22: Antenatal care by age

Variables	16-25		26-30		31-35		36+	
	n	(%)	n	(%)	n	(%)	n	(%)
<b>Antenatal care from</b>								
Midwife	44	(95.6)	99	(89.1)	122	(87.1)	90	(83.3)
GP	7	(15.2)	13	(11.7)	11	(7.8)	12	(11.1)
Obstetrician	4	(8.7)	23	(20.7)	36	(25.7)	41	(37.9)
Parental classes	29	(63)	70	(63)	85	(60.7)	67	(62)
None	-	-	2	(1.8)	3	(2.1)	1	(0.9)
Other	3	(6.5)	7	(6.3)	10	(7.1)	6	(5.5)
<b>Have seen dentist for check up and/or clean</b>								
Yes	12	(26)	33	(29.7)	39	(27.8)	47	(43.5)
No	34	(73.9)	78	(70.2)	101	(72.1)	61	(56.4)
<b>Have needed to see a dentist</b>								
Yes	8	(17.3)	15	(13.5)	20	(14.2)	20	(18.5)
No	38	(82.6)	96	(86.4)	120	(85.7)	88	(81.4)

### 4.3 Results by ethnic group

The average age for „Pakeha“ mothers was 31.8 (standard deviation 4.7) with the minimum age of 16 and maximum age of 45 years old. For „Others“ group the average age was 29.3 (standard deviation 5.7), minimum age of 16 and maximum age of 43 years old.

Table 23 shows that most of the women from both ethnic groups in this survey were satisfied with the condition of their mouths prior to pregnancy. However, 3.8% of the „Others“ group reported their oral health as poor, while just 0.9% of the „Pakeha“ group considered their oral health poor. The „Pakeha“ group reported visiting the dentist slightly more frequent than the „Others“ group, but the main reasons for the visit differed between groups. 47.9% of the „Pakeha“ visited the dentist for regular check ups, followed by the need for fillings. Just 29.1% of the „Others“ group went to the dentist for check ups. 26.5% went because they needed fillings and 8.8% had toothache. Going to the dentist just when “I have a problem or need treatment” is more frequent within the „Others“ ethnic group. The hygiene habits are similar in both groups, but the „Others“ group reported slightly more use of dental floss.

Both ethnic groups reported changes in their eating habits during pregnancy. The „Others“ group reported eating more (62%) and more often (64.5%) during pregnancy than the Pakeha group (55.1 and 60.1% respectively), but the „Pakeha“ group reported eating more sugar (43.3%) than the „Others“ group (41.7%). Both groups reported to rinse and brush their teeth after vomiting, with the „Others“ group more likely to eat or drink something than the „Pakeha“ group. The main changes in the mouth during pregnancy were bleeding gums (61.3% „Pakeha“ and 60.7% „Others“) and sensitive teeth (14.9% „Pakeha“ and 16.4% „Others“) for both groups. Toothache and cavities were also important problems in the „Others“ group (table 24).

Table 25 shows that „Pakeha“ were more likely to visit the dentist or other health care worker and consequently more likely to receive information about care for teeth and gums and diet. The main reason for „Others“ group not seeing a dentist was economic (27.8%), followed by “believe that is not recommended” (18.9%) and “had no time” (8.8%). For „Pakeha“, the reasons were, firstly, the price of the dental visit (16.5%), thinking that it is not recommended (13.7%), followed by reporting being afraid of the dentist (5.3%). Almost half of the „Pakeha“

women (47.1%) stated that they had access to dental health information, while 30.3% of the „Others“ group reported the same (table 26). The „Pakeha“ group is more likely to seek information from the media and dental healthcare workers and this is more often related to dental hygiene. The „Others“ are more likely to obtain information from Lead Maternity Carers, and more often about diet. As a consequence of this information, 10.1% of the „Others“ changed their brushing habits and 8.7% of „Pakeha“ changed their flossing habits. „Pakeha“ are more likely to have seen a dentist for a check up and/or clean, but „Others“ are more likely to state that they needed to do it. „Pakeha“ are also more likely to see a specialist (Obstetrician) for antenatal care than “Others” (table 27).

In summary, pakeha visit the dentist more regularly for checkups than women of other ethnicities. They have more access to information related to hygiene from media and dental workers. More of the „Other“ groups reported they had poor oral health than the „Pakeha“ group. The „Others“ group also reported seeing the dentist when they had problems such as toothache or needed fillings. They received more information from their LMC about diet.



Table 23: Pre-pregnancy oral care by ethnicity

Variables	Pakeha		Others	
	n	(%)	n	(%)
<b>How would you describe the health of your teeth and mouth</b>				
Excellent	44	(13.7)	11	(13.9)
Very Good	120	(37.3)	20	(25.3)
Good	120	(37.3)	38	(48.1)
Fair	34	(10.5)	7	(8.8)
Poor	3	(0.9)	3	(3.8)
<b>Last visit to the dentist</b>				
Less than 1 year ago	161	(50.1)	37	(46.8)
1 year ago	65	(20.2)	16	(20.2)
2 years or more	95	(29.6)	26	(32.9)
<b>What was the main reason for visited the dentist</b>				
Bleeding gums	13	(4)	5	(6.3)
Cavities or needed filling	54	(16.9)	21	(26.5)
Loose teeth	1	(0.3)	1	(1.2)
Toothache	21	(6.5)	7	(8.8)
Sensitive teeth	16	(5)	2	(2.5)
Check up	153	(47.9)	23	(29.1)
Check up and/or clean	26	(8.1)	7	(8.8)
Others	35	(10.9)	13	(16.4)
<b>How often do you normally see a dentist</b>				
Once every 6 months	39	(12.1)	5	(6.3)
Once a year	129	(40.1)	28	(35.4)
Once every two years or more	79	(24.6)	19	(24)
Just when I have a problem or need treatment	72	(22.4)	22	(27.8)

Never	2	(0.6)	5	(6.3)
<b>How often brush your teeth</b>				
Twice or more a day	259	(80.9)	63	(80.7)
Once a day	57	(17.8)	15	(19.2)
Not every day	4	(1.2)	-	-
<b>How often floss your teeth</b>				
Twice or more a day	7	(2.1)	2	(2.5)
Once a day	45	(14)	14	(17.9)
Not every day	191	(59.6)	41	(52.5)
Never	77	(24)	21	(26.9)
<b>Use mouth rinse</b>				
Yes	107	(33.4)	26	(33.3)
No	213	(66.5)	52	(66.6)

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Table 24: Current pregnancy by ethnicity

Variables	Pakeha		Others	
	n	(%)	n	(%)
<b>How often brush your teeth</b>				
Twice or more a day	264	(82.5)	64	(82)
Once a day	54	(16.8)	14	(17.9)
Not every day	2	(0.6)	-	-
<b>How often floss your teeth</b>				
Twice or more a day	8	(2.5)	1	(1.2)
Once a day	48	(15)	17	(21.7)
Not every day	182	(56.8)	41	(52.5)
Never	82	(25.6)	19	(24.3)
<b>Use mouth rinse</b>				
Yes	95	(29.6)	21	(26.5)
No	226	(70.4)	58	(73.4)
<b>Changes eating habits</b>				
Eating more food	177	(55.1)	49	(62)
Eating more often	193	(60.1)	51	(64.5)
Eating more sugar	139	(43.3)	33	(41.7)
Other	39	(12.1)	9	(11.3)
No changes	30	(9.3)	9	(11.3)
<b>What did you do after vomiting</b>				
Brushed teeth	86	(26.7)	19	(24)
Rinsed mouth with water	107	(33.3)	28	(35.4)
Rinsed mouth with mouth rinse products	13	(4)	-	-
Drank/ate something	51	(15.8)	19	(24)
Did not do anything	9	(2.8)	6	(7.5)
Did not have vomiting	162	(50.4)	34	(43)
<b>Changes/Problems mouth</b>				

Bleeding gums	197	(61.3)	48	(60.7)
Cavities or needed filings	14	(4.3)	6	(7.5)
Loose teeth	5	(1.5)	2	(2.5)
Toothache	14	(4.3)	7	(8.8)
Sensitive teeth	48	(14.9)	13	(16.4)
Other	20	(6.2)	4	(5)
No changes	98	(30.5)	26	(32.9)

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Table 25: Dental healthcare advice by ethnicity

Variables	Pakeha		Others	
	n	(%)	n	(%)
<b>Dental healthcare worker provided information about care for teeth and gums</b>				
Yes	87	(27.1)	16	(20.2)
No	26	(8.1)	6	(7.5)
Haven't seen a dentist or dental healthcare worker	208	(64.8)	57	(72.1)
<b>Dental healthcare worker provided information about diet</b>				
Yes	18	(5.6)	3	(3.8)
No	93	(29)	18	(22.7)
Haven't seen a dentist or dental healthcare worker	209	(65.3)	58	(73.4)
<b>Dental healthcare worker provided information about fluorides</b>				
Yes	13	(4)	4	(5)
No	98	(30.6)	18	(22.7)
Haven't seen a dentist or dental healthcare worker	209	(65.3)	57	(72.1)
<b>Reason for not seeing the dentist</b>				
Too expensive	53	(16.5)	22	(27.8)
Had no time	16	(4.9)	7	(8.8)
I am afraid of dentists	17	(5.3)	3	(3.8)
I thought it was not recommended	44	(13.7)	15	(18.9)
Other	27	(8.4)	6	(7.5)
I did needed to see the dentist	122	(38)	27	(34.1)

Table 26: Information about oral health by ethnicity

Variables	Pakeha		Others	
	n	(%)	n	(%)
<b>Have you received any information about dental health</b>				
Yes, in this current pregnancy	150	(47.1)	24	(30.3)
Yes, in a previous pregnancy	10	(3.1)	1	(1.2)
No, never	158	(49.6)	54	(68.3)
<b>Where did you obtain/ who gave the information</b>				
Dental healthcare workers	49	(15.2)	8	(10.1)
Lead Maternity Carer	36	(11.2)	15	(18.9)
Media	85	(26.4)	9	(11.3)
Others	5	(1.5)	5	(6.3)
Have not received any information	146	(45.4)	42	(53.1)
<b>Information related to</b>				
Dental hygiene	68	(21.1)	14	(17.7)
Diet	44	(13.7)	15	(18.9)
Oral health diseases	40	(12.4)	11	(13.9)
Babies' oral health	19	(5.9)	11	(13.9)
Association between oral problems and general health	19	(5.9)	10	(12.6)
Other	68	(21.1)	6	(7.5)
Have not received any information	152	(47.3)	42	(53.1)
<b>Changed practices as consequence of receiving information</b>				
Changed brushing	24	(7.4)	8	(10.1)
Changed flossing	28	(8.7)	6	(7.5)
Changed dietary habits	12	(3.7)	5	(6.3)
Went to see the dentist	16	(4.9)	4	(5)

Others	9	(2.8)	4	(5)
No changes	133	(41.4)	24	(30.3)
Have not received any information	131	(40.8)	39	(49.3)

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Table 27: Antenatal care by ethnicity

Variables	Pakeha		Others	
	n	(%)	n	(%)
<b>Antenatal care from</b>				
Midwife	281	(87.5)	70	(88.6)
GP	33	(10.2)	10	(12.6)
Obstetrician	95	(29.6)	9	(11.3)
Parents' classes	199	(61.9)	47	(59.4)
None	4	(1.2)	2	(2.5)
Other	19	(5.9)	7	(8.8)
<b>Have seen dentist for check up and/or clean</b>				
Yes	108	(33.6)	18	(22.7)
No	213	(66.3)	61	(77.2)
<b>Have needed to see a dentist</b>				
Yes	48	(14.9)	12	(15.1)
No	273	(85)	67	(84.8)



#### 4.4 Results by educational level

Independent of the educational level, women were satisfied with the condition of their mouth and teeth prior to pregnancy. Most of the women found the health of their teeth and gums were good and very good. Most of the women in all education groups had visited the dentist one year or less prior to pregnancy. The main reason for seeing a dentist differed between the education groups. The lower education level group was more likely to visit the dentist for bleeding gums (8.5% of the high school group) and sensitive teeth (6.3% of the high school group) while the highest education level groups were more likely to visit the dentist for checkups (52.9% of the postgraduate group) and or fillings (17% of the postgraduate group). The frequency of visits to the dentist also differs between education groups, women in the lower education level group were more likely to visit the dentist when they had a problem (34% of high school group), while those in the higher education groups were more likely to see the dentist regularly (46.6% of the postgraduate group see a dentist once a year). The „tertiary group“ and „postgraduate group“ report more frequent dental hygiene, with more frequent brushing and flossing (table 28).

