Eating Habits and Nutrition Attitudes among Pregnant Chinese Women in New Zealand

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Abstract

Immigration to a Western country can lead to dietary changes among Chinese immigrants, which can cause poor diets and health problems. Chinese immigrants' eating habits might be influenced by both Western and traditional Chinese Medicine (TCM) nutrition recommendations. These two nutrition recommendations point out eating and nutrition during pregnancy is crucial for both maternal and fetal health, and they provide suggestions on eating habits during pregnancy. The population of Chinese women of reproductive age in New Zealand has increased dramatically. Since there is a lack of evidence about the eating habits and nutrition attitudes of pregnant Chinese women in New Zealand, the current study investigates pregnant Chinese women's eating habits, attitudes towards both Western and TCM nutrition, and possible relations to acculturation.

Pregnant Chinese women in New Zealand were recruited mainly via a Chinese website, communities, churches, and the "snow-ball" model. The immigrants' eating habits, attitudes towards Western and TCM nutrition recommendations, and acculturation were measured by an online questionnaire. The questionnaire was completed by 84 pregnant Chinese women, with a median age of 30.0 (95% CI 29.0 - 30.6). The participants' acculturation score was comparatively low (1.98 ± 0.592) compared with the theoretical score range (1.0 to 5.0).

Regarding New Zealand nutrition recommendations, some of the findings cause concerns: (1) most of the participants did not meet the recommended intake of vegetables, cereals, and dairy food during pregnancy; (2) although a large proportion of the participants had positive attitudes towards recommended supplements and food for pregnancy, they did not follow the recommendations in practice, especially for the iodine supplements and food rich in iodine (e.g., bread and breakfast cereals). However, it is positive to find that: (1) most of the participants always consumed folic acid supplements during the first trimester of pregnancy; (2) a majority of the participants thought it was important for them to limit fat, salt, and sugar intake and most of them seldom or never eat food high in fat, sugar, and salt.

A majority of the participants had positive attitudes towards TCM, including: (1) balancing cold and hot (or yin and yang) foods and adjusting their diets according to seasons or body constitutions; (2) eating less greasy food, eating more light food, and eating more spleen and stomach strengthening food. However, only a small proportion of participants had positive attitudes towards foods with specific TCM features and did not consume these foods no matter whether they are recommended by TCM nutrition for pregnancy or not. Meanwhile, a considerable proportion of the participants reported neutral attitudes towards caring and learning about nutrition and most of the TCM nutrition recommendations.

Acculturation was positively associated with meeting the New Zealand recommended intake from food groups, but was not positively associated with other eating habits. Acculturation was not related to most nutrition attitudes. It was only positively associated with attitudes towards Western nutrition recommendations for pregnant women and their attitudes towards TCM nutrition recommendation for healthy eating for adults. In addition, there was a positive correlation between attitudes towards Western nutrition and TCM nutrition ($p < 0.05$).

The above findings of the current study provide useful information for health professionals who work with Chinese immigrants in New Zealand. In particular, health professionals should help immigrants to consume sufficient servings of foods and understand the importance of consuming iodine supplements during pregnancy. Additionally, it might be helpful for health professionals to be familiar with overall TCM nutrition recommendations.

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List of Abbreviations

AI: Adequate Intake

ANOVA: Analysis of Variance

ARSMA: Acculturation Rating Scale for Mexican-Americans

ASSA: Acculturation Scale for Southeast Asians

BMI: Body Mass Index

BP: Blood Pressure

CVD: Cardiovascular Disease

EAR: Estimated Average Requirement

FFQ: Food Frequency Questionnaire

GDM: Gestational Diabetes Mellitus

RDI: Recommended Dietary Intake

SASH: Short Acculturation Scale for Hispanics

SL-ASIA: Suinn-Lew Asian Self-Identity Acculturation Scale

TCM: Traditional Chinese Medicine

UL: Upper Level of Intake

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Chapter 1 Introduction

New Zealand is a multi-ethnic country. People living in New Zealand have various cultural origins, mainly European, Maori, Asian, and Pacific. The size of the Asian population dramatically increased between 2001 and 2006, to become the third largest ethnic group in New Zealand in 2006 (Statistics New Zealand, 2006b). The Social Report (2010) predicted that the Asian population will increase about 3.4% each year and would account for 16% of the total population in 2026. A rise in immigration is one of the reasons for the increase in the Asian population. In particular, Chinese was the second largest immigrant ethnic group to New Zealand, which accounted for 13% of permanent immigrants in 2011/12 (Ministry of Business Innovation and Employment, 2013). Due to the large proportion and dramatic increase of the Chinese population in New Zealand, it is necessary to understand Chinese immigrants' nutritional status, and identify if potential problems are associated with adaption to life in New Zealand.

Living in New Zealand, Chinese immigrants experience a new environment and their lives change. This includes changes in eating habits and associated factors. For example, where they buy food, how they choose food, and how they cook food might change after immigration. Such changes could result in positive or negative changes in nutritional status. Compared Chinese immigrants' eating habits after living in Western countries with their eating habits before immigration, previous studies have shown both positive changes (e.g., increased consumption of fresh fruits) and negative changes (e.g., increased consumption of fast food and soft drinks) in eating habits as well as health problems (e.g., increased risk of obesity). Since Chinese immigrants retain some of their Chinese eating habits, they have different nutritional status compared with New Zealanders. Compared with the overall New Zealand population, Asians are less likely to be obese (Ministry of Health, 2013c). However, a larger proportion of Asians have diabetes and do not meet the recommended vegetable intake (Ministry of Health, 2013c).

Eating and nutrition during pregnancy are important to maternal health and fetal development (Ministry of Health, 2006). It is necessary for women to change their

eating habits during pregnancy (Ministry of Health, 2006). Since both traditional Chinese medicine (TCM) and Western nutrition have recommendations for healthy eating during pregnancy, Chinese immigrants' nutrition attitudes and eating habits might be influenced by both TCM and Western nutrition. There is lack of evidence about Chinese immigrants' eating habits and nutrition attitudes during pregnancy in Western countries. Hence, the present study focuses on pregnant Chinese immigrants' eating habits and nutrition attitudes in New Zealand. It aims to measure pregnant Chinese women's eating habits and nutrition attitudes in New Zealand through an online questionnaire. Specifically, this study describes pregnant Chinese immigrants' eating habits and attitudes towards Western and TCM nutrition. In addition, this study measures the inter-relationship between eating habits, nutrition attitudes, and acculturation.

In what follows, Chapter 2 reviews studies in New Zealand and other Western countries that investigated Chinese immigrants' health status, eating habits, and nutrition attitudes. Chapter 3 describes the participant recruitment, the development of the questionnaire, and details of data collection and analysis. Chapter 4 presents the results of the study, including the participants' eating habits, nutrition attitudes, and their relationship to acculturation. Chapter 5 compares the current findings with previous research and discusses implications of the findings. Finally, Chapter 6 sums up the main findings and gives recommendations for health professionals and for further study.

Chapter 2 Literature Review

2.1 Acculturation

When living in new countries, the lives of immigrants change as they start to become involved in a new environment and come in contact people with different cultural origins. The word *acculturation* is used in order to investigate and describe the changes after immigration. Several researchers have defined acculturation. The most frequently used definition of acculturation is from Redfield, Linton, and Herskovits (1936, p.149): "Acculturation comprehends those phenomena which result when groups of individuals having different cultures come into continuous first-hand contact, with subsequent changes in the original culture patterns of either or both groups". Acculturation is a complex process, which involves the acceptance of involvement in a new culture (Satia, 2003; Satia, Patterson, Nerhouser & Elder, 2002). Moreover, Suinn, Khoo, and Ahuna (1995) pointed out that acculturation includes both the adoption of a new culture and the combination of the original and new culture.

In particular, living in a new environment causes changes in immigrants' eating habits (e.g., food choices and food preparations). Dietary acculturation is a multidirectional process describing immigrants' changes in eating habits after living in a new environment, including both the adaption to the local dietary pattern and the maintenance of the traditional dietary pattern (Satia, 2010). Satia (2010) summarized that after immigration, immigrants might: (1) consume more local food, (2) develop new ways to prepare traditional food, and (3) use traditional cooking methods to prepare local food. Thus, immigrants' eating habits might not be the same as the locals, at least not in the short- to medium-term, but the eating habits are also not the same as they were before immigration.

Researchers have investigated Chinese immigrants' eating habits and the effect of acculturation. The findings are inconsistent and there is a lack of studies measuring Chinese immigrants' eating habits in New Zealand and other Western countries. In addition, researchers have reported some dietary related health problems (e.g., obesity) associated with acculturation of Chinese migrants to Western countries.

2.2 Chinese immigrants' health status

People's health status is impacted by their diet and eating habits. Overweight and obesity, cardiovascular disease (CVD), and diabetes are the three health concerns relating to acculturation and diet. Wahlqvist (2002) pointed out that the food choices of Asian immigrants, which were influenced by acculturation, lead to higher risk of health problems than other ethnic groups, including abdominal obesity and diabetes (type 2 diabetes and gestational mellitus diabetes [GDM]). This section reviews the diet-related health concerns.

2.2.1 Overweight and obesity

There is a high prevalence of overweight and obesity around the world, including in China. The World Health Organization (2013) reported that 1.4 billion adults worldwide, accounting for 35% of all adults, were overweight in 2008. Among these overweight people, 11% of them were obese (including more than 200 million males and nearly 300 million females). Similarly, the Chinese National Nutrition and Health Survey in 2002 reported that the total prevalence of overweight and obesity in China was nearly a quarter of the whole population, with 17.6% of the population being overweight and 5.6% being obese (Wu et al., 2005).

Studies showed that both high BMI before pregnancy and significant weight gain during pregnancy were related to higher risks of adverse pregnant outcomes (e.g., gestational hypertension, gestational diabetes, macrosomia, and large for gestational age infants) among Chinese women (Chen et al., 2010; Liu, Dai, Dai, & Li, 2012).

Many researchers focused on the prevalence of overweight and obesity among Chinese immigrants according to the Western standard for BMI recommended by World Health Organization (1995). These studies reported that most Chinese immigrants have BMI in the normal range (Lauderdale & Rathouz, 2000; Yeh et al., 2009). According to the Western standard BMI recommendation by World Health Organization (1995), the normal weight range for an adult is from 18.50 to 24.99 kg/m^2, the range for overweight

is ≥ 25.0 kg/m^2, and the range for obese is ≥ 30kg/m^2. However, Wulan, Westerterp, and Plasqui (2010) pointed out that Asian people were more likely to have a larger proportion of body fat, be at a higher risk of abdominal obesity, and have higher levels of intramyocellular lipids and liver fat than Caucasians with the same BMI. Therefore, there is a BMI standard for Asians, which recommends that the range for being overweight is ≥ 23.0 kg/m^2 and being obese is ≥ 25/0 kg/m^2 (Gersh, Sliwa, Mayosi, & Yusuf, 2010). In addition, waist circumference (men ≥ 90 cm; women ≥ 80 cm) is also a standard for the classification of obesity (Gersh et al., 2010).

Several studies investigated the prevalence of overweight and obesity among Asian and Chinese immigrants using Asian BMI Standard and found that the incidence of being overweight or obese with this standard was higher than the incidence using the World Health Organization (1995) BMI standard. Wong, Dixon, Gilbride, Chin, and Kwan (2011) measured the health status of 125 older Chinese in New York City, US. According to the World Health Organization (1995) standard, 30% of the participants were overweight, and 7% of them were obese. When using the Asian standard, the prevalence of overweight and obesity became very high (29% were obese, and 38% were overweight). Additionally, the prevalence of obesity was also high (32% for the male participants and 46% for the female participants) when using waist circumference as an indicator. Similarly, Rajpathak and Wylie (2011) found that the prevalence of obesity using the Asian standard (36.1%) was higher than the prevalence using the World Health Organization (1995) standard (3.6%) when measuring 2,017 Chinese Americans in New York City, US. This study also showed a high prevalence of abdominal obesity (42.9%) based on the waist circumference standard. Based on these studies, it is shown that Chinese immigrants have high a prevalence of overweight and obesity.

Studies suggested that longer duration of living in the US was associated with a higher bodyweight. Yeh et al. (2009) classified Chinese Americans into three groups according to the length of living in the US (≤ 5 years, 5 – 16 years, and ≥ 16 years). They found that Chinese immigrants who had lived in the US for a longer period were significantly more likely to be overweight or obese than those who lived in the US for a short period ($p < 0.005$). Similarly, Lauderdale and Rathouz (2000) showed that the duration of living in the US was positively related to overweight and obesity among foreign born

Asian-Americans. Moreover, Kandula et al. (2008) found that the BMI of elder Chinese immigrants in the US (62.8 ± 10.2 years' old; n = 737) was positively related to their acculturation level. The relationship between acculturation and weight gain indicates that eating habits and/or activity patterns, which change with acculturation, may be responsible.

2.2.2 Diabetes and cardiovascular disease

Diabetes and CVD are a common health problem across the world, including in China. There were about 17.3 million deaths caused by CVD in 2008 in the world (Mendis, Puska, & Norrving, 2011). It is predicted that by 2030 there will be more than 23.3 million deaths caused annually by CVD (Mendis et al., 2011) and 239 million adults (accounting for 7.7% of the world adult population) will have diabetes (Shaw, Sicree, & Zimmet, 2010).

Several studies have reported a high prevalence of diabetes and CVD among elder Chinese immigrants in Western countries. Kandula et al. (2008) investigated the risk of diabetes among immigrants with different cultural origins (including 737 Chinese) in six regions of the US and found that 13% of the Chinese participants had diabetes. The prevalence of diabetes among Chinese was significantly lower than among Mexicans and non-Mexicans Hispanics in the US. This suggests that the influence of acculturation on the risk of diabetes might be different among different ethnic groups. Likewise, Wong et al. (2011) reported that the prevalence of pre-diabetes (38%; fasting blood glucose between 100 and 125 mg/dL) and diabetes (40%; fasting blood glucose 126 mg/dL or higher) among 125 older Chinese-Americans was high in New York City, US. Wong et al. found a high prevalence of risk factors for CVD among Chinese immigrants. This study also found a significant relationship between the consumption of oil, confectionaries, and meats and the increased risk factors of CVD (including waist circumference and systolic blood pressure). This indicates that Chinese immigrants' eating habits might influence their health status. However, since age is positively related to a high risk of diabetes and CVD, the high risk of CVD and diabetes might be related to the older age (rather than acculturation) of participants in the above two studies.

Another two studies adjusted for the possible influence of age, and reported a high risk of CVD and diabetes among Chinese-Americans (Rajpathak & Wylie, 2011) and Chinese-Canadians (Liu et al., 2010). This indicates that there is a high prevalence of diabetes and CVD across Chinese immigrants in general.

Since obesity is positively related to the risk of diabetes and CVD (Gersh et al., 2010; Mendis et al., 2011; Yusuf, Reddy, Ôunpuu, & Anand, 2001), and acculturation positively associates with weight gain (see Section 2.2.1), acculturation might also be related to higher risk of diabetes and CVD. Deng, Zhang, and Chan (2013) pointed out that dietary acculturation of Chinese in Western countries is related to a higher risk of chronic disease, such as diabetes. However, Kandula et al. (2008) did not find an association between diabetes and acculturation level (measured by participants' country of origin, duration of living in the US, and usage of language at home) among Chinese immigrants in six cities in the US. This might be due to the low acculturation level of the sample.

Several studies showed a positive association between duration of Chinese immigrants living in Western countries and the risk of both CVD and diabetes. Oza-Frank, Chan, Liu, Burke, and Kanaya (2013) recruited 4922 immigrants (including 593 Chinese immigrants) living in six centres of the US. They found that the participants who lived in the US for at least 20 years were significantly more likely to develop type 2 diabetes than those who lived in the US for less than 20 years after adjusting for age, ethnic groups, education level, and current regions of living in the US. Lear, Humphries, Hage-Moussa, Chockalingam, and Mancini (2009) measured the relationship between duration of living in Canada and the risk of atherosclerosis among 450 immigrants (including 180 Chinese immigrants) in Canada. This study showed a significant relationship between the duration of living in Canada and higher intima-media thickness. Likewise, a large-scale study by Chiu, Austin, Manuel, and Tu (2012) found that Chinese immigrants who lived in Canada for at least 15 years (n = 1563) had a higher prevalence of CVD risk factors (including smoking, obesity, hypertension, and diabetes) than Chinese immigrants who lived in Canada for less than 15 years (n = 1475). Thus, a longer duration living in Western countries (e.g., more than 15 years according to Chiu et al.'s study) is associated with a higher risk of diabetes and CVD.

2.2.3 Gestational diabetes mellitus

Considering health problems among pregnant women in particular, there is a dramatic increase in the incidence of GDM in the worldwide (Metzger et al., 2007; Nielsen, 2011).

Both a high prevalence of GDM and a dramatic increase in the prevalence of GDM among Asian or Chinese immigrants have been reported. Rosenberg, Garbers, Lipkind, and Chiasson (2005) investigated pregnant women's health status in New York City, US. They found that the prevalence of GDM among 38,507 Asian immigrants was 6.6%. A high prevalence of GDM was also found in Chinese immigrants in Western countries (Beischer, Oats, Henry, Sheedy, & Walstab, 1991; Mukerji, Chiu, & Shah, 2012; Savitz, Janevic, Engel, Kaufman, & Herring, 2008). More importantly, there has been a large increase in the prevalence of GDM. Thorpe et al. (2005) reported that the prevalence of GDM increased from 3.9% in 1990 to 7.4% in 2001 among Asian women who gave live birth in New York City. Hence, Chinese immigrants have a high prevalence of GDM and there is a high risk of developing GDM among Chinese immigrants.