During pregnancy (table 29) the oral hygiene patterns seem to remain the same as prior to pregnancy. The highest education level group present with more frequent brushing and flossing. In relation to changes in eating habits the three groups reported an increase in the amount eaten. The „postgraduate group“ reported eating more often (69.4%) and the „high school group“ stated they ate more sugar (51%) during pregnancy. The action taken straight after vomiting for about 50% of the sample studied who reported this symptom did not differ between groups. However when changes and problems in the mouth during pregnancy were reported, the postgraduate group reported more frequent symptoms of gum disease such as bleeding gums and loose teeth, which in this case could be related to age (older age people are more likely to have periodontal disease). The „high school group“ and the „tertiary group“ reported toothache and the need for fillings more often, probably related to not seeing the dentist regularly.

In relation to information about dental care during pregnancy, tables 30 and 31 show that the highest education group was more likely to have access to information related to teeth and gums (29.6%), while the lowest education group reported to have access to more information

related to diet (8.5%). None of the groups seems to receive advice on fluorides. The major obstacle to not seeing the dentist is economic for the lowest education group (29.7%), while for the highest education group it is the thought that it was not recommended to see the dentist during pregnancy (17.8%) and/or for not perceiving the need for a dental visit (41.5%).

More than 40% of the population surveyed had access to oral health information during pregnancy but the source of information differs between education level groups. The postgraduate group received information from dental health workers (16.1%) and sought information from media sources (33%), while the „high school group“ received information from maternity care workers (27.6%). The highest education group seems to have more access to information related to dental hygiene (24.5%) and the lowest education group to information related to diet (23.4%). As a consequence of advice on dental care the „postgraduate group“ changed their flossing habits (10.1%), while the „high school group“ was more likely to change brushing (10.6%) and diet (8.5%) habits, and was more likely to see the dentist (8.5%) when advised.

The majority of the „high school group“ received antenatal care from midwives (93.6%), while there were more postgraduate women receiving antenatal care from obstetricians (33%). The highest education level group went to see the dentist more often in comparison to the lower education level group; however, it was the lower education level who reported more need to see the dentist than higher education level (table 32).

In conclusion, the women with the highest education level visited the dentist more regularly for a check up. They had more access to information, especially about the care of teeth and gums and they seemed more proactive seeking information from a media source. The lower education level group, on the other hand, received more information from their LMC about diet basically, but were more likely to change hygiene habits when information was received.

Table 28: Pre-pregnancy by education

Variable	High school		Tertiary		Post-graduate	
	n	(%)	n	(%)	n	(%)
<b>How would you describe the health of your teeth and mouth</b>						
Excellent	2	(4.2)	37	(15.8)	15	(12.7)
Very Good	19	(40.4)	78	(33.3)	43	(36.4)
Good	19	(40.4)	92	(39.3)	47	(39.8)
Fair	7	(14.8)	22	(9.4)	12	(10.1)
Poor	-	-	5	(2.14)	1	(0.8)
<b>Last visit to the dentist</b>						
Less than 1 year ago	26	(55.3)	110	(47)	61	(51.6)
1 year ago	7	(14.8)	46	(19.6)	28	(23.7)
2 years or more	14	(29.7)	78	(33.3)	29	(24.5)
<b>What was the main reason for visiting the dentist</b>						
Bleeding gums	4	(8.5)	11	(4.7)	3	(2.5)
Cavities or needed filling	6	(12.7)	49	(21)	20	(17)
Loose teeth	-	-	2	(0.8)	-	-
Toothache	3	(6.3)	18	(7.7)	7	(5.9)
Sensitive teeth	3	(6.3)	10	(4.2)	5	(4.2)
Ck	16	(34)	98	(42)	62	(52.9)
Ck and/or clean	4	(8.5)	22	(9.4)	7	(5.9)
Others	11	(23.4)	23	(9.8)	13	(11.1)
<b>How often do you normally see a dentist</b>						
Once every 6 months	5	(10.6)	27	(11.5)	12	(10.1)
Once a year	17	(36.1)	85	(36.3)	55	(46.6)
Once every two years or more	8	(17)	60	(25.6)	29	(24.5)
Just when I have a problem or need	16	(34)	57	(24.3)	21	(17.8)

treatment						
Never	1	(2.1)	5	(2.1)	1	(0.8)
<b>How often brush your teeth</b>						
Twice or more a day	30	(63.8)	191	(82.3)	100	(84.7)
Once a day	14	(29.7)	40	(17.2)	18	(15.2)
Not every day	3	(6.3)	1	(0.4)	-	-
<b>How often floss your teeth</b>						
Twice or more a day	-	-	6	(2.5)	3	(2.5)
Once a day	6	(12.7)	31	(13.3)	22	(18.6)
Not every day	26	(55.3)	132	(56.9)	73	(61.8)
Never	15	(31.9)	63	(27.1)	20	(16.9)
<b>Use mouth rinse</b>						
Yes	17	(36.1)	85	(36.6)	31	(26.2)
No	30	(63.8)	147	(63.3)	87	(73.7)

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Table 29: Current pregnancy by Education

Variable	High school		Tertiary		Post-graduate	
	n	(%)	n	(%)	n	(%)
<b>How often brush your teeth</b>						
Twice or more a day	33	(70.2)	192	(82.7)	102	(86.4)
Once a day	13	(27.6)	39	(16.8)	16	(13.5)
Not every day	1	(2.1)	1	(0.4)	-	-
<b>How often floss your teeth</b>						
Twice or more a day	-	-	5	(2.1)	4	(3.3)
Once a day	7	(14.8)	36	(15.5)	22	(18.6)
Not every day	27	(57.5)	125	(53.8)	70	(59.3)
Never	13	(27.6)	66	(28.4)	22	(18.6)
<b>Use mouth rinse</b>						
Yes	15	(31.9)	70	(29.9)	31	(26.2)
No	32	(68)	164	(70)	87	(73.7)
<b>Changes eating habits</b>						
Eating more food	27	(57.4)	129	(55.1)	70	(59.32)
Eating more often	24	(51)	137	(58.5)	82	(69.4)
Eating more sugar	24	(51)	97	(41.4)	51	(43.2)
Other	2	(4.2)	34	(14.5)	12	(10.1)
No changes	7	(14.8)	21	(8.9)	1	(16.6)
<b>What did you do after vomiting</b>						
Brushed teeth	14	(29.7)	60	(25.6)	31	(26.2)
Rinsed mouth with water	18	(38.3)	71	(30.3)	46	(38.9)
Rinsed mouth with mouth rinse products	2	(4.2)	7	(2.9)	4	(3.3)
Drank/ate something	7	(14.8)	42	(17.9)	21	(17.8)
Did not do anything	3	(6.3)	9	(3.8)	3	(2.5)
Did not have vomiting	22	(46.8)	117	(50)	56	(47.4)
<b>Changes/Problems mouth</b>						

Bleeding gums	27	(57.4)	139	(59.4)	78	(66.1)
Cavities or needed filings	3	(6.3)	15	(6.4)	2	(1.6)
Loose teeth	1	(2.1)	4	(1.7)	1	(16.6)
Toothache	4	(8.5)	15	(6.4)	2	(1.6)
Sensitive teeth	7	(14.8)	37	(15.8)	17	(14.4)
Other	18	(38.3)	74	(31.6)	32	(27.1)
No changes						

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Table 30: Dental healthcare by education

Variable	High school		Tertiary		Post-graduate	
	n	(%)	n	(%)	n	(%)
<b>Dental healthcare worker provided information about care for teeth and gums</b>						
Yes	11	(23.4)	57	(24.3)	35	(29.6)
No	6	(12.7)	19	(8.1)	7	(5.3)
Haven't seen a dentist or dental healthcare worker	30	(63.8)	158	(67.5)	76	(64.4)
<b>Dental healthcare worker provided information about diet</b>						
Yes	4	(8.5)	12	(5.1)	5	(4.2)
No	13	(27.6)	61	(26.1)	37	(31.3)
Haven't seen a dentist or dental healthcare worker	30	(63.8)	160	(68.6)	76	(64.4)
<b>Dental healthcare worker provided information about fluorides</b>						
Yes	2	(4.2)	10	(4.2)	5	(4.2)
No	15	(31.9)	64	(27.4)	37	(31.3)
Haven't seen a dentist or dental healthcare worker	30	(63.8)	159	(68.2)	76	(64.4)
<b>Reason for not seeing the dentist</b>						
Too expensive	14	(29.7)	47	(20)	14	(11.8)
Had no time	-	-	15	(6.4)	8	(6.7)
I am afraid of dentists	2	(4.2)	12	(5.1)	6	(5)
I thought it was not recommended	6	(12.7)	32	(13.6)	21	(17.8)
Other	5	(10.6)	17	(7.2)	11	(9.30)
I did needed to see the dentist	13	(27.6)	87	(37.1)	49	(41.5)