Some studies showed that Western acculturation relates to a high risk of GDM. Acculturation level was positively associated with incidence of GDM among Somali women in Minnesota, US (Flynn, Foster, & Brost, 2011). Larger proportions of highly acculturated Hispanic and non-Hispanic white pregnant women had GDM than less acculturated Hispanic pregnant women in Phoenix, US (Coonrod, Bay, & Balcazar, 2004). Nevertheless, there is lack of evidence about influence of acculturation on GDM and weight gain during pregnancy of Chinese immigrants. As previous studies have found the positive influence of acculturation on Chinese immigrants' weight gain (see Section 2.2.1) and weight gain during pregnancy is related to higher risk of GDM, then acculturation might also be associated with high risk of GDM among Chinese immigrants.

2.2.4 Summary

Overall, there is a high prevalence of health problems (including overweight and obesity, CVD, and diabetes) among Chinese immigrants in Western countries. Moreover, Chinese immigrants' acculturation level is associated with a higher risk of these health problems. Regarding pregnant Chinese women in particular, the prevalence of GDM was high among them, but there is no evidence of a relationship between acculturation and the prevalence of GDM.

2.3 Chinese immigrants' eating habits

As the current study focuses on pregnant Chinese women's eating habits in New Zealand, "food, eat, Chinese, pregnancy, women, and nutrition" were used as the key words in searching databases. Many researchers have investigated the impact of living in Western countries on Chinese immigrants, but they did not focus on pregnant women. Table 2.1 shows that previous studies investigated immigrants with different demographic characteristics (including different age ranges, duration of living in Western countries, regions, and gender). All of these characteristics influence involvement in a new culture, so it can be difficult to compare findings from these studies. There are also shortcomings in the literature in relation to the relevance to the current study. First, most studies focused on Chinese immigrants in the United States and Canada; only one study focused on Chinese in Australia (Hsu‐Hage, Ibiebele, & Wahlqvist, 1995); and only five studies focused on Chinese immigrants in New Zealand (Jin, 2007; Lu, 2002; Soh, Ferguson, & Wong, 2000; Tan & Waton, 2004; Wen, Rush, & Plank, 2010). Second, most studies focused on elders in Western countries. For example, participants were older than 60 in several studies (Chau, Lee, Tseng, & Downes, 1990; Newman & Ludman, 1984; Tam et al., 2011). Pan, Dixon, Himburg, and Huffman (1999) is one of few studies which included younger participants (Asian students aged between 21 and 35). Third, only a few studies examined participants who had lived in Western countries for a short time (e.g., less than five years) (Newman & Linke, 1982; Newman & Ludman, 1984; Pan et al., 1999). In addition, some of these

studies are rather old (Chau et al., 1990; Grivetti & Paquette, 1978; Newman & Linke, 1982; Newman & Ludman, 1984). Consequently, they might not reflect current eating habits of Chinese immigrants because the dietary pattern in China has become more Western in recent years (Du, Lu, Zhai, & Popkin, 2002; Popkin, 2014; Zhai et al., 2009). Thus, these studies are not so relevant for understanding acculturation of pregnant Chinese women in New Zealand, some of whom are recent immigrants.

All the studies in Table 2.1 examined Chinese immigrants' diets in Western countries. Some studies only measured eating habits in Western countries (Chau et al., 1990; Hsu‐Hage et al., 1995; Lv & Brown, 2010). Some studies measured changes in eating habits (Grivetti & Paquette, 1978; Newman & Linke, 1982; Newman & Ludman, 1984; Pan et al., 1999; Tam et al., 2011; Yang & Read, 1996). Only a few studies measured association between the duration of living in Western countries and eating habits (Lv & Brown, 2010; Lv & Cason, 2004; Rosenmoller, Gasevic, Seidell, & Lear, 2011). Since the duration of living in Western countries is associated with more social contacts with local people, it is usually used as an indicator of acculturation (Salant & Lauderdale, 2003). However, these studies did not directly measure the immigrants' acculturation level.

The variations in both sample characteristics and methodologies led to inconsistent results among the studies. Section 2.3 will discuss the results in detail. Generally, upon moving to a Western country, Chinese immigrants' eating habits changed in both food types and meal patterns.

2.3.1. Consumption of different food types

Generally, research shows that Chinese immigrants consumed a wider range of foods in Western countries than when living in China. Changes in food consumption in Western countries include the following food groups: grains, dairy products, foods high in fats/sweets, soft drinks, fruits, vegetables, meat, and meat products (Lv & Cason, 2004; Newman & Linke, 1982). Analyzing each type of food consumed leads to some unexpected results.

2.3.1.1 Grains and cereals

For Asians in the US (most with Chinese cultural origins), the frequency of consuming grains and cereals in both their home countries and the US was similar (Pan et al., 1999), but the serving/portion size (i.e., the amount of food consumed at a time) was found to be smaller in the US (Yang & Read, 1996). Pan et al. (1999) and Yang and Read (1996) both asked participants about their food consumption in their home countries. This could result in recall biases, especially for participants in the Yang and Read (1996) study, who had been in the US for 8.6 years on average. By contrast, Tam et al. (2011) compared the eating habits of Chinese who had recently immigrated to Canada with the eating habits of local Westerners. They found that Chinese immigrants still ate significantly more grains than local Westerners (Tam et al., 2011).

2.3.1.2 Vegetables

Research shows mixed results in relation to changes in vegetable consumption after immigration. Asian immigrants in the US (mostly of Chinese cultural origin) ate vegetables less frequently (Pan et al., 1999) and consumed smaller serving sizes of vegetables (Yang & Read, 1996) in the US than in their home countries. Contrary to this, Chinese-Canadians consumed more vegetables after they immigrated to Canada than when living in China (Rosenmoller et al., 2011). The participants in the studies by Pan et al. (1999) and Yang and Read (1996) were much younger than participants in the study by Rosenmoller et al. (2011), so they might respond to the environment differently. In addition, unlike Rosenmoller et al. (2011), the studies by Pan et al. (1999) and Yang and Read (1999) included Asian participants, not exclusively Chinese, although most of the participants were Chinese. Also as discussed in Section 2.3.1.1, these two studies may be affected by recall biases.

All of the above three studies (Pan et al., 1999; Rosenmoller et al., 2011; Yang & Read, 1996) only focused on change in intake of Asian and Chinese immigrants. However, Tam et al. (2011) compared Chinese immigrants' vegetable intake with local Westerners. They found that Chinese immigrants ate more vegetables than local Caucasians (Tam et al., 2011), suggesting that the immigrants' diet might not have completely changed to what the locals eat.

Although Chinese-Americans were found to consume a variety of vegetables in both China and the US, their vegetable selection changed significantly after living in the US. The Chinese-Americans ate lettuce, broccoli, potato, zucchini, and squash more often in the US than in China (Grivetti & Paquette, 1978). However, they ate green onions, mushrooms, bok choy, tree ears, water chestnuts, and lotus root less often (Grivetti & Paquette, 1978).

2.3.1.2 Fruit

Chinese immigrants' fruit consumption in Western countries is consistently found to be higher than in China. Asian immigrants, most of whom were of Chinese cultural origins, consumed fruit significantly more frequently (Pan et al., 1999) and consumed larger amounts of fruit (Yang & Read, 1996) in the US than in their home countries. Similarly, Chinese-Canadians ate more fruit when living in Canada than when living in China (Rosenmoller et al., 2011). In addition, Chinese-Canadians' fruit intake was significantly higher than Westerners' fruit intake (Tam et al., 2011).

Furthermore, the selection of fruit was considerably more often than fruit selection in China. For instance, Chinese-Americans consumed apples and peaches markedly more often in the US than in China. However, they consumed pineapples, watermelons, lychees, persimmons, and Mandarin oranges less often (Grivetti & Paquette, 1978). The consumption of grapes, bananas, honeydew melons, and oranges remained the same in the US (Grivetti & Paquette, 1978).

2.3.1.3 Dairy products

Compared with dairy food consumption in their home countries, Chinese immigrants consistently report that they consume dairy products (such as milk, yogurt, cheese, and sour cream) more regularly in the US (Chau et al., 1990; Newman & Linke, 1982; Pan et al., 1999). In addition, Chinese-Canadians (Rosenmoller et al., 2011) and Asian-Americans (mostly of Chinese cultural origin) (Yang & Read, 1996) consumed more dairy food and larger serving sizes of milk in Western countries than in their home countries. However, Newman and Ludman (1984) found only a small increase in the consumption of dairy food among elder Chinese-Americans. The small increase possibly related to the low consumption of dairy food among elders in the US (Kim,

Reicks, & Sjoberg, 2003) and lactose intolerance among Chinese people (Zheng & Rosenberg, 1984). However, Chinese who had lived in the US for a short time (6.8 ± 2.9 years) had a significantly lower intake of cheese and yogurt relative to local Westerners (Tam et al., 2011).

2.3.1.4 Meat, meat products, and seafood

Reported changes in the frequency of meat consumption after immigration are inconsistent. Chinese-American women consumed food from all food groups more often in the US than in China, and the largest increase was in the frequency of meat consumption (Newman & Linke, 1982). However, the majority of elderly Chinese-Americans did not eat meat and meat products more regularly after moving to the US (Newman & Ludman, 1984). The reason might be the influence of acculturation on eating habits was less among elders than young people (Satia et al., 2001). But, Asian students (mostly of Chinese cultural origin) ate meat less often in the US than in their home countries (Pan et al., 1999). This might be a consequence of the low income typical for a student. Additionally, Chinese-Canadians' meat consumption was significantly lower than local Westerners, but their fish consumption was significantly higher (Tam et al., 2011).