Table 31: Information about oral health by education

Variable	High school		Tertiary		Post-graduate	
	n	(%)	n	(%)	n	(%)
<b>Have you received any information about dental health</b>						
Yes, in this current pregnancy	21	(45.6)	97	(41.8)	56	(47.4)
Yes, in a previous pregnancy	-	-	5	(2.1)	6	(5)
No, never	25	(54.3)	130	(56)	56	(47.4)
<b>Where did you obtain/ who gave the information</b>						
Dental healthcare workers	6	(12.7)	32	(13.6)	19	(16.1)
Lead Maternity Carer	13	(27.6)	27	(11.5)	11	(9.3)
Media	4	(8.5)	51	(21.7)	39	(33)
Others	1	(2.1)	8	(3.4)	1	(0.8)
Have not received any information	23	(48.9)	116	(49.5)	48	(40.6)
<b>Information related to</b>						
Dental hygiene	8	(17)	45	(19.2)	29	(24.5)
Diet	11	(23.4)	31	(13.2)	17	(14.4)
Oral health diseases	6	(12.7)	27	(11.5)	18	(15.2)
Babies oral health	5	(10.6)	19	(8.1)	6	(5)
Association between oral problems and general health	5	(10.6)	18	(7.6)	6	(5)
Other	7	(14.8)	41	(17.5)	26	(22)
Have not received any information	21	(44.6)	119	(50.8)	53	(44.9)
<b>Changed practices as consequence of receiving information</b>						
Changed brushing	5	(10.6)	20	(8.5)	7	(5.9)
Changed flossing	2	(4.2)	20	(8.5)	12	(10.1)
Changed dietary habits	4	(8.5)	6	(2.5)	7	(5.9)
Went to see the dentist	4	(8.5)	9	(3.8)	7	(5.9)



Others	3	(6.3)	6	(2.5)	4	(3.3)
No changes	16	(34)	94	(40.1)	47	(39.8)
Have not received any information	21	(44.6)	103	(44)	45	(38.1)

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Table 32: Antenatal care by education

Variable	High school		Tertiary		Post-graduate	
	n	(%)	n	(%)	n	(%)
<b>Antenatal care from</b>						
Midwife	44	(93.6)	205	(87.6)	101	(85.5)
GP	4	(8.5)	25	(10.6)	14	(11.8)
Obstetrician	6	(12.7)	59	(25.2)	39	(33)
Parental classes	24	(51)	145	(61.9)	76	(64.4)
None	-	-	2	(0.8)	4	(3.3)
Other	2	(4.2)	15	(6.4)	9	(7.6)
<b>Have seen dentist for check up and/or clean</b>						
Yes	15	(31.9)	72	(30.7)	39	(33)
No	32	(68)	162	(69.2)	79	(66.9)
<b>Have needed to see a dentist</b>						
Yes	8	(17)	36	(15.3)	16	(13.5)
No	39	(82.9)	198	(84.6)	102	(86.4)

## 4.5 Results by income

Table 33 describes the women's self-reported oral health status before pregnancy. There are no significant differences between income groups in relation to the satisfaction with their mouth condition. The majority of women describe the health of their teeth and mouth as good and/or very good. However, in relation to the last visit to the dentist there are differences between groups, 53.7% of the highest income group, 46.8% of the middle income group and 34.6% of the lowest income group had visited the dentist within the previous year. Less frequent visits to the dentist (two years ago or more) can be connected to lower income. The reason for visiting the dentist varied between groups as well. The higher income group was more likely to visit the dentist for regular checkups and/or a clean than for other reasons. The lower income group, on the other hand, was more likely to see the dentist just when they had problems (40.3%). The high income group reported a high standard of oral hygiene, brushing their teeth, using the floss at least once a day and using a mouth rinse more often than the lower income group.

When pregnant, the women in all groups seemed to be slightly more concerned about oral hygiene than prior to their pregnancy. The middle and high income groups reported a higher frequency of a change in eating habits (57.4% and 65.4% respectively) and the amount (53.1% and 57.4% respectively) of food eaten during pregnancy, while the low income group reported an increase in sugar consumption (46.1%). The women who had vomiting during their pregnancy normally brushed their teeth and rinsed with water. The change and/or problem noticed more often in all three groups was bleeding gums, 57.6% for income up to NZ\$70,000, 64.8% for income between NZ\$70,000 and NZ\$100,000 and 62.1% for NZ\$100,000 or over income group. Sensitive teeth and toothache were reported more in the lowest income (table 34).

Tables 35 and 36 show the association between income and oral health information. Women from a higher income group stated they were more informed about the care of teeth and gums and fluorides, while those from the medium income group were less informed about diet. The reason for not seeing a dentist is clearly economic for low income women (42.3%) and also the idea that it is not recommended to see a dentist during pregnancy is relevant for this group (23%). For the medium income group the reasons for not seeing a dentist are firstly economic

(25.5%), then thinking that it is not recommended (18%), followed by being afraid of dentists (11.7%) and a lack of time (10.6%). For the highest income group the idea that it is not recommended (13%) is the first reason for not seeing the dentist. Just 23% of the lower income group had access to dental health information during pregnancy compared to 54.2% of the medium income group and 44.9% of the higher income group.

The main source of information for all groups was the media such as pregnancy books, pregnancy websites, pregnancy pamphlets and folders. The lowest income group was better informed about diet (17.3%), while the medium and highest income group was better informed about dental hygiene (24.4% and 20.5% respectively). However, the lowest income group was more likely to change brushing habits (19.2%) when informed about dental health. The interviewed pregnant women in the survey whose household income was equal to or over NZ\$70,000 were more likely to have had antenatal care from obstetricians and frequent antenatal classes when compared with women with household incomes less than \$70,000. The wealthier groups are also more likely to go to see a dentist for checkups and/or clean while the less wealthy group reported more need to see a dentist (table 37).

In summary, the higher income group visited the dentist more often for regular check ups and reported a higher dental hygiene standard. They are better informed about how to look after teeth and gums. The main reason for not seeing a dentist during pregnancy was the belief that it was not recommended. For low income people visits to the dentist were sporadic, due to economic reasons, and normally only when they had problems such as toothache. This group normally received more information about diet from their LMC.

Table 33: Pre-pregnancy dental care by income

Variable	< 70,000		70,001 – 100,000		100,001 – or more	
	n	(%)	n	(%)	n	(%)
<b>How would you describe the health of your teeth and mouth</b>						
Excellent	2	(3.8)	6	(6.38)	38	(17.7)
Very Good	19	(36.5)	33	(35.1)	79	(36.9)
Good	23	(44.2)	41	(43.6)	77	(35.9)
Fair	7	(13.4)	14	(14.8)	17	(7.9)
Poor	1	(1.9)	-	-	3	(1.4)
<b>Last visit to the dentist</b>						
Less than 1 year ago	18	(34.6)	44	(46.8)	115	(53.7)
1 year ago	10	(19.2)	19	(20.2)	47	(21.9)
2 years or more	24	(46.15)	31	(32.9)	52	(24.3)
<b>What was the main reason for visiting the dentist</b>						
Bleeding gums	2	(3.8)	6	(6.4)	7	(3.2)
Cavities or needed filling	11	(21.1)	22	(23.6)	36	(16.9)
Loose teeth	-	-	1	(1)	1	(0.4)
Toothache	3	(5.7)	9	(9.6)	14	(6.5)
Sensitive teeth	4	(7.6)	1	(1)	12	(5.6)
Ck	17	(32.6)	37	(39.7)	104	(48.8)
Ck and/or clean	4	(7.6)	8	(8.6)	21	(9.8)
Others	11	(21.1)	9	(9.6)	18	(8.4)
<b>How often do you normally see a dentist</b>						
Once every 6 months	-	-	14	(14.8)	27	(12.6)
Once a year	16	(30.7)	30	(31.9)	94	(43.9)
Once every two years or more	11	(21.1)	24	(25.5)	53	(24.7)
Just when I have a problem or need treatment	21	(40.3)	26	(27.6)	39	(18.2)

Never	4	(7.6)	-	-	1	(0.4)
<b>How often brush your teeth</b>						
Twice or more a day	38	(73)	68	(73.1)	182	(85.4)
Once a day	13	(25)	23	(24.7)	30	(14)
Not every day	1	(1.9)	2	(2.1)	1	(0.4)
<b>How often floss your teeth</b>						
Twice or more a day	-	-	3	(3.2)	4	(1.8)
Once a day	4	(7.6)	11	(11.8)	37	(17.3)
Not every day	24	(46.1)	57	(61.2)	131	(61.5)
Never	24	(46.1)	22	(23.6)	41	(19.2)
<b>Use mouth rinse</b>						
Yes	13	(25)	32	(34.4)	73	(34.2)
No	39	(75)	61	(65.5)	140	(65.7)

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Table 34 Current pregnancy dental care by Income

Variable	< 70,000		70,001 – 100,000		100,001 – or more	
	n	(%)	n	(%)	n	(%)
<b>How often brush your teeth</b>						
Twice or more a day	40	(76.9)	72	(77.4)	182	(85.4)
Once a day	12	(23)	19	(20.4)	31	(14.5)
Not every day	-	-	2	(2.1)	-	-
<b>How often floss your teeth</b>						
Twice or more a day	-	-	2	(2.1)	5	(2.3)
Once a day	7	(13.4)	14	(15)	38	(17.8)
Not every day	23	(44.2)	58	(62.3)	122	(57.2)
Never	22	(42.3)	19	(20.4)	48	(22.5)
<b>Use mouth rinse</b>						
Yes	13	(25)	30	(31.9)	64	(29.9)
No	39	(75)	64	(68)	150	(70)
<b>Changes eating habits</b>						
Eating more food	36	(30.7)	50	(53.1)	123	(57.4)
Eating more often	27	(51.9)	54	(57.4)	140	(65.4)
Eating more sugar	24	(46.1)	41	(43.6)	97	(45.3)
Other	5	(9.6)	13	(13.8)	21	(9.8)
No changes	5	(9.6)	12	(12.7)	17	(7.9)
<b>What did you do after vomiting</b>						
Brushed teeth	14	(26.9)	29	(30.8)	55	(25.7)
Rinsed mouth with water	14	(26.9)	36	(38.3)	69	(32.2)
Rinsed mouth with mouth rinse products	-	-	7	(7.4)	5	(2.3)
Drank/ate something	11	(21.1)	21	(22.3)	32	(14.9)
Did not do anything	3	(5.7)	1	(1)	9	(4.2)
Did not have vomiting	23	(44.2)	43	(45.7)	110	(51.4)
<b>Changes/Problems mouth</b>						

Bleeding gums	30	(57.6)	61	(64.8)	133	(62.1)
Cavities or needed filings	3	(5.7)	6	(6.3)	8	(3.7)
Loose teeth	1	(1.9)	3	(3.1)	1	(2.2)
Toothache	5	(9.6)	7	(7.4)	8	(3.7)
Sensitive teeth	13	(25)	15	(15.9)	31	(14.4)
Other	5	(9.6)	11	(11.7)	3	(1.4)
No changes	17	(32.6)	21	(22.3)	72	(33.6)

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Table 35: Dental healthcare by income

Variable	< 70,000		70,001 – 100,000		100,001 – or more	
	n	(%)	n	(%)	n	(%)
<b>Dental healthcare worker provided information about care for teeth and gums</b>						
Yes	6	(11.5)	28	(29.7)	59	(27.5)
No	7	(13.4)	5	(5.3)	17	(7.9)
Haven't seen a dentist or dental healthcare worker	39	(75)	61	(64.8)	138	(64.4)
<b>Dental healthcare worker provided information about diet</b>						
Yes	3	(5.7)	3	(3.2)	13	(6)
No	9	(17.3)	28	(30.1)	63	(29.4)
Haven't seen a dentist or dental healthcare worker	40	(76.9)	62	(66.6)	138	(64.4)
<b>Dental healthcare worker provided information about fluorides</b>						
Yes	2	(3.8)	1	(1)	11	(5.1)
No	11	(21.1)	30	(32.2)	65	(30.3)
Haven't seen a dentist or dental healthcare worker	39	(75)	62	(66.6)	138	(64.4)
<b>Reason for not seeing the dentist</b>						
Too expensive	22	(42.3)	24	(25.5)	24	(11.2)
Had no time	4	(7.6)	10	(10.6)	8	(3.7)
I am afraid of dentists	-	-	11	(11.7)	9	(4.2)
I thought it was not recommended	12	(23)	17	(18)	28	(13)
Other	6	(11.5)	8	(8.5)	7	(15.5)
I did needed to see the dentist	16	(30.7)	30	(31.9)	88	(41.1)