Moreover, selection of meat changed after immigration. Compared with food consumption in China, Chinese-Canadians ate more fatty meat (Rosenmoller et al., 2011) and ate bacon more regularly (Grivetti & Paquette, 1978) in Canada. On the contrary, Chinese-Canadians ate duck less regularly (Grivetti & Paquette, 1978). Furthermore, the variety of meat and meat products decreased after moving to the US (Grivetti & Paquette, 1978). Nevertheless, how frequently they consumed beef and chicken did not vary (Grivetti & Paquette, 1978).

2.3.2 Chinese food vs. Western food

Previous studies showed Chinese immigrants' consumption of Chinese and Western food changed when living in Western countries. After immigration, Chinese immigrants continued consuming typical Chinese food. For example, Chinese-American

immigrants ate cooked vegetables, soy sauce, and rice at least three times a week at their meals (Chau et al., 1990). In contrast, Chinese immigrants consumed more Western food after immigration than in China, such as breakfast cereals, frozen desserts, cheese, coffee, yogurt, and black tea (Lv & Cason, 2004; Newman & Ludman, 1984; Tam et al., 2011). Moreover, Hsu‐Hage et al. (1995) used the duration of living in Australia as the indicator of Western dietary acculturation and found that Chinese-Australians who were more acculturated consumed more Western food (e.g., red meat and coffee) instead of traditional Chinese food (e.g., rice and soups).

In general, Chinese immigrants eat more Western food and less Chinese food when they lived in Western countries for a longer time. Take grain products as an example, steamed bun, bread, dumpling, noodles, and rice were less frequently consumed by immigrants in US than in China (Lv & Cason, 2004). On the contrary, tortillas, which were never consumed by most participants while in China, were consumed 2 or more times per month by most participants after immigration to the US (Chau et al., 1990). The increased consumption of Western food and decreased consumption of traditional Chinese food results in a combination of both traditional Chinese foods and local Western foods in immigrants' diets. The details of the combination will be discussed in the following section.

2.3.3 Meal patterns

In addition to changes in individual types of food, researchers have found changes of meal patterns.

2.3.3.1 Meal times & with whom meals are shared

Several researchers found that fewer meals were consumed and less time was spent in preparing meals after immigration. In China, only a small proportion of Chinese people did not eat breakfast (male - 6.6%, female - 2.4%) (Fu et al., 1998). However, Asian students (mostly of Chinese cultural origin) in Florida allocated less time for preparing meals in the US than in their home countries, and nearly half of them did not have breakfast (Pan et al., 1999). Similarly, almost a quarter of Chinese-Americans (22.6%)

in Pennsylvania reported that they had fewer meals in the US. In particular, 64.6% of them stopped eating breakfast (Lv & Cason, 2004). Additionally, Chinese-Americans reported they did not have meals with their families as frequently as in China, including daily meals (breakfast, lunch, supper) and snacks (Newman & Linke, 1982).

2.3.3.2 Foods consumed at meals - breakfast, lunch, dinner & snacks

Chinese immigrants' breakfast changed more than lunch and dinner; breakfast consisted of more Western food. Compared with breakfast in China, first generation Chinese-Americans (i.e. newly immigrated Chinese-Americans) began to select Western food, such as breakfast cereals and tortillas, instead of typical Chinese food, such as rice and steamed buns (Grivetti & Paquette, 1978). A strong preference towards Western food at breakfast was also found in other studies. Most of the elder Chinese women surveyed in San Francisco and elder Chinese-Americans immigrants in Pennsylvania consumed Western food (e.g., breads, breakfast cereals, cookies, pies, and cakes) at breakfast (Chau et al., 1990; Lv & Brown, 2010). However, only half of the Chinese immigrants sometimes had Chinese food (e.g. rice, steamed buns, stewed eggs, and porridge) at breakfast (Lv & Brown, 2010).

Although Lv and Brown (2010) found some Chinese-Americans bought food for lunch on working days, most of them ate leftovers brought from home. At lunch, Chinese food (including rice, noodles and dumplings) was eaten by most immigrants (Newman & Linke, 1982). Nevertheless, a small proportion of immigrants also ate Western food, such as sandwiches (Chau et al., 1990). Children were especially likely to eat Western food (Lv & Brown, 2010).

The type of food that Chinese immigrants eat for dinner changed the least among all meals (Chau et al., 1990; Lv & Brown, 2010; Yang & Read, 1996). They continued to consume Chinese dishes at dinner, including starch (e.g. rice, noodles, and steamed buns) and vegetables together with meat or seafood (Lv & Brown, 2010). Nevertheless, rice consumption decreased, and more side dishes were added (Newman & Linke, 1982). Western foods were seldom prepared for dinner (Lv & Brown, 2010).

Regarding snacks, nearly half of Chinese-American participants selected fresh fruit as their snacks (Chau et al., 1990). However, Lv and Brown (2010) reported that Chinese-Americans, especially children, ate food high in fat, sugar, and salt (e.g., chips, cookies, chocolates, sweets, ice cream, and soft drinks) as snacks. To what extent snacking habits changed was unclear. Pan et al. (1999) found that although the frequency of eating snacks did not change after immigration, Asian students (predominantly of Chinese culture origin) ate snacks high in salt and sugar more often after immigration, especially chocolates and chips. Similarly, when eating out in restaurants, immigrants, especially children, ate Western food (e.g., pizza, burgers, and fried chips) more frequently than Chinese food (e.g., noodles, rice, stir-fried Chinese dishes, and soups) (Lv & Brown, 2010; Pan et al., 1999). However, Rosenmoller et al. (2011) found that nearly half (40%) of the Chinese Canadian participants reported that they consumed less fries and soft drinks after moving to Canada. These differences might be caused by different demographic factors of participants. The elders (≥ 60 years' old) (Chau et al., 1990) and those who had lived in Western countries for a long period (> 17 years) (Rosenmoller et al., 2011) were more likely to choose less food high in fat, sugar and salt and more fresh fruits than other people. On the contrary, younger people, such as children in Lv and Brown's study and students (21 - 25 years' old) in Pan et al.'s study, and those who had lived in the Western countries for a short period (25 months on average) (Pan et al., 1999) were more likely to eat food high in fat, sugar, and salt.

2.3.3.3 Supplements

Pan et al. (1999) investigated supplement intake by Asian students living in the US and found that some Asian students (about one third of the participants) consumed typically Western dietary supplements (mainly vitamins and minerals) (Pan et al., 1999). Furthermore, just under a quarter of the participants consumed the TCM type supplements, mainly including ginseng, angelica root, and medlar (Pan et al., 1999). However, this study also included students from other Asian countries, so it might not accurately reflect Chinese immigrants' supplements intake. Unfortunately, the other studies did not investigate Chinese immigrants' supplements intake.

2.3.4. Cooking methods and eating habits

As discussed above, researchers have found that immigrants combine traditional and Western foods together. Compared to when in China, Chinese Canadians used microwaves more frequently in Canada and used fresh vegetables more often to prepare salads rather than eating cooked vegetables (Rosenmoller et al., 2011). Immigrants added butter, margarine and cheese to their foods more often than when they lived in China (Yang & Read, 1996). While this change could result in increased fat consumption, these immigrants also cut fat away from meats more frequently in the US compared to their country of origin (Yang & Read, 1996). Although the increased selection of butter, margarine and cheese indicated the influence of Western dietary habits, participants still had their own traditional choices during cooking, such as stir-fried vegetables and pickles (Yang & Read, 1996). Even though Chinese immigrants tried to cook Western food, women found it hard to prepare Western dishes and had to select semi-prepared foods, which are comparatively easier to prepare (Lv & Brown, 2010). The difficulty of cooking Western food might be a barrier for Chinese immigrants to eat Western food, especially at dinner.

2.3.5 Special food for different cultural occasions

Research has shown that special food was consumed for both Chinese and Western events. Chinese immigrants stayed faithful to their traditions and ate traditional foods on special Chinese days, including Spring Festival, Lantern Festival, and Dragon Boat Festival (Newman & Linke, 1982; Pan et al., 1999). Chinese immigrants also ate special Western food on Western festivals, including Thanksgiving and Christmas (Newman & Linke, 1982; Pan et al., 1999). The consumption of special foods for both Chinese and Western events reflect the fact that immigrants not only inherit their own traditional culture, but also begin to learn and become involved in the local Western culture in the US.

2.3.6 Summary and discussion

According to the research discussed above, Chinese immigrants' eating habits change after immigration. They incorporate new foods and eating practices, as well as maintaining some traditional Chinese dietary patterns. The primary changes of eating habits are the consumptions of different type of food. Although these changes indicate the influence of acculturation on immigrants' eating habits, there is not a clear, consistent trend in the food type variations. Increases in fruit and dairy food intake were found in most of the studies. By contrast, the variations in other food types (vegetables, grains & cereals, meat, meat products, and seafood) either rose or fell, and did not show a consistent trend.