Table 36: Information about oral health by income

Variable	< 70,000		70,001 – 100,000		100,001 – or more	
	n	(%)	n	(%)	n	(%)
<b>Have you received any information about dental health</b>						
Yes, in this current pregnancy	12	(23)	51	(54.2)	94	(44.9)
Yes, in a previous pregnancy	2	(3.8)	3	(3.1)	4	(1.9)
No, never	38	(73)	40	(42.5)	111	(53.1)
<b>Where did you obtain/ who gave the information</b>						
Dental healthcare workers	7	(13.4)	15	(15.9)	29	(13.5)
Lead maternity care workers	6	(11.5)	8	(8.5)	30	(14)
Media	8	(15.3)	34	(36.1)	47	(21.9)
Others	2	(3.8)	2	(2.1)	3	(1.4)
Have not received any information	29	(55.7)	35	(37.2)	105	(49)
<b>Information related to</b>						
Dental hygiene	6	(11.5)	23	(24.4)	44	(20.5)
Diet	9	(17.3)	7	(7.4)	33	(15.4)
Oral health diseases	6	(11.5)	15	(15.9)	27	(12.6)
Babies oral health	5	(9.6)	10	(10.6)	12	(5.6)
Association between oral problems and general health	2	(3.8)	8	(8.5)	15	(7)
Other	6	(11.5)	21	(22.3)	40	(18.6)
Have not received any information	31	(59.6)	39	(41.4)	104	(48.6)
<b>Changed practices as consequence of receiving information</b>						
Changed brushing	10	(19.2)	9	(9.5)	11	(5.1)
Changed flossing	4	(7.6)	13	(13.8)	15	(7)
Changed dietary habits	1	(1.9)	4	(4.2)	9	(4.2)

Went to see the dentist	2	(3.8)	8	(8.5)	8	(3.7)
Others	3	(5.7)	5	(5.3)	4	(1.8)
No changes	13	(25)	37	(39.30)	89	(41.5)
Have not received any information	27	(51.9)	32	(34)	93	(43.4)

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Table 37: Antenatal care by income

Variable	< 70,000		70,001 – 100,00		100,001 – or more	
	n	(%)	n	(%)	n	(%)
<b>Antenatal care from</b>						
Midwife	46	(88.4)	84	(89.3)	185	(86.4)
GP	8	(15.3)	12	(12.7)	20	(9.3)
Obstetrician	5	(9.6)	32	(34)	58	(27.1)
Parental classes	28	(53.8)	52	(55.3)	142	(66.3)
None	1	(1.9)	-	-	5	(2.3)
Other	4	(7.6)	9	(9.5)	11	(5.1)
<b>Have seen dentist for check up and/or clean</b>						
Yes	11	(21.1)	31	(32.9)	18	(40)
No	41	(78.8)	63	(67)	27	(60)
<b>Have needed to see a dentist</b>						
Yes	12	(23)	15	(15.9)	27	(12.6)
No	40	(76.9)	79	(84)	187	(87.3)

## 4.6 Logistic regression

Table 38 displays the logistic regression analysis of pregnant women who had access to oral health information during pregnancy. Women who reported having access to oral health information during pregnancy were more likely to be pakeha, older and/or have a high level of income and education. Women who also reported flossing their teeth, using mouth rinse, seeing a dentist during pregnancy; and those who last visited the dentist in the previous year were also more likely to have access to information during pregnancy.

The „Others“ ethnic group were less likely to access oral health information (OR 0.45, 95% CI 0.27-0.77) than those woman identifying themselves as „Pakeha“. Lower income women were 0.41 (CI 0.21-0.81) times less likely to have access to oral health information than the higher income group. Older groups had more access to information on oral health than the youngest group. Women who reported flossing their teeth were more likely to have access to oral health information (OR 1.92 CI 1.20-3.07) than women who reported no flossing. The same for women who use mouth rinse; they were more likely to receive advice on dental health (OR 1.63 CI 1.05-2.53) than the women who did not use mouth rinse. The women who had seen the dentist during pregnancy were 2.73 (CI 1.77-4.24) times more likely to have received information than those who had not. The women who visited the dentist in the previous year were more likely to have received information (OR 2.16, 95% CI 1.35-3.45) than those who last visited two or more years ago.

Table 39 shows the multivariable logistic regression for access to oral health information, adjusted for confounders such as ethnicity, education, income, age, and other variables. In the final model, „Others“ (OR 0.38, 95%CI 0.15-0.91) and low income (OR 0.27, 95% CI 0.10-0.76) groups were significantly less likely to report access to oral health information. Recent visits to the dentist were greatly associated with having accessed oral health information during pregnancy. It is also important to note that education and age variables are no longer significant factors in this final analysis.

Expectant mothers who reported visiting the dentist during pregnancy were more likely to be pakeha, older, and have a higher education level and higher income. Table 40 shows that „Others“ (OR 0.58, CI 0.32-1.03) were less likely to see the dentist during pregnancy than

„Pakeha“. Women who had high school and tertiary education were less likely than women who had post-graduate education to have seen the dentist during pregnancy. Similarly, low income women were less likely than high income women to have seen the dentist during pregnancy. Women in the older age group (OR 2.18, 95% CI 1.02-4.66) were more likely to have seen the dentist than younger women. When adjusted for confounders (ethnicity, education, income and age), ethnicity, education, income and age were not statistically significant (table 41). However, it is interesting to note the trend that the older the woman, the more likely they are to have seen the dentist.

Women belonging to „Others“, tertiary and high school education group and, medium and low income group, were more likely to state that they need to see a dentist than their peers (table 42). The older group were more likely to state that they needed to see a dentist than the youngest group (16-25 years old). After adjusting for variables (table 43), „Others“ (OR 1.17, 95% CI 0.55-2.52) were more likely to report the need to see a dentist, but this was not statistically significant. Low income women were also more likely to report the need to see a dentist (OR 2.55, CI 1.08-5.99) and this was statistically significant (table 43).

Table 38: Percentages and number of pregnant women who had access to oral health information, and odds ratios and their 95% confidence intervals.

Variable	N (%)	OR	95% CI	p-value
<b>Ethnicity</b>				
Pakeha	160 (50.3)	1.00		
Others	25 (31.6)	0.45	(0.27-0.77)	0.003
<b>Education</b>				
Post-graduate	62 (52.5)	1.00		
Tertiary	102 (43.9)	0.70	(0.45-1.10)	0.129
High school	21 (45.6)	0.75	(0.38-1.50)	0.428
<b>Income (\$)</b>				
100,000 or more	98 (46.8)	1.00		
70-100,000	54 (57.45)	1.52	(0.93-2.49)	0.090
less than 70,000	14 (26.9)	0.41	(0.21-0.81)	0.011
<b>Age</b>				
16-25 years	13 (28.2)	1.00		
26-30 years	46 (41.8)	1.82	(0.86-3.84)	0.114
31-35 years	67 (47.8)	2.32	(1.13-4.79)	0.022
36+ years	60 (58.2)	3.54	(1.67-7.51)	0.001
<b>Brush teeth</b>				
Twice or more	160 (48.7)	1.00		
Once a day	26 (38.81)	0.66	(0.38-1.13)	0.138
<b>Floss teeth</b>				
No	35 (35)	1.00		
Yes	151 (50.8)	1.92	(1.20-3.07)	0.006
<b>Use mouth rinse</b>				
No	121 (42.9)	1.00		
Yes	64 (55.1)	1.63	(1.05-2.53)	0.026
<b>Have seen dentist</b>				
No	106 (38.8)	1.00		
Yes	80 (63.4)	2.73	(1.77-4.24)	<0.001
<b>Needed see dentist</b>				
No	155 (45.7)	1.00		
Yes	31 (51.6)	1.26	(0.73-2.19)	0.396
<b>Last visit to the dentist</b>				
2 years or more	42 (34.7)	1.00		
1 year ago	38 (47.5)	1.70	(0.95-3.02)	0.071
Less than 1 year ago	106 (46.6)	2.16	(1.35-3.45)	0.001
<b>Change practices</b>				
No changes	119 (76.2)	1.00		
Changes	60 (75)	0.93	(0.49-1.74)	0.828

Table 39: Multivariable logistic regression for access to oral health information (final model, giving odds ratio adjusted for other variables in the model)

Variable	Odds ratio	(95% CI)	p-value
<b>Ethnicity</b>			
Pakeha	1.00		
Others	0.38	(0.15-0.91)	0.031
<b>Education</b>			
Post-graduate	1.00		
Tertiary	0.99	(0.45-2.20)	0.993
High school	1.16	(0.31-4.30)	0.817
<b>Income (\$)</b>			
100,000 or more	1.00		
70-100,000	1.91	(0.77-4.75)	0.013
less than 70,000	0.27	(0.10-0.76)	0.011
<b>Age</b>			
16-25 years	1.00		
26-30 years	0.97	(0.19-4.88)	0.972
31-35 years	0.69	(0.14-3.42)	0.659
36+ years	1.71	(0.31-9.20)	0.529
<b>Brush teeth</b>			
Twice or more	1.00		
Once a day	0.52	(0.20-1.34)	0.180
<b>Floss teeth</b>			
No	1.00		
Yes	1.32	(0.54-3.22)	0.535
<b>Use mouth rinse</b>			
No	1.00		
Yes	1.55	(0.68-3.57)	0.294
<b>Have seen dentist</b>			
No	1.00		
Yes	0.93	(0.34-2.57)	0.901
<b>Needed see dentist</b>			
No	1.00		
Yes	0.59	(0.22-1.60)	0.306
<b>Last visit to the dentist</b>			
2 years or more	1.00		
1 year ago	2.06	(0.73-5.76)	0.168
Less than 1 year ago	2.27	(0.81-6.37)	0.118
<b>Change practices</b>			
No changes	1.00		
Changes	1.02	(0.44-2.39)	0.948



Table 40: Percentages and number of pregnant women who had seen a dentist, and odds ratios and their 95% confidence intervals.