Descriptions of meal patterns are more consistent than the results for food types. Firstly, a combination of both Chinese and Western food was found among meals. Secondly, Western food was more frequently eaten at breakfast and lunch, but dinner remained traditional, with immigrants eating a typical Chinese dinner. Thirdly, both special Chinese and Western dishes were cooked to celebrate special Chinese and Western events separately. Fourthly, more Western food (such as chips, burgers, and soft drinks) was eaten as snacks or when eating at a restaurant as compared to Chinese food, and was preferred by children.

The inconsistent findings from previous research might result from the following limitations; see Table 2.1 for details. First, as the studies reported here mainly asked immigrants how their eating habits changed after immigration, these studies did not measure the immigrants' actual daily food intake when living in Western countries. Second, sample characteristics varied among these studies, such as which Western country they immigrated to, the time spent living in Western countries, gender, and age. Third, when answering the questionnaire, the participants had to remember their previous eating patterns before immigration. Some participants, who had moved many years before, might not have remembered which food they consumed or how often they chose certain types of food. Finally, the research reviewed ranged from 1978 to 2011. However, common foods, food availability and other factors relating to eating habits have changed both in China and Western countries, which will lead to further inconsistencies.

Table 2.1 Chinese immigrants' eating habit

Reference	Population	Method	Main Findings	Strengths and Limitations
Chau et al., 1990	● Population group (PG): Chinese-Americans ● *n* = 45 ● Age: ≥ 60 ● Gender: female ● Region: San Francisco Bay area, US ● Time spent living in Western countries (TSLW): not mention	● Measured current frequency of food consumption in the US ● Used food frequency questionnaire (FFQ) and 24 hour food recall	● Meal pattern: ① 95% of participants still ate Chinese food as main food at lunch, e.g. "rice (55%), noodles (22%), and dumplings (18%)" and dinner; ② 5% of participants ate Western food at lunch, such as sandwiches; ③ Chinese food was mainly preferred at dinner, such as "rice (82%), noodles (9%), and dumplings (9%)"; ④ 73% of participants consumed Western food at breakfast, such as "bread, rolls pastries (49%), hot cereals (15%), and cookies and crackers (9%)". 27% took Chinese food at breakfast, such as "rice (16%) and noodles (11%)"; ⑤ Snacks: fresh fruit (44%). ● Food consumption: ① "cooked vegetables, fresh fruit, soy sauce and rice" were ate at least three times a week; ② 60% of participants often drank milk.	Strengths ● Both FFQ and 24 hour food recall were used in this study which made this study more accurate at measuring Chinese-immigrants eating habits. Limitations ● Only females > 60 years' old were recruited. ● Small sample size. ● Did not measure change
Grivetti et al., 1978	● PG: first generation of Chinese-Americans ● *n* = 30 ● Age: not mention ● Gender: females and males ● Region: north-central California ● TSLW: not mention	● Measured frequency of food consumption before and after living in the US ● Used FFQ (current in US and recall in China)	● Meat & meat products ① ↓ total types of meat and meat products were consumed in US; ② ↔ consumption frequency of beef and chicken; ③ dramatically ↑ in bacon; ④ dramatically ↓ in seafood and duck. ● Dairy food ① ↑ consumption of most dairy food, e.g. cheese, yogurt and sour cream; ② not often consumed both living in China and US. ● Cereals: ① pasta was easy to consume, but quite different from Chinese wheat and egg noodles; ② ↓steamed buns (27% did not eat steamed buns in US); ③ rice was still eaten as main food, but ↓;	Strengths ● Investigated immigrants eating habits in detail including both traditional Chinese and American food and included variation in food items selected in each food group. Limitations ● All of the participants were born in the South of China. ● Small sample size. ● Did not measure the amount consumed.

Note: ↑= increase, higher or more, ↓ = decrease, lower or less, ↔ = no change or similar, sig = significant, (10%) = 10% of participant.
Abbreviations: FFQ (food frequency questionnaire), PG (population group),TSLW (time spent living in Western countries)

Table 2.1 Chinese immigrants' eating habit (continued)

Reference	Population	Method	Main Findings	Strengths and Limitations
Grivetti et al., 1978 *(continued)*			④ frequency of breakfast cereals consumption raised dramatically – although 63% did not have in China, only 7% did not have in US; ⑤ tortillas, which were never consumed by 20 of the 30 participants in China, were consumed 2 or more times per month by 67% of participants. ● Vegetables: ① ate lots types of vegetables in both China and US; ② after living in US, selection of vegetables changed, - ↑ broccoli, lettuce, potato, squash, zucchini; - ↓ bok choy, green onions, lotus root, mushrooms, tree ears, and water chestnuts; - remain the same, including bell pepper. Cabbage, carrots, celery, onions, peas and string beans. ● Fruits: ① ↑ apples and peaches; ② ↓ lychee. Mandarin orange, persimmon, pineapple, and watermelon; ③ remained the same, including banana, grape, honeydew melon, and orange.	● Recall bias - data for food frequency before immigration might be inaccurate because participants might not clearly remember their eating habits before immigration.
Hsu-Hage et al., 1995	● PG: Chinese-Australian ● *n* = 545 ● Age: (female) 42.4 ± 12.6; (male) 44.6 ± 12.4 ● Gender: both male and female ● Region: Melbourne, Australia ● TSLW (years): (female) 8.8 ± 5.8; (male) 12.1 ± 9.0	● Measured Melbourne Chinese' current food habits ● Used quantitative FFQ	Two types of eating habits after living in Australia: ① Western acculturated Chinese ate some Western food (e.g. "wheat products, red meat and coffee") instead of traditional Chinese food (e.g. "rice, pork, leafy green and cruciferous vegetables, soups and tea"); ② Participants who reduced their food consumption mainly ate traditional Chinese food.	Strengths ● Large sample size. ● Measures participants' actual food intake. Limitations ● Did not measure changes in eating habits.

Note: ↑= increase, higher or more, ↓ = decrease, lower or less, ↔ = no change or similar, sig = significant, (10%) = 10% of participant.
Abbreviations: FFQ (food frequency questionnaire), PG (population group),TSLW (time spent living in Western countries)

Table 2.1 Chinese immigrants' eating habit (continued)

Reference	Population	Method	Main Findings	Strengths and Limitations
Lv & Brown, 2010	● PG: Chinese-Americans ● *n* = 40 (20 couples) ● Age (average): (female) 41.4; (male) 43.6 ● Gender: male and female ● Region: Weekend Chinese schools in Pennsylvania ● TSLW (years): (female) 16.0; (male) 17.1	● Measured current food practice of participants' family; dividing participants into two groups: ① "modified meal plan (MMP)" group, in which participants ate both Chinese and other Western food for their dinner; ② "traditional meal plan (TMP)" group, in which participants only ate Chinese food for their dinner ● Used interview	● Add new food/dish to family: ① all females would like to cook new food, however, only a small number of males (6 males in MMP group among 20 male participants) reported they would like to provide new food; ② new Chinese dishes were preferred to Western food, and compared with other Western food, only semi-manufactured food (e.g. pizzas) were more accepted. ● Meals ① breakfast: most were Western food (e.g. breakfast cereals); approximately halt participants eat traditional Chinese food for breakfast (e.g. porridge); ② snacks: Western snacks were preferred by children (e.g. cookies, chips, and confections); ③ lunch: 2/3 ate leftovers for lunch, others buy lunch, and children selected Western food for lunch more often; ④ dinner: Chinese immigrants' families had three groups of food for dinner, including starch (e.g. rice, noodles and steamed buns), meat or seafood, and vegetables; Western food was less accepted for dinner among parents, and Western food was prepared/made to meet children's require ● "Eat out": children preferred western fast food	Strengths ● Interviews get deeper understanding of participants current food practice than the studies only using questionnaire. ● Investigated effect of western living basing on the whole family. Limitations ● Small sample size. ● Did not measure changes in eating habits. ● Did not measure the amount consumed.
Lv & Cason, 2004	● PG: Chinese-Americans ● *n* = 399 ● Age: 24-34 (13.0%); 35-44 (55.9%); 45-54 (21.1%) ● Gender: 36.3% male; 63.6% female	● Measured acculturation by duration of living in the US, English proficiency, and social relationship ● Compared food habits: before vs. after immigration by FFQ (current in the US and recall in China)	● For overall food groups: ↑ total frequency of food intake for each food groups, especially for grains, dairy food, and fats/confectionary ● Food items in each food group: ① western food (e.g. pizzas and breakfast cereals); ② ↓ traditional Chinese food; ③ ↑ cheap food.	Strengths ● Classify changes of food frequency according to each specific food items (e.g. evaluated different types of cereal consumption, such as rice and noodles). Limitations ● Did not measure the amount consumed. ● Recall bias.