Variable	N (%)	OR	95% CI	p-value
<b>Ethnicity</b>				
Pakeha	108 (33.6%)	1.00		
Others	18 (22.7%)	0.58	(0.32-1.03)	0.065
<b>Education</b>				
Post-graduate	39 (33%)	1.00		
Tertiary	72 (30.7%)	0.90	(0.56-1.44)	0.664
High school	15 (31.9%)	0.94	(0.46-1.95)	0.888
<b>Income</b>				
100 or more	71 (33.1%)	1.00		
70-100	31 (32.9%)	0.99	(0.59-1.65)	0.973
less than 70	11 (21.15%)	0.54	(0.26-1.11)	0.096
<b>Age</b>				
16-25	12 (26%)	1.00		
26-30	33 (29.7%)	1.19	(0.55-2.59)	0.646
31-35	39 (27.86%)	1.09	(0.51-2.32)	0.815
36+	47 (43.5%)	2.18	(1.02-4.66)	0.044

Table 41: Multivariable logistic regression for women who reported seen a dentist during pregnancy (final model, giving odds ratio adjusted for other variables in the model)

Variable	OR	95% CI	p-value
<b>Ethnicity</b>			
Pakeha	1.00		
Others	0.64	(0.33-1.24)	0.190
<b>Education</b>			
Post-graduate	1.00		
Tertiary	1.01	(0.60-1.68)	0.965
High school	0.89	(0.39-2.01)	0.783
<b>Income</b>			
100 or more	1.00		
70-100	1.01	(0.59-1.73)	0.944
less than 70	0.60	(0.26-1.36)	0.223
<b>Age</b>			
16-25	1.00		
26-30	1.13	(0.41-3.08)	0.807
31-35	1.16	(0.42-3.16)	0.765
36+	1.95	(0.71-5.31)	0.190

Table 42: Percentages and number of pregnant women who reported need to see a dentist, and odds ratios and their 95% confidence intervals.

Variable	N (%)	OR	95% CI	p-value
<b>Ethnicity</b>				
Pakeha	48 (14.9%)	1.00		
Others	12 (15.1%)	1.01	(0.51-2.02)	0.958
<b>Education</b>				
Post-graduate	16 (13.5%)	1.00		
Tertiary	36 (15.3%)	1.15	(0.61-2.18)	0.649
High school	8 (17%)	1.30	(0.51-3.29)	0.570
<b>Income</b>				
100 or more	27 (12.6%)	1.00		
70-100	15 (15.9%)	1.31	(0.66-2.60)	0.432
less than 70	12 (23%)	2.07	(0.97-4.44)	0.060
<b>Age</b>				
16-25	8 (17.3%)	1.00		
26-30	15 (13.5%)	0.74	(0.29-1.89)	0.533
31-35	20 (14.2%)	0.79	(0.32-1.94)	0.610
36+	20 (18.5%)	1.07	(0.43-2.66)	0.868

Table 43: Multivariable logistic regression for women who reported need to see a dentist during pregnancy (final model, giving odds ratio adjusted for other variables in the model)

Variable	OR	95% CI	p-value
<b>Ethnicity</b>			
Pakeha	1.00		
Others	1.17	(0.55-2.52)	0.672
<b>Education</b>			
Post-graduate	1.00		
Tertiary	0.96	(0.48-1.89)	0.906
High school	1.05	(0.38-2.93)	0.914
<b>Income</b>			
100 or more	1.00		
70-100	1.39	(0.68-2.81)	0.357
less than 70	2.55	(1.08-5.99)	0.032
<b>Age</b>			
16-25	1.00		
26-30	1.46	(0.43-4.87)	0.537
31-35	1.54	(0.46-5.16)	0.481
36+	2.25	(0.68-7.49)	0.183

## CHAPTER 5: DISCUSSION

### 5.1 Limitations of the study

This study has some methodological weaknesses that should be addressed before the findings are considered in detail.

#### *Sample and design*

The study sample was limited to the number of women who participated in the selected antenatal classes in the Wellington region. The centres were selected based on their representative numbers of participants, locations and the possibility of a variety of women from different backgrounds attending. Some of the classes were designed for low income women (such as MATPRO), while others charged a fee that could have excluded some participants who could not afford the cost of these courses. In addition, the centres had to agree to be the intermediary between the researcher and study population, which also limited the sample. Two antenatal classes refused to be part of the research, and some other centres failed to reply following initial approach and requests.

As noted earlier in the methods section, due to a small number of Pacific Islanders and Maori participants they had to be included into an „Others“ category for analytic purposes. Given that there may well be difference between these groups, this limits the inferences that we can draw from this mixed group.

The response rate of 55.4% was satisfactory considering there were no follow ups of the participants. As the childhood educators assumed the responsibility of reminding women to complete and post their questionnaires, that information cannot be corroborated. No data was collected from non-respondents, and the non-response could introduce a selection bias in this survey. The non-response group (44.6%) would ideally require further investigation as these could differ in ethnicity and socio-economic distribution from the respondents. However, this was not possible.

### *Selection bias and generalisability*

Women who participated in this research were, in the majority, pakeha, high SES as measured by high education and income standards; and most were around 30 years old. Thus, generalisations have to be made carefully because the population studied is not representative of the Wellington region's population of pregnant woman. But such characteristics seem to be common among those that seek antenatal care/education during pregnancy. Studies show that women who attend antenatal classes normally have better pregnancy outcomes and lower maternal and prenatal mortality, however, it is the more privileged women who normally attend antenatal classes (E. Murray et al., 2000), as confirmed by this survey.

According to a New Zealand study (Abel et al., 2001) that evaluated beliefs and practices of different ethnic groups of mothers, another aspect to be considered in relation to attendance at antenatal classes is culture. For Pacific women their families attend to their antenatal care needs, and they don't normally see the need to attend formal antenatal classes. This is reflected in the low number of Pacific people (1.9%) that took part in this research. „Pakeha“ groups, on the other hand, attend antenatal classes in higher numbers because they rely more on professional advice during pregnancy. This is supported by the number of pakeha that took part in this survey (80.2%). Māori are a heterogeneous group with part of the Māori group valuing the support and advice from family and following traditional culture, with another part more integrated into western culture and seeking professional advice. This could have influenced the higher number of Māori, then Pacific participating in this study. (8.8% of the study sample).

The Ministry of Health conducted a consumer satisfaction survey with 2,936 women who used maternity services during March and April 2007. Of all respondents, 43% attended antenatal classes. For first time mothers the percentage was 78%. In this survey they also found that Māori and Pacific women were significantly less likely to attend antenatal classes (Health Services Consumer Research, 2008).

In the Abel et al. (2001) study, it was also observed that mothers under 25 years old tended to be more „intuitive“ with their infant care, while older parents were more likely to follow professional advice and were probably more inclined to attend antenatal classes. In the

Paraparaumu Maternity Service there is an antenatal class specifically for expectant teenage mothers, which was not included in this survey.

### ***Accuracy and validity***

A number of questions in this questionnaire that related to self-reported dental care were validated by similar studies from the United States of America (Gaffield et al., 2001; Habashneh et al., 2005; Lydon-Rochelle et al., 2004; Ressler-Maerlender et al., 2005; Stevens et al., 2007) Australia (Thomas et al., 2008), England (Hullah et al., 2007), and others (Christensen et al., 2003; Honkala & Al-Ansari, 2005). Demographic questions were based on the New Zealand Census 2001 (Statistics New Zealand, 2008b). Some other questions about oral health information were included in the questionnaire. A pilot questionnaire was applied to test the understanding of the questions by women. However, relying on self-reported data is subject to biases inherent in this method, such as misclassification of the question being asked.

The food frequency diet was an adaptation of the New Zealand Food Survey (Ministry of Health, 1999), and we were interested only in a few food items included in the survey, such as the ones that would have more direct relation to dentistry (sweets, carbohydrates, fruit and water). Thus generalisations were very difficult to make because there are a number of factors that make it difficult to conduct diet studies relating to decay. Firstly, diets are a complex combination of foods and behaviour and have individual and cultural variations (Benny et al., 1991; Rugg-Gunn & Hackett, 1993). Secondly, from a dentistry point of view the most relevant component of the diet for dental caries is sugar, not just the amount of sugar consumed, but also the frequency and consistency (such as adherence) of the sugar consumed (Murray J, Nunn J, & J, 2003). Thirdly, “it is difficult to test just one dietary item because it is likely to go undetected amongst other sugar-containing foods and drinks” (Rugg-Gunn A & Hackett A, 1993). All those factors would be better analysed in a more detailed method such as seven day diary, for example. Finally most dental professionals are not prepared to provide appropriate nutritional interventions (Fitzsimons et al., 1998), especially during pregnancy when women have to increase the quantity and quality of food ingested.

### ***Strengths***

It is important to consider the strengths of this research. This study had a good sample size (405) with the threshold for statistical significance being determined at 380 participants.

The study also covered a wide geographical area in the Wellington region, with centres from Island Bay to Paraparaumu to Upper Hutt being visited. The study took place over a six (6) month period with each course cycle at each centre being visited over this period.

The face-to-face delivery of the questionnaire was likely to have further increased the response rate and the widespread support from all course facilitators for the topic must also be recognised as a positive contributor to the study.

Recall bias is unlikely to have affected this study as the questionnaire was applied to pregnant woman who were typically in their last trimester. Whilst there is a possibility that some questionnaires were returned after pregnancy it is believed the vast majority of participants completed and returned questionnaires shortly after receiving it whilst still pregnant. Therefore the results are unlikely to differ according to pregnancy outcomes.

## **5.2 Study findings**

A number of self-reported studies around the world have investigated dental care, dental health access and knowledge about dental health and the relationship with pregnancy outcomes (Christensen et al., 2003; Gaffield et al., 2001; Habashneh et al., 2005; Honkala & Al-Ansari, 2005; Hullah et al., 2007; Lydon-Rochelle et al., 2004; Ressler-Maerlender et al., 2005; Stevens et al., 2007; Thomas et al., 2008). To the best of our knowledge this is the first study in New Zealand adopting a similar approach. Previously, Makowharemahihī (2006) presented a thesis on “A community-based health needs assessment of the oral health needs of Māori mothers in Porirua”, in which she extrapolated through a qualitative study the needs of a group of Māori mothers. Our study, on the other hand, sought to provide more broadly quantitative information about expectant mothers in the Wellington region.

The main findings of this research suggested that pregnant woman in the Wellington region present with good oral hygiene habits. Although more than half reported bleeding gums during pregnancy, just a small percentage attended a dental appointment during pregnancy, and this was more frequent among pakeha women. The level of access to oral health information was higher among pakeha and women from a high income household. Women who went to see the dentist during pregnancy were more likely to receive information on dental health. Women from low income households were significantly more likely to report the need to see a dentist.

### **5.2.1 Oral health care and practices before and after pregnancy**

The first objective of this research was to analyse oral health care practices and behaviour of women before and during pregnancy, and whether these changed during this period. This was achieved through a series of questions relevant to dentistry including dental hygiene practices, diet, frequency of seeing a dentist and self-reported oral problems. In general, the women in our study described having good oral health prior to pregnancy; with most describing they had good and/or very good dental health.

Prior to pregnancy, the majority of women had seen the dentist during the previous year, mainly for a check up and/or clean, however a significant proportion of women went to the

dentist for problems such as toothache/need for fillings, wisdom teeth extraction and broken teeth. About 50% of women reported frequent visits to the dentist, once a year or less, and the remainder of women see the dentist every two years or more or when they have problems. The women who only see the dentist for a problem-related matter could be categorised into “episodic” users as defined by the Dunedin Multidisciplinary Health and Development Cohort Study (Thomson, 2001). The study found that at age 26, 45.6% of the sample reported to be “routine” users of the dental health system, visiting the dentist normally once a year for check ups, with a larger proportion of females than males. Those “routine” users presented with better hygiene and better oral health (less caries and teeth loss) than “episodic” users of the dental care system.

In our study, most women reported „good“ oral hygiene, brushing their teeth two or more times per day, using floss and mouth wash occasionally. Their hygiene pattern did not change significantly during pregnancy, with 82.6% brushing their teeth twice or more per day, 16.3% flossing their teeth once a day and 29.4% using mouth rinse. Other international studies (Honkala & Al-Ansari, 2005; Thomas et al., 2008) show similar findings of high standards of oral hygiene during pregnancy, but these studies did not compare this with oral hygiene practices before pregnancy. Our study shows that habits acquired before pregnancy tend to be maintained during pregnancy, and even if women eat more often, they tend to maintain the same dental hygiene pattern.

As expected, more than half of the women reported changes in eating habits during pregnancy. Energy requirements increase by about 12% (Ministry of Health, 2006b) during pregnancy and women normally increase the amount of food eaten and the frequency. However, some women reported increased consumption of sugar (42%) which can be due to personal preference for sweet snacks or in some cases woman experiencing cravings for sweet foods (Ministry of Health, 2006b). This is highly likely to be a factor contributing to dental decay, because there is a substantial amount of evidence that shows that the frequency and the amount of sugar consumed are related to dental caries (J. Murray et al., 2003).

Advice on dietary issues should be provided either by dental health workers and Lead Maternity Carers to reinforce the choices for healthier snacks instead of sugary ones. A New Zealand study (Makowharemahihi, 2006) showed that pregnant women were familiar with healthy eating messages but felt that these were not linked to oral health. Counselling on diet



should be practical and relevant to women because pregnancy is an optimal time to promote a healthy diet for the expectant mother and baby which can have long term benefits for both (Fitzsimons et al., 1998). Diets rich in sugar can contribute to microorganism (*Streptococcus mutans*) colonisation on the mother's mouth which can potentially be transmitted to the child and increase the risk of future dental decay (Berkowitz, 2003b).

Attention and counselling should also be provided to women who report vomiting during pregnancy. Some of the women (26.1%) who had this symptom in our research were uninformed about the effects of brushing their teeth straight after vomiting and how this can contribute to tooth erosion due to the abrasive effect of tooth brushing after an acid attack (J. Murray et al., 2003). In addition, this can aggravate teeth sensitivity, with 15% of women experiencing sensitive teeth during pregnancy in this research, which could be one consequence of teeth erosion. Women should be advised to rinse their mouth (with either mouthwash or water) after vomiting.

The main change and/or problems related to mouths that were reported by women during pregnancy were bleeding gums, followed by sensitive teeth and others (such as infections or broken teeth). It is important to note that more than 60% of women in this study noticed bleeding gums during pregnancy. Similar findings were found in the Australian study (Thomas et al., 2008) where 60% of women stated they had gums which hurt and/or bled at some stage during the previous 12 months. Bleeding gums is normally one of the first signs of gingivitis and is common among pregnant women due to hormonal changes in this period which accentuate the gum's response to plaque (Chai & Ngeow, 1998). It is important to point out that pregnancy does not cause gingivitis, but may aggravate pre-existing disease (Laine, 2002). However, gingivitis can progress to periodontitis (loss of connective tissue) (J. Murray et al., 2003) and, according to a number of studies, can be associated with birth outcomes (Jeffcoat et al., 2001; Lopez et al., 2002; Offenbacher et al., 2006) such as low birthweight, preterm birth and preeclampsia (Boggess et al., 2003; Vergnes, 2008). In conclusion, health professionals and women should be aware of this important association to prevent major implications for their health and the health of their baby.

During pregnancy, the number of women who have seen a dentist or other dental health care worker drops to 32%. Similar frequencies have been found in a number of international researchers, 30% in Australia (Thomas N, Middleton P, & Crowther C, 2008), a range of 25-

50% in American studies, (Gaffield et al., 2001; Habashneh et al., 2005; Lydon-Rochelle et al., 2004; Ressler-Maerlender et al., 2005) and 32% in a UK study (Hullah et al., 2007).

The reasons given for not seeing a dentist in our research were several. The most frequent reason given was that it was not considered necessary, followed by the high cost of visiting a dentist. Another common reason was the perception that visiting a dentist while pregnant was not recommended. Other research has found similar reasons for pregnant women not visiting a dentist during pregnancy but found additional reasons such as not having any dental problems, a desire to delay the visit until after pregnancy, had not been informed that they should go; or did not consider it a priority (Habashneh et al., 2005). It is clear that better knowledge and awareness about the importance and benefits of utilising dental services during pregnancy is necessary in a global context. Even when dental care for pregnant women is funded by the government, such as in the UK, the number of pregnant women who see a dentist during pregnancy in the studies reviewed is small, and a significant percentage of women were unaware of the availability of free dental care during pregnancy (and for 12 months after delivery) offered by UK National Health Service (Hullah et al., 2007).

In conclusion there is a world-wide need to improve preventive measures regarding oral health care for pregnant women. There is a need to improve the awareness by women, dental health professionals and primary care providers about the importance of a sound dental health for mother and baby. Preventive, routine and emergency dental procedures are safe and beneficial for pregnant women. Besides, counselling about oral hygiene and diet, for example, are simple measures and can have an important impact on the pregnant woman's oral health. During pregnancy women are normally open to new information about the best health and wellbeing for themselves and their babies.

### **5.2.2 Source and content of oral health information**

In our study, more than half of the women (53.3%) reported they had never received any information about dental health during their pregnancy. This is an important indicator that oral health issues are not integrated with antenatal care in Wellington.

This study investigated the association between access to oral health information and socio-economic and behaviour variables that, to our knowledge, have not been previously studied. Pregnant women who had access to oral health information during pregnancy were more likely to be pakeha, have high income, education and be older. They were also more likely to brush their teeth more often, use floss and mouth rinse and to have visited the dentist recently. However, when controlled for other variables, age and education were not significant predictors of oral health information. Ethnicity and income in contrast, were significant factors and require special attention. Information on dental health should be prioritised to low income women, and Māori, Pacific and other ethnic groups.

For the women who did obtain oral health information during pregnancy, they typically sought it themselves predominantly through „media“ sources such as the internet and pregnancy books. In another international study, women also stated that books and magazines were the most useful source of information, followed by advice from a dentist (Habashneh et al., 2005). Looking for information shows a positive attitude towards the health and well-being of themselves and that of their baby. There were a number of popular books and websites researched by women that contained some information about oral health during pregnancy. However, this information can be limited and can often generate confusion for the public. Some references, for example, positively emphasise the importance of a regular and efficient plaque control regime for pregnant women, and alert women to the possibility of bleeding gums during pregnancy. On the other hand, some other information will emphasise the contra-indications of dental treatment and leave women reluctant to see a dentist during pregnancy (Cook, 1999; Gliksman & DiGeronimo, 1999; Gordon, Sharkey, Raffees, & Fime, 2007).

There is a lack of formal guidelines about oral health for pregnant women in New Zealand, which could be beneficial for public and health professionals to inform pregnant woman about the best practices regarding this topic.

The other sources of information for pregnant woman in our study were dental healthcare workers and Lead Maternity Carers. The information was related mainly to dental hygiene, diet and oral health diseases. The information received from dental health workers was likely to be about care for teeth and gums and less likely about diet or fluorides. Women who did not receive dental care during pregnancy were more likely not to receive dental care advice.

This was a clear point in our research and also within other international surveys (Lydon-Rochelle et al., 2004). Women, who visited the dentist in the previous year in the present study, were more likely (OR 2.27, 95% CI 0.81-6.37) to have access to oral health information even having controlled for other factors.

As a result of having access to information a small percentage of women changed their habits during pregnancy. Taking into consideration that dental hygiene is the most common advice about dental care that would have been given, the main changes in behaviour are with dental hygiene, with 8.4% changing flossing habits and 7.9% changing brushing habits.

The lack of information received by pregnant woman about oral health suggests that not enough emphasis is being placed on this issue and this appears to lead to further problems. Firstly, a smaller percentage of pregnant women see the dentist during this period for various reasons and probably miss the opportunity to be informed about oral health issues and pregnancy. Secondly, sometimes dentists are insecure about the management of pregnant patients and don't take the opportunity to promote preventative measures. A Canadian survey (Huebner, Milgron, Conrad, & Lee, 2009) asked 1,604 dentists from Oregon about their attitudes, beliefs and practices regarding dental care for pregnant patients. This study found that while the majority of dentists were interested in receiving continuing education regarding the care of pregnant women, there was some misinformation about clinical issues related to pregnancy. Dental health workers should be aware of the importance of care to pregnant women and the potential role they can play in proactively promoting oral health with this group.

Finally, there is a lack of integration between dentistry and other professional areas such as lead maternity care workers, who do not normally cover this topic with their patients. The vast majority of women receive antenatal care from midwives, obstetrician and/or attend antenatal classes. Thus, Lead Maternity Carers (LMCs) are in a strategic position to provide counselling to pregnant women regarding oral health (Ministry of Health, 2008a). Women could be advised to see the dentist before becoming pregnant and visit the dentist and other dental health workers during pregnancy, especially for check ups and cleaning. They should be advised to brush their teeth at least twice a day, floss at least once a day and have a balanced diet that avoids excessive amounts of sugary snacks.

### **5.2.3 Oral health care and access to dental services among pregnant women by age, ethnicity and SES**

Findings suggest that older age groups, high SES groups and pakeha visit the dentist more regularly, especially for check ups. They present with slightly better oral hygiene patterns and receive more information about how to look after their teeth and gums from dental healthcare workers. They are also more likely to seek oral health information in books and/or from the internet. The cost of a dental consultation is a significant factor for not seeing a dentist, but the main reason for not seeing a dentist within this group is the belief that it is not necessary or that dental consultations and/or dental proceedings during pregnancy are not recommended.

Younger, low SES and „Others“ ethnic groups reported seeing a dentist only when a problem arose such as toothache or cavities. They also have lower oral hygiene standards and did not see the dentist during pregnancy mainly because of economic reasons. A small percentage reported receiving information related to oral health from their LMC but this was limited to diet. When given advice these groups were more likely to change brushing habits and they also reported more the need to see the dentist during pregnancy.

Pregnant women who report regular visits to the dentist for check ups and/or clean are more likely to be pakeha, older and have a higher SES (high education and income). The „Others“ ethnic groups, younger and low SES groups are more likely to see the dentist only every two years or more, or “just when they have problems” such as toothache, infections or broken teeth.

The last New Zealand Health Survey (Ministry of Health, 2008c) presented similar findings, with half the participants visiting an oral health care worker in the previous 12 months. Minority ethnic groups such as Pacific, Māori and Asian were significantly more likely to visit an oral health care worker only when they had toothache, with older adults and Māori and Pacific people being much more likely to have a tooth removed, showing inequalities between ethnic groups within New Zealand.