Note: ↑= increase, higher or more, ↓ = decrease, lower or less, ↔ = no change or similar, sig = significant, (10%) = 10% of participant.
Abbreviations: FFQ (food frequency questionnaire), PG (population group),TSLW (time spent living in Western countries)

Table 2.1 Chinese immigrants' eating habit (continued)

Reference	Population	Method	Main Findings	Strengths and Limitations
Lv & Cason, 2004 *(continued)*	● Region: Pennsylvania ● TSLW (years): 0 - 5 (19.8%); 6 - 10 (29.0%); 11 - 15 (27.5%); > 15 (23.7%)		● number of meals per day: ① (22.6%) ↓ (especially 64.6% did not have breakfast); ② (16.0%) ↑	
Newman & Linke, 1982	● PG: Chinese-American women whose child/children was/were in grades 1 to 12 ● *n* = 102 ● Age: 26-49 ● Gender: female only ● Region: Chinatown (more than 50% participants were Chinese) and Queenstown (only 16% were Chinese). New York ● TSLW (years): covered different time spend, including ① < 2; ② 2 – 5; ③ > 5	● Compared food habits changes via two ways: ① before immigration vs. after immigration; ② Chinatown (where more Chinese people lived) group vs. Queenstown (where more US people lived) group. ● FFQ and interview (current in US and recall in China) ● Changes of food habits including 3 following subgroups: ① "eating pattern" - food consumption frequency before and after immigration; ② "social aspects of food" - whom did they have meals with, and what food were consumed for particular events and festivals; ③ "food related practice" - food purchasing and cooking.	● Food consumption frequency (including all food groups) ↑, especially meat and dairy products. ● Meal patterns that changed slightly ① ↑ fruit intake for breakfast; ② ↓ rice intake for lunch and supper; ③ ↑ side dishes for meals (particularly for dinner). ● Traditional food: ① continue cooking traditional foods for special days; ② changes to some traditional food: ↓ rice dumplings for Lantern festival, ↑ cook unusual traditional foods for Chinese New Year. ● Involvement in food preparation: ① mainly females cooked food; ② ↓ elders involved in cooking ● ↓ frequency of having meals with family.	Strengths ● Measured changes in eating habits in two comparison groups Limitations ● Did not measure the amount consumed. ● Recall bias. ● This study was held more than 30 years ago and current eating patterns and food availability in China have changed since 1982.
Newman et al., 1984	● PG: PRC (People's Republic of China) - Chinese and Chinese-Americans ● *n* = 337 ● Age: 57.7% of PRC-Chinese > 40; 53.5% of Chinese-Americans > 60	● Compared the current eating habits between PRC-Chinese and American Chinese ● Used FFQ current in China (for PRC-Chinese) or in the US (for Chinese Americans) ● Asked Chinese-Americans whether their eating habits were changed and what were the changes	● Food consumptions: ① 57.7% of Chinese-Americans did not report changes in their eating habits; ② ↑ consumption of American food was found among 6.7% of Chinese-Americans; ③ ↑ consumption of new food was found among 7.8% of Chinese-Americans;	Strengths ● Measured both PRC-Chinese and Chinese-Americans' eating habits in detail. Limitations ● Participants were old.

Note: ↑= increase, higher or more, ↓ = decrease, lower or less, ↔ = no change or similar, sig = significant, (10%) = 10% of participant.
Abbreviations: FFQ (food frequency questionnaire), PG (population group),TSLW (time spent living in Western countries)

Table 2.1 Chinese immigrants' eating habit (continued)

Reference	Population	Method	Main Findings	Strengths and Limitations
Newman et al., 1984 *(continued)*	● Gender: male and female ● Region: PRC-Chinese from Beijing, Shanghai, Guangzhou, China; Chinese-Americans from New York, US ● TSLW of Chinese-Americans (years): (30.8%) < 5; (28.2%) 6 - 10; (19.1%) 11 - 15; (14.3%) ≥ 16		④ ↑ consumption of dairy food was found among 1.1 % of Chinese-Americans; ⑤ ↑ consumption of meat was found among 1.1 % of Chinese-Americans. ● Food availability: ① PRC-Chinese: low availability of "bamboo shoots (35.6%), beef (17.9%), fish (13.7%), cabbage (11.4%), duck (6.8%), chicken (8.8%) and bean curd (6.0%)". ② Chinese-Americans: low availability of bamboo shoots (13.4%)	● Directly asked Chinese-Americans change in eating habits, which might be hard for them to evaluate themselves. ● This study was held nearly 30 years ago and current eating patterns and food availability in China have changed since 1984.
Pan et al., 1999	● PG: Asian students, most with Chinese cultural origin in US (from Taiwan ---- 49%,*n* = 31; China ---- 40%, *n* =25 ● Age: 21-35 ● Gender: 54% were female and 46% were male ● Region: Florida, US ● TSLW: average 25 months	● Measured eating habits changes before and after living in the US ● Used FFQ (current in the US and recall in China)	● Meal patterns: ① ↓ meals per day ($p < 0.001$); ② Nearly half (46%) did not take breakfast; ③ frequency of eating snacks did not change significantly, but high sugar and salt snacks were more frequently eaten, especially chips (44%) and chocolate (32%); ④ 57 % ordered Western fast food, such as fries, pizzas and hamburgers when they ate at restaurants. ● Frequency of eating different groups of food: ① ↑ fatty ($p < 0.001$) and sweet food ($p < 0.001$), dairy food ($p < 0.001$), fruits ($p < 0.01$); ② ↓ meat and meat products ($p < 0.01$), vegetables ($p < 0.001$).; ③ ↔ grains and other food ● Supplements: ① took vitamins and minerals (36%); ② took traditional Chinese medicine (TCM) supplements (24%); ● Food for particular occasions: ① ate traditional Chinese food at Chinese event (75%); ② ate western food at Western events (24%).	Strengths ● Using questions with open answers to investigate the reasons for changes of eating habits. Limitations ● Participants had not lived in the US very long (only 25 months on average). ● Did not measure the amount consumed. ● Recall bias.

Note: ↑= increase, higher or more, ↓ = decrease, lower or less, ↔ = no change or similar, sig = significant, (10%) = 10% of participant.
Abbreviations: FFQ (food frequency questionnaire), PG (population group),TSLW (time spent living in Western countries)

Table 2.1 Chinese immigrants' eating habit (continued)

Reference	Population	Method	Main Findings	Strengths and Limitations
Pan et al., 1999 *(continued)*			● Self-reported reasons relating to changes in eating habits: ① not enough time to cook (16%); ② low food availability of traditional food (14%); ③ low quality of traditional food (14%); ④ lack of cooking skills (8%); ⑤ high price of traditional food (6%)	
Rosenmo-ller et al., 2011	● PG: Chinese-Canadians ● *n* = 120 ● Age range: 30-65 ● Gender: male (average age----50.4); female (average age----53.3) ● Region: Canada ● TSLW (years): male (17.8); female (17.2)	● Asked participants about the changes in their eating practice after they immigrated to Canada ● Used self-completed questionnaire	● ↑ fruits, vegetables, white meat, and dairy food (> 50%) ● ↑ usage of microwaves (> 50%) ● ↑ fresh vegetables (> 50%, e.g. salad) ● ↓ fried or high fat food, soft drinks (> 40%) ● Rice and potato intake did not change ● More convenient to buy fresh fruits and vegetables in Canada	Strengths ● Measured changes in eating habits. Limitations ● Relied on self-reported data regarding change in food preparation and consumption after immigration, which was hard for participants to remember as they immigrated 17 years ago. ● Did not cover all commonly consumed food items, thus the results could not comprehensively show the whole variation in eating practices after immigration.
Tam et al., 2011	● PG: Caucasian and Chinese - Canadian women, divided into 3 groups – "① Caucasian (A); ② Recent Chinese (B); ③ Born in the west or migrated to west before age 21 (C)" ● *n*: (A) 392; (B) 156; (C) 383 ● Age: (A) 61.3 ± 6.8; (B) 59.3 ± 7.1; (C) 60.0 ± 6.4	● Measured current food intake ● Used four 24 hour food recalls	● Recent Chinese vs. Caucasians: ① sig ↑ intake of "grains, pasta, fruits, vegetables, eggs, fish, soy products, and green tea"; ② sig ↓ intake of "breads and crackers, breakfast cereals, cheese, yogurt, juice, potatoes, meat, sweets and frozen desserts, alcohol, coffee, and black tea".	Strengths ● Used food recalls to get both the amount consumed and the detail about eating habits. ● Compared eating habits between Chinese immigrants and local westerners and eating habits between recent Chinese immigrants and long term immigrants, which might indicate possible association to the acculturation ● Large sample size. Limitations ● Participants were limited to postmenopausal women.