As described in previous New Zealand studies (Jamieson & Thomson, 2002; Thomson, 2001), non-regular users of dental services are from the lower socio-economic class and normally only go to the dentist when they have a problem. They are likely to have a poorer long term dental health status and poorer reported self-care than regular users. The same is observed in a study from UK (Hullah et al., 2007), where 206 women completed a questionnaire within 3 days of delivery at North London Hospital. Of these, 72.4% were immigrants (38.3% Black African) and overall 34% reported regular attendance for dental care. The research concluded mothers from lower socio-economic groups were less likely to see a dentist regularly.

In our study, just 32% of all women surveyed had seen a dentist during pregnancy with 33.6% of pakeha woman and 22.7% of the „Other“ group having seen the dentist during their pregnancies. „Others“ were less likely to see the dentist during pregnancy (OR 0.58 CI 0.32-1.03) than pakeha, even after controlling for other confounders. Women with lower educational achievements were less likely to see the dentist during pregnancy. The same applied for income, with women from lower income households less likely to see the dentist during pregnancy. For women who had less than NZ\$70,000 household income the odds of seeing the dentist were 0.54 (CI 0.26-1.11) less than for women with a household income higher than NZ\$100,000. Older women were more likely to see the dentist during pregnancy, with the older group 2.18 times (1.02-4.66) more likely to see the dentist than the youngest group in this research. However, ethnicity, education, income and age were not statistically significant after controlling for confounders and further studies are required to investigate this association.

Regular visits to the dentist before pregnancy are strong predictors for dental visits during pregnancy as showed in the Habashnesh et al. (2005) study. Mothers who reported regular (every 6-12 months) dental attendance when they were not pregnant were more likely to see the dentist when pregnant, compared with mothers who reported a visit every 2 years when not pregnant. Those who reported dental visits were also more likely to be married, older, have 4 or more years of college education, have a healthier lifestyle (no smoking or alcohol consumption), better hygiene, greater income, have dental insurance, have initiated the antenatal care during the first trimester; and have better knowledge about oral health and pregnancy. The author also found no association between seeing a dentist and age and education in multivariable analyses (Habashneh et al., 2005).

Other American studies used the data from the Washington State Department of Health's Pregnancy Risk Assessment Monitoring System (PRAMS), (Gaffield et al., 2001; Lydon-Rochelle et al., 2004; Ressler-Maerlender et al., 2005) which identified a relationship between seeking dental care during pregnancy and early pre-natal care, previous utilisation of dental services, insurance and perceiving problems. It found that most mothers did not make a dental visit during pregnancy, even when they reported having dental problems.

The findings in our study also suggest that women belonging to the „Others“ group are more likely to state that they need to see a dentist than pakeha women. Pregnant women with lower educational achievements responded that they needed to see the dentist more than women holding post-graduate qualifications. Women with a lower household income were twice (CI 0.97-4.44) as likely to state that they needed to see the dentist as women with higher income. Women between 26 and 35 years old were less likely to state that they needed to see a dentist than younger women. However, in the multivariable analyses, ethnicity showed an increase in association but was not statistically significant. Age and education were also not statistically significant. Income, on the other hand, showed statistical significance, the lower income had the greatest likelihood in reporting need to see the dentist (OR 2.55, 95% CI 1.08-5.99).

In New Zealand, dental care is publicly funded for children and teenagers (Thomson, 2001). Adults rely essentially on private dental care. There are some services and benefits relating to dental care assistance for low income people, but they are basically for emergency procedures only. There is a need for preventive oral services for the adult population. There are some positive efforts being made to provide oral health care on a community basis (Ministry of Health, 2006a), which can facilitate more universal access to care. The findings in our survey suggest that there is also a lack of preventive oral services specifically for pregnant women and that should be considered in future strategies and policies.

Other New Zealand studies (Poulton et al., 2002; Thomson et al., 2004) showed that low adult SES had a significant effect on poor adult dental health and that there are oral health inequalities. Taking into consideration that the population studied was in the majority pakeha and of higher SES, it is concerning that for other ethnic minorities and lower SES groups the need for oral health could be even more serious than that documented in this study.

This dissertation has investigated, through a self-assessed questionnaire, the status, practices and behaviours of pregnant women in the Wellington region, regarding their oral health. A good response rate occurred over a 6 month survey period and a significant sample size was achieved. Most women reported not receiving or accessing oral health information during pregnancy however those who visited a dentist were more likely to receive oral health information; with this group being typically pakeha and of high income and education group. In general, most of the woman in the study had good oral hygiene habits prior to becoming pregnant and these did not markedly change during pregnancy. However, the majority of woman did not visit the dentist during pregnancy for a variety of reasons including financial restraints, because they did not think it was necessary and for some of the women, due to beliefs that undertaking dental procedures during pregnancy was not recommended. The most commonly reported oral health problem during pregnancy was bleeding gums.



## CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

This study identifies special attention to pregnant women's oral health in New Zealand is needed. This could be achieved through public policies and strategies that integrate dental health workers and lead maternity care workers to assist women with their oral health during pregnancy, particularly through distribution of adequate information and encouragement of preventive measures. Increasing oral health education in pregnancy can lead to better oral health for women and better health outcomes for children.

This study recommends the development of guidelines for health professionals to assist pregnant women regarding their oral health. This document would guide dental health professionals to assess the risks and needs of pregnant patients; to review expert consensus and recommendations regarding clinical practices; and to emphasise the importance of preventive measures such as dietary and hygiene counselling, prophylaxis, and fluoride applications.

This study also recommends introducing an oral health component in prenatal services such as midwives and LMCs, Plunket and tamariki ora health nurses and antenatal classes. Those services are normally in a better position to educate women in oral health issues and reinforce healthy messages already emphasised by those services and/or professionals, such as advice on balanced and healthy diets, avoidance of alcohol and smoking, advice on the importance of adequate oral hygiene; avoidance of brushing teeth straight after vomiting; and the benefits of breastfeeding. They also should be aware of dental health issues and encourage pregnant woman to visit a dentist if they have a dental problem.

This study recommends informative material regarding oral health during pregnancy should be given to women. This is necessary to dispel myths and „old wives“ tales such as those that suggest that tooth loss is normal during pregnancy. Pregnant women have to be properly informed about the changes they can expect in their mouth during pregnancy and what they can do to prevent problems and maintain oral health. They also should be encouraged to see a dentist before and during pregnancy, especially for routine check ups, cleaning and other preventive measures. Sound oral health for women can also mean sound health for their

children, due to preventing periodontal disease and possible negative birth outcomes and through decreasing the transmission of cariogenic bacteria to infants; that contributes to early caries development. In addition, through establishing healthy diet and hygiene habits with mothers at the beginning of the lifecycle, the oral health of future generations will also be improved.

Finally, it is suggested further research be undertaken to investigate pregnant women's oral health status and inequalities in access to dental care in different populations in New Zealand. Such studies should take in consideration the ethnicity and socio-economic composition of the antenatal classes to improve response rate and generalisability of the data. Some studies could for example, involve midwives, once more than 80% of the women in New Zealand see a midwife during their pregnancy.

There is a need to increase access to oral health care for pregnant women, especially for minority ethnic and low SES groups. However, increasing access is not a guarantee for better health outcomes. It is necessary to understand women's beliefs, attitudes, and behaviours about their oral health during pregnancy to best deliver health messages and services. This could start by increasing awareness about the importance of oral health for pregnant women within the whole population and to health professionals.

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## APPENDICES

### Appendix 1: Data collection record

<b>Data</b>	<b>Local</b>	<b>Number of questionnaires handed out to women</b>
10/06/08	PC Lower Hutt	13
12/06/08	PC Lower Hutt	12
16/06/08	PC Khandallah	8
16/06/08	MATPRO Porirua	12
17/06/08	PC Mana	9
18/06/08	MATPRO Newtown	15
19/06/08	PC Khandallah	8
23/06/08	Newlands Monday	8
25/06/08	Newlands Wednesday	10
07/07/08	PC Khandallah	10
09/07/08	PC Khandallah	8
15/07/08	PC Karori	6
16/07/08	PC Kapiti	9
17/07/08	PC Khandallah	9
21/07/08	Breastfeeding class	14
28/07/08	MATPRO Porirua	8
29/07/08	PC Island Bay	15
30/07/08	MATPRO Newtown	9
04/08/08	Well High School	10
05/08/08	PC Lower Hutt	11
11/08/08	PC Upper Hutt	11
11/08/08	MATPRO Porirua	10
12/08/08	Tawa	6
13/08/08	PC Kapiti	7
14/08/08	PC Lower Hutt	14
18/08/08	Breastfeeding	15
18/08/08	Newlands Monday	9
20/08/08	Newlands Wednesday	9
20/08/08	MATPRO Newtown	11
01/09/08	Breastfeeding	15
09/09/08	PC Well South	11
10/09/08	PC Well South	11
11/09/08	PC Khandallah	12
15/09/08	MATPRO Porirua	12
15/09/08	PC Khandallah	12
16/09/08	PC Karori	13
17/09/08	MATPRO Newtown	12
18/09/08	PC Upper Hutt	12
17/09/08	PC Khandallah	12
22/09/08	Breastfeeding	10

23/09/08	PC Mana	11
30/09/08	PC Lower Hutt	13
06/10/08	Breastfeeding	10
08/10/08	PC Kapiti	11
13/10/08	MATPRO Porirua	12
15/10/08	MATPRO Newtown	12
20/10/08	Breastfeeding	15
23/10/08	PC Mana	07
28/10/08	Tawa	11
28/10/08	PC Khandallah	11
29/10/08	Newlands Wednesday	09
29/10/08	PC Khandallah	12
03/11/08	Upper Hutt	11
04/11/08	Lower Hutt	13
05/11/08	PC Well South	10
06/11/08	PC Khandallah	12
10/11/08	MATPRO Porirua	12
10/11/08	Wellington High School	10
11/11/08	PC Well South	10
12/11/08	MATPRO Newtown	10
12/11/08	Wellington High School	05
13/11/08	PC Lower Hutt	13
17/11/08	Newlands	07
18/11/08	Breastfeeding	10
18/11/08	Karori	13
19/11/08	Kapiti	12
20/11/08	Mana	11
24/11/08	Breastfeeding	08
TOTAL	68	730

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## Appendix 2: Questionnaire

### ORAL HEALTH AND USE OF DENTAL CARE SERVICES AMONG PREGNANT WOMEN IN WELLINGTON

Completion and return of the questionnaire implies consent

This first set of questions relate to the care of your teeth when you are **NOT PREGNANT**: (please only tick one box for each question)

1. How would you describe the health of your teeth and mouth?

- Excellent
- Very good
- Good
- Fair
- Poor

2. When did you last visit a dentist?

- Less than 1 year ago
- 1 year ago
- 2 years ago
- more than 2 years ago

3. What was the main reason for this visit to the dentist?

- I had/have bleeding gums
- I had/have cavities or needed a filling
- I had/have loose teeth
- I had/have toothache
- I had/have a sensitive tooth
- Other (please specify) \_\_\_\_\_

4. How often do you normally see a dentist when you are **not** pregnant?

- Once every 6 months
- Once a year
- Once every two years or more
- Just when I have a problem or need treatment
- Never