Note: ↑= increase, higher or more, ↓ = decrease, lower or less, ↔ = no change or similar, sig = significant, (10%) = 10% of participant.
Abbreviations: FFQ (food frequency questionnaire), PG (population group),TSLW (time spent living in Western countries)

Table 2.1 Chinese immigrants' eating habit (continued)

Reference	Population	Method	Main Findings	Strengths and Limitations
Tam et al., 2011 *(continued)*	● Gender: female ● Region: Toronto and Vancouver, Canada ● TSLW (years): (A) 61.2 ± 6.8; (B) 48.3 ± 12.9; (C) 6.8 ± 2.9			.
Yang & Read, 1996	● PG: Asian immigrants in US, mainly (79%) with Chinese cultural origin---- Chinese (51.6%) Taiwanese (16.1%) Hong Kong (11.3%) ● *n* = 124 ● Age: 18-75, average 37.2 ● Gender: (female) 35%, (male) 65% ● Region: Nevada, US ● TSLW (years): average 8.6	● Measured Asian immigrants' current eating practice in the US and previous eating habits in home countries ● Used quantitative FFQ (current in US and recall in home counties)	● After immigration, mean serving size: ① ↑ milk, fruit and fat food groups ($p<0.01$); ② ↑ meat and meat product, but not significant; ③ ↓ vegetables and bread ($p<0.01$). ● Diet after immigration: ① low in fat; ② high in carbohydrate and fiber.	Strengths ● Measured actual food intake in detail, especially mean serving size of food consumption. Limitations ● Only a general estimation of serving size was used (small, medium and large). ● Recall bias.

Note: ↑= increase, higher or more, ↓ = decrease, lower or less, ↔ = no change or similar, sig = significant, (10%) = 10% of participant.
Abbreviations: FFQ (food frequency questionnaire), PG (population group),TSLW (time spent living in Western countries)

2.4 Chinese immigrants' attitudes towards health, eating, and nutrition

The previous section discussed changes to Chinese immigrants' eating habits after living in a Western country. Researchers have tried to understand the reasons for these changes. Since attitudes have a crucial influence on food and nutrient intake (Kim et al., 2003; Stafleu, Van Staveren, De Graaf, Burema, & Hautvast, 1996), previous researchers have investigated the attitudes towards health, eating, and nutrition of Chinese immigrants.

2.4.1 Concern about health

Chinese immigrants show positive attitudes towards maintaining their health. For example, Liou and Contento (2001) conducted a large-scale study in New York that measured the psychological factors relating to eating habits of 600 Chinese immigrants. In Liou and Contento's study, most Chinese-Americans reported that they were concerned about their health (Liou & Contento, 2001). However, they had lived in the US for a long time (13.6 years on average). Yang and Read (1996) investigated the ideas regarding nutrition of 124 Asian immigrants in Nevada. The participants in Yang and Read's study had lived in the US for less time (8.6 years on average) than the participants in Liou and Contento's study. Yang and Read found that Asian immigrants (most with Chinese cultural origins) were concerned significantly more about their health and bodyweight after they immigrated to the US than when they lived in their home countries ($p < 0.05$). This finding suggested Western culture might influence immigrants' concern about health.

In addition to concern about health, Chinese immigrants also linked their health with their eating habits, especially with regard to certain diseases. Satia et al. (2000) interviewed 30 Chinese-American women in Seattle and investigated these women's psychological factors relating to their diet. These Chinese-American women thought that eating fried or greasy food would increase their risk of heart disease (Satia et al., 2000). In addition, these women thought eating pickles, fermented food, fries, greasy food, and food with preservatives and chemicals would increase their risk of cancer

(Satia et al., 2000). However, the sample size was too small to reflect the population's attitude towards diet. Following the qualitative study, Satia, Patterson, Kristal, The, and Tu (2002) surveyed a large sample of immigrants (113 Chinese-American women in Seattle and 131 Chinese-Canadian women in Vancouver). Similar to their previous study, nearly half of the participants thought their eating habits could influence their risk of cancer and heart disease (Satia, Patterson, Kristal, et al., 2002). However, since both of the above studies focused only on elder females (the mean age of the two studies was about 52.4 years old), it is not possible to assume similar attitudes related to diet among young Chinese immigrants and, in particular, in relation to lifecycle stages such as pregnancy.

2.4.2 Healthy eating

Chinese immigrants show positive general attitudes relating to healthy eating. Kwok, Mann, Wong, and Blum (2009) measured 106 elderly Chinese-Canadians' ideas about diet and health in Toronto. The participants had positive attitudes with respect to healthy eating: all of them thought they should eat neither too much nor too little in order to maintain a healthy diet. In addition, 59% of them thought a healthy diet should be "simple, regular and without snacks" (Kwok et al., 2009). Chinese-American women reported similar attitudes towards healthy eating. The Chinese-American women in Seattle thought that in order to eat healthy, they should neither eat too much nor be too fussy (Satia et al., 2000). Furthermore, these Chinese-American women pointed out that their diets should be balanced to help them maintain a healthy bodyweight (Satia et al., 2000). However, these studies did not show the influence of acculturation on Chinese immigrants' attitudes about healthy eating. Schultz, Spindler, and Josephson (1994) recruited both Chinese-American women who were born in the US and Chinese-American women who had lived in the US for a short duration. They found that Chinese-American women who were born in the US were more likely to report that nutrition impacted on their food choice (Schultz et al., 1994). This study suggested that Western acculturation might positively influence immigrants' attitudes about nutrition and healthy eating. However, because women who were born in foreign countries had lived in the US for a short time (70% of them lived in the US for less than 23 months)

(Schultz et al., 1994), it was not possible to assess if a longer residence in the US would result in similar attitudes to those that had been born there. However, all three studies discussed in this section only focused on elder female Chinese immigrants. Thus, further research is needed to study the attitudes towards healthy eating of young Chinese immigrants, and new research should include immigrants who have lived in Western countries for both short and long durations.

2.4.3 Healthy and unhealthy food

Chinese immigrants demonstrated positive attitudes towards foods with high nutritional value, in addition to general positive attitudes towards healthy eating. Young Chinese-Canadian boys had positive attitudes towards recommended healthy food items and negative attitudes towards unhealthy food items (e.g., soft drink and ice cream) (Hrboticky & Krondl, 1984). This study also found that second generation Chinese-Canadian boys had more positive attitudes than first generation Chinese-Canadian boys towards food with high nutrition value (e.g., vegetables and fruit juice) and more negative attitudes towards food with low nutrition value (e.g., meat and soft drinks) (Hrboticky & Krondl, 1984). This suggested that acculturation had a positive influence on immigrants' nutrition attitudes.

Chinese immigrants also had attitudes in line with current nutrition recommendations relating to nutrients. For example, studies found they have negative attitudes towards consuming food rich in fat and cholesterol. Most Chinese-American women in Seattle and Chinese-Canadian women in Vancouver thought eating food low in fat was important for them (Sstia, Patterson, Kristal, et al., 2002). Chinese-Americans in New York had positive attitudes towards limiting their fat intake (Liou & Contento, 2001). Furthermore, more US-born Chinese-American women had a positive attitudes towards limiting dietary fat and cholesterol consumption than did Chinese-American women born in foreign countries (Schultz et al., 1994). These results show that Western acculturation might influence nutrition attitudes.

2.4.4 Chinese diets and TCM nutrition

2.4.4.1 Western diets vs. Chinese diets

Although Chinese immigrants adapt aspects of Western diets, they have more positive attitudes towards Chinese diets than towards Western diets. More than half of the sampled Chinese-American women in Seattle and Chinese-Canadian women in Vancouver considered traditional Chinese diets to be healthier than Western diets (Satia, Patterson, Kristal, et al., 2002). Similarly, the majority (60%) of Chinese-Canadians surveyed in Toronto preferred Chinese food instead of Western food, and only 14% of them thought that Chinese diets were less healthy than Western diets (Kwok et al., 2009). However, these two studies only focused on older Chinese immigrants (all of them were older than 45 years old); there is a lack of evidence about the attitudes of young Chinese immigrants towards Western and Chinese diets.

2.4.4.2 Attitudes towards TCM nutrition

Several studies have investigated the relationship of nutrition attitudes (Western nutrition) to eating habits, but attitudes towards TCM nutrition can also influence food choice. For example, Satia et al. (2000) found that Chinese-American women's eating habits were impacted by both Western beliefs (e.g., eggs contained lots of cholesterol) and TCM beliefs (e.g., consuming of soup was beneficial for their organs) about nutrition.

Several studies investigated attitudes towards TCM recommendations among Chinese immigrants, mostly considering attitudes towards yin and yang or cold and hot food. In general, Chinese immigrants' showed positive attitudes towards balancing yin/cold and yang/hot food in their diets. A majority of the Chinese-American women (56%) who participated in a study in San Francisco thought that hot and cold food should be balanced (Chau et al., 1990). Similarly, in a study of 30 Chinese-American women in Seattle, some women reported that it was important to combine hot and cold food and balance yin and yang during eating (Satia et al., 2000). Nevertheless, the sample size in each of these studies was small. Kwok et al. (2009) used a telephone survey to measure beliefs regarding TCM and health of 106 Chinese-Canadians (45 years' old or older and more than half had lived in Canada for at least 11 years). Similar to studies by Chau et al. (1990) and Satia et al. (2000), 73% of these Chinese-Canadians thought it was

important for them to combine cold and hot food (Kwok et al., 2009). Moreover, more than half of these Chinese-Canadians thought that yin and yang food could adjust their body heat and energy level (e.g., yin food could decrease their energy/heat and yang food could raise their energy/heat) (Kwok et al., 2009).