5. How often do you normally brush your teeth when you are **not** pregnant?

- Twice or more a day
- Once a day
- Not every day

6. How often do you normally floss your teeth when you are **not** pregnant?

- Twice or more a day
- Once a day
- Not every day
- Never

7. Do you normally use any mouth **rinse** products at least once a week when you are **not** pregnant?

- Yes (please specified which product) \_\_\_\_\_
- No

**This next set of questions are about the care of your teeth DURING THIS PREGNANCY:**

8. From which of the following people are you receiving antenatal care or advice during this pregnancy? (tick as many boxes as necessary)

- Midwife
- GP
- Obstetrician
- Parental classes
- None
- Other (please specified) \_\_\_\_\_

9. How often are you brushing your teeth **during this pregnancy**?

- Twice or more a day
- Once a day
- Not every day

10. How often are you flossing your teeth **during this pregnancy**?

- Twice or more a day
- Once a day
- Not every day
- Never

11. Are you using any mouth **rinse** products at least once a week **during this pregnancy**?

- Yes (please specified which product) \_\_\_\_\_  
 No

12. Have you noticed any changes in your eating habits **during this pregnancy**? (tick as many boxes as necessary)

- Yes, I am eating more food  
 Yes, I am eating more often  
 Yes, I am eating more sugar  
 Yes, other \_\_\_\_\_  
 No, I have not noticed any changes to my eating habits

13. In a typical day **during this pregnancy**, how often would you usually eat these foods or drinks (please only tick one box for each item):

Food/drink	Never	Less than once per day	Once per day	Twice per day	Three or more per day
Coffee with sugar					
Tea with sugar					
Flavoured milk (e.g. milkshake, iced coffee)					
Breakfast cereal (including muesli)					
Bread					
Jam, honey, marmalade or syrup					
Peanut butter, other nut spreads					
Fruit					
Sultanas, raisins or currants					
Other dried fruit (e.g. apricots, prunes, dates)					
Fruit buns or iced buns					

Muffins – all types					
Cakes, scones or pikelets					
Savoury or dry biscuits or crackers					
Plain sweet biscuits					
Cream filled and/or chocolate biscuits					
Muesli bar					
Sweet pies or sweet pastries					
Pudding or desserts					
Chocolate (including chocolate bars)					
Other confectionary (e.g. sweets, lollies etc)					
Potato/kumara					
Pasta (e.g. spaghetti, noodles etc)					
Rice (including white or brown)					
Chips					
Carbonated drinks (e.g. Coke, lemonade etc)					
Fruit juice					
Sports drink (e.g. Powerade)					
Water					

14. When you have had morning sickness or vomiting **during this pregnancy**, what did you do straight after the vomiting had stopped? (tick as many boxes as necessary)

- Brushed my teeth
- Rinsed my mouth with water

- Rinsed my mouth with mouth rinse products
- Drank/ate something
- I did not do anything
- I didn't have morning sickness/vomiting

15. Have you noticed any changes to your mouth or had any problems with your gums **during this pregnancy?** (tick as many boxes as necessary)

- Yes, I had/have bleeding gums
- Yes, I had/have cavities or need fillings
- Yes, I had/have loose teeth
- Yes, I had/have toothache
- Yes, I had/have more sensitive teeth
- Yes, other (please specify) \_\_\_\_\_
- No, I have not noticed any changes

16. Have you seen a dentist or other dental healthcare worker for a check up and/or clean of your teeth **during this pregnancy?**

- Yes
- No

17. Have you needed to see a dentist or other dental healthcare worker for a problem with your teeth **during this pregnancy?**

- Yes
- No

18. When you saw the dentist or other dental healthcare worker, **during this pregnancy,** did they talk with you about how to care for your teeth and gums?

- Yes
- No
- I haven't seen a dentist or other dental healthcare worker

19. When you saw the dentist or other dental healthcare worker, **during your pregnancy,** did they advise you about diet?

- Yes
- No
- I haven't seen a dentist or other dental healthcare worker

20. When you saw the dentist or other dental healthcare worker, **during your pregnancy,** did they advise you about the use of fluorides?



- Yes
- No
- I haven't seen a dentist or other dental healthcare worker

21. If you needed to see the dentist, **during your pregnancy**, but did not, what were your reasons for **not** going? (tick as many boxes as necessary)

- Too expensive
- I had no time
- I am afraid of dentists
- I thought it was not recommended to visit a dentist while you are pregnant
- Other (please specify) \_\_\_\_\_
- I didn't think I needed to see a dentist

**The next set of questions are about sources of dental health information:**

22. During this pregnancy or any previous pregnancies, have you received any information about dental health? (tick as many boxes as necessary)

- Yes, in this current pregnancy
- Yes, in a previous pregnancy
- No, never

23. Where did you obtain/ who gave you the information about dental health **during this pregnancy**? (tick as many boxes as necessary)

- Dentist
- Dental hygienist
- Midwife
- GP
- Obstetrician
- Family/friends
- TV/radio
- Folders
- Books/magazines (please specify) \_\_\_\_\_
- Internet (please specify) \_\_\_\_\_
- Other (please specify) \_\_\_\_\_
- I have not received any information on dental health during this pregnancy

24. The information that I received on oral health **during this pregnancy** was related to: (tick as many boxes as necessary)

- Dental hygiene (e.g. how to floss, for how long I should brush my teeth...)
- Diet (e.g. should avoid eating too much sugar...)
- Oral health diseases (e.g. what causes decay or gum disease...)
- Babies oral health (e.g. early childhood decay...)

- Association between oral problems and general health (e.g. periodontal disease and diabetes...)
- Other (please specify) \_\_\_\_\_
- I have not received any information on oral health during this pregnancy

25. Have you changed any of the following practices as a consequence of receiving information about dental health **during this pregnancy**? (tick as many boxes as necessary)

- Yes, I changed my brushing habits
- Yes, I changed my flossing habits
- Yes, I changed my dietary habits
- Yes, I went to visit the dentist
- Yes, other (please specify) \_\_\_\_\_
- No, I haven't changed anything
- I have not received any information on oral health during my pregnancy

**This last set of questions are asking information about you:**

26. What is your date of birth? \_\_\_\_/\_\_\_\_/\_\_\_\_

27. Where do you usually live?

Street number \_\_\_\_\_  
 Street name \_\_\_\_\_  
 Suburb \_\_\_\_\_  
 City \_\_\_\_\_

28. Which ethnic group(s) do you belong to (tick as many boxes as necessary):

- |   |                                  |
|---|----------------------------------|
| <input type="checkbox"/> New Zealand European or Pakeha | <input type="checkbox"/> Niuean  |
| <input type="checkbox"/> New Zealand Maori              | <input type="checkbox"/> Tongan  |
| <input type="checkbox"/> Other European                 | <input type="checkbox"/> Indian  |
| <input type="checkbox"/> Samoan                         | <input type="checkbox"/> Chinese |
| <input type="checkbox"/> Cook Island Maori              |                                  |
| <input type="checkbox"/> Tokelauan                      |                                  |
| <input type="checkbox"/> Other (please specify) _____   |                                  |

29. Education. Please tick the highest level of education you have, as it applies now (please only tick one box):

- Less than high school
- High School
- Some tertiary – certificate, diploma or incomplete degree
- Tertiary - degree
- Tertiary - postgraduate

**30.** What would be the total income, that your household got from all sources before tax or anything has been taken out of it, **in the last 12 months?** (please only tick one box)

- |  |   |
|--|---|
| <input type="checkbox"/> Loss              | <input type="checkbox"/> \$40,001-\$50,000  |
| <input type="checkbox"/> Zero              | <input type="checkbox"/> \$50,001-\$70,000  |
| <input type="checkbox"/> \$1-\$5,000       | <input type="checkbox"/> \$70,001-\$100,000 |
| <input type="checkbox"/> \$5,001-\$10,000  | <input type="checkbox"/> \$100,001- or more |
| <input type="checkbox"/> \$10,001-\$15,000 | <input type="checkbox"/> Refused            |
| <input type="checkbox"/> \$15,001-\$20,000 | <input type="checkbox"/> Don't know         |
| <input type="checkbox"/> \$25,001-\$30,000 |   |
| <input type="checkbox"/> \$30,001-\$40,000 |   |

**Would you like to make any comments on this research/questionnaire?**

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**Thank you very much for taking part in this study**

## **Appendix 3: Information sheet**

### **Oral health and use of dental care services among pregnant women in Wellington**

#### **Information sheet**

##### **Researchers Introduction**

My name is Bianca Claas. I qualified as a dentist in Brazil and also trained as a Public Health Specialist at the Federal University of Bahia, Brazil. This research forms part of my study towards a Masters in Public Health at Massey University. I can be contacted on 02102707317 or email [biaclaas@hotmail.com](mailto:biaclaas@hotmail.com) if you have any queries or would like more information about this study. My supervisor is Dr Lis Ellison-Loschmann, who has a PhD in Epidemiology and currently works at the Centre for Public Health Research, Massey University, Wellington campus.

##### **Participant Recruitment**

I am interested in finding out about the access pregnant women have to oral health care. Pregnant women are a group requiring special attention in respect of their oral health and this has been recognised by the Ministry of Health. There is almost no information currently available about the oral health needs of pregnant women. I am asking pregnant women who are attending antenatal education classes in the Wellington region to complete a survey questionnaire on their oral health, use of dental services and where they get information on caring for their teeth during pregnancy. I am also interested to know if oral health care and access to dental services are the same for all groups of pregnant women.

##### **Project procedures**

All information you give us will be treated with absolute confidentiality. You will not be identified in any publications or reports arising from this work. I am asking for your address so that it can be coded and used for measuring socio-economic differences. The coding is done anonymously and you cannot be identified in any way from this information. Questionnaires will be kept in locked filing cabinets and on a password-protected database on the research premises of the research supervisor at the Centre for Public Health Research. If you would like to access the summary of the study it will be sent to you by mail.

### **Participant involvement**

If you agree to take part, I will ask you to complete a questionnaire. The questionnaire will be given to you at your antenatal class and can be taken away to be completed at home. It will take approximately 20 minutes to fill-in. Completion and return of the questionnaire implies consent.

You will be asked to bring back the completed questionnaire to your antenatal class and deposit it in a “drop box” specifically for this purpose. I will then visit the antenatal class to collect in all the questionnaires.

### **Participant’s Rights**

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- ask any questions about the study at any time during participation;
- provide information on the understanding that your name will not be used unless you give permission to the researcher;
- be given access to a summary of the project findings when it is concluded.

### **Project Contacts**

Please contact the researcher, Bianca Claas at the Centre for Public Health Research, ph 02102707317 or email [biaclaas@hotmail.com](mailto:biaclaas@hotmail.com) to discuss any queries or concerns that you may have about the study. The contact details for my supervisor, Dr Lis Ellison-Loschmann, are: the Centre for Public Health Research, PO Box 756, Wellington, ph 3800614.

*“This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern A, Application 08/21. If you have any concerns about the conduct of this research, please contact Professor John O’Neill, Chair, Massey University Human Ethics Committee: Southern A, telephone 06 350 5799 x 8771, email [humanethicsoutha@massey.ac.nz](mailto:humanethicsoutha@massey.ac.nz).”*

**Thank you very much for your time in considering taking part in this study**