Other aspects of TCM have also been found to be influential on food choice. As well as balancing yin/cold and yang/hot food, 86% of the elderly Chinese-Canadians thought choosing food according to their body constitutions was important for them (Kwok et al., 2009). More than half (57%) of the elderly Chinese-American women participants believed elder people's body constitution to be colder than younger people's body constitution, and that it was important to choose food according to this colder body constitution (Chau et al., 1990). Furthermore, 83% of Chinese-Canadians believed that it was better for them to select food according to the changes of different seasons and their body constitutions (Kwok et al., 2009).

2.4.5 Summary and discussion

Overall, previous studies reported positive attitudes towards health, eating, and nutrition among Chinese immigrants to Western countries. Most Chinese immigrants reported that they were concerned about their health. They thought that their eating habits could influence their health and risk of certain diseases (e.g., cardiovascular disease and cancer). In addition, they showed positive attitudes towards healthy food (e.g., fruits and vegetables) that are recommended by Western nutrition and negative attitudes towards unhealthy food (e.g., soft drinks, and food high in fat and cholesterol) that are not recommended. There is limited evidence that positive attitudes towards practice in line with Western nutrition recommendations increase with longer residence in Western countries, possibly due to exposure to Western nutrition information. More than 60% of Chinese immigrants reported that they heard more about healthy food from the media and advertisements after they moved to Canada than they had when living in China (Rosenmoller et al., 2011).

Nevertheless, Chinese immigrants' attitudes towards Chinese diets were more positive than towards Western diets. Chinese immigrants thought Chinese diets were healthier than Western diets, and they also reported positive attitudes to TCM food recommendations (e.g., balancing yin and yang food in their diets). Chinese migrants also had positive attitudes towards some eating practices that are recommended by both Western and TCM nutrition, such as eating a balanced diet, not eating too much, not being fussy, and eating regularly. This indicates that the diets of Chinese immigrants might be influenced by TCM nutrition as well as Western nutrition.

There are some limitations with previous studies investigating the nutrition attitudes of Chinese immigrants. First, most research only investigated one or two general points relating to nutrition. Hence, there is lack of detailed information about immigrants' specific nutrition attitudes (e.g., nutrition during pregnancy). Second, participants in most of the studies were older, so there is a lack of evidence about younger Chinese immigrants' nutrition attitudes, such as those who would become pregnant. Third, as most of the studies only measured immigrants' nutrition attitudes after immigration and only a few studies compared new immigrants to second generation immigrants, there is lack of studies investigating the changes to attitudes after living in Western countries and the influence of acculturation. Both the theory of planned behaviour model and the knowledge attitudes behaviour model identify that attitudes could change people's intention and further change their practice (Contento, 2011). However, the relationship between immigrants' attitude and eating practice has not yet been investigated. Fourth, all of the above studies only investigated Chinese-American and Chinese-Canadians' nutrition attitudes. Thus, it is necessary to investigate Chinese New Zealanders' nutrition attitudes. Accordingly, the current study focuses on Chinese immigrants in New Zealand and investigated both their nutrition attitudes and the relationship between their nutrition attitudes and eating habits in relation to pregnancy. In addition, there have been no investigations that directly measure how beliefs regarding TCM and food choice influence the diet quality of Chinese immigrants in Western countries. Therefore, the current study measures the relationship between attitudes towards TCM nutrition recommendations and eating habits.

2.5 Nutrition recommendations: Western and traditional Chinese medicine (TCM)

According to the above evidence, some Chinese immigrants have positive attitudes towards both Western and TCM nutrition recommendations and both sets of recommendations influence their food choices. Thus, it is necessary to understand Western and TCM nutrition recommendations in detail and check whether the two are in conflict with each other. This section will introduce and compare Western and TCM nutrition recommendations.

2.5.1 Western Nutrition Recommendations

In New Zealand, current nutrition recommendations for adults are summarised in "Food and Nutrition Guidelines for Healthy Adults", which was published by the Ministry of Health in 2003. The nutrition recommendations during pregnancy are based on the "Food and Nutrition Guidelines for Healthy Pregnant and Breastfeeding Women", a recommendation published by the Ministry of Health in 2006. These two documents mainly include: advice about food choice and other related health habits; and recommended nutrient values for adults and pregnant women, respectively (Ministry of Health, 2003, 2006). The Ministry of Health also published "Eating for Healthy Adults" (Ministry of Health, 2013a) and "Eating for Healthy Pregnant Women" (Ministry of Health, 2013b), both of which use simple words to interpret healthy eating habits (e.g., food choice and food safety) in detail, and are more easily understood by public than the 2003 and 2006 background papers.

2.5.1.1 General Western nutrition recommendation for both pregnant and non-pregnant women

● Eat foods from the various food groups and choose healthy drinks

Table 2.2 lists recommendations for both pregnant and non-pregnant women. Generally, both pregnant and non-pregnant women are advised to eat various types of food to maintain a balanced diet. When pregnant, women should eat more servings of various types of food, including the vegetables group, the milk and other dairies group, and the

meat, eggs, and seafood group. In particular, pregnant women should eat less food at each meal or snack, and increase the frequency of eating to alleviate nausea and vomiting during pregnancy (Ministry of Health, 2013b). Also, these guidelines emphasise fluid consumption. Both pregnant and non-pregnant women should limit their consumption of energy drinks, cordial, and soft drinks (Ministry of Health, 2013a, 2013b). Alcohol is not recommended for both pregnant and non-pregnant women. Ministry of Health (2013a) suggests that non-pregnant women should limit their alcohol consumption (≤ 14 standard drinks/day), but pregnant women, should not drink any alcohol during pregnancy (Ministry of Health, 2013b). In addition, tea and coffee (≤ 6 cups of tea/coffee; or ≤ 3 'single' espresso-type of coffee; or ≤ 1 'double' espresso - type coffee each day) are also not recommended for pregnant women (Ministry of Health, 2013b). Water, low fat, and reduced fat milk are recommended during pregnancy (Ministry of Health, 2013b). Furthermore, folic acid supplements (during the first trimester of pregnancy), and iodine supplements are recommended during pregnancy (Ministry of Health, 2013b). Section 2.5.1.2 gives details about these nutrients.

Table 2.2 Comparison of recommended food intake between non-pregnant (Ministry of Health, 2013a) and pregnant women (Ministry of Health, 2013b)

<table>
<tr><td rowspan="2">Food groups</td><td colspan="2">Recommended food servings</td><td rowspan="2">Other recommendations</td></tr>
<tr><td>Non-pregnant women</td><td>Pregnant women</td></tr>
<tr><td rowspan="2">Vegetables & Fruit</td><td>● Vegetables & fruits in total:
≥ 5 servings/day;
● Fruits:
≥ 2 servings/day
● Vegetables:
≥ 3 servings/day</td><td>● Vegetables & fruits in total:
≥ 6 servings/day
● Fruits:
≥ 2 servings/day
● Vegetables:
≥ 4 servings/day</td><td rowspan="2">● Eat fresh and clean fruits and vegetables.</td></tr>
<tr><td colspan="2">● Juice / dry fruit: ≤1 servings/day</td></tr>
<tr><td>Breads & Cereals</td><td colspan="2">≥ 6 servings/day</td><td>● Choose wholegrain products as they are high in fibre and other nutrients.</td></tr>
<tr><td>Milk & Other Dairies</td><td>≥ 2 servings/day</td><td>≥ 3 servings/day</td><td>● Choose low fat or reduced fat dairy products
● If drink soy milk, choose calcium-fortified milk.</td></tr>
</table>

Table 2.2 Comparison of recommended food intake between non-pregnant and pregnant women (continued)

Food groups	Recommended food servings		Other recommendations
	Non-pregnant women	Pregnant women	
Lean Meats, Chicken, Seafood, Beans & Eggs	≥ 1 servings/day	≥ 2 servings/day	● Iron in lean meat, chicken, and seafood are more easily absorbed than in other food.

● Choose food low in fat, salt, and sugar

Controlling fat, salt, and sugar intake is recommended for both pregnant and non-pregnant women. They should: choose low fat, salt, and sugar foods (e.g., vegetables, lean meat, seafood, and fish); avoid eating high fat, salt, and sugar foods (e.g., soft drinks, fast food, and other deep fried food); and reduce fat, salt, and sugar during cooking (e.g., cutting off fatty meat; adding less sugar, fat, butter, and cream; and boiling, steaming, or baking foods instead of frying foods) (Ministry of Health, 2013a, 2013b).

● Maintain food safety

Food safety covers all the processes that occur before eating (including food gathering, cooking, and storage). For both pregnant and non-pregnant women, food should be well washed, consumed before the expiry date, and well cooked (Ministry of Health, 2013a, 2013b). In addition, food safety for pregnant women is stricter than for non-pregnant women. This is because immune function is weaker when pregnant than when not pregnant, and both the woman and fetus are more easily affected by bacteria (e.g., listeria and salmonella) (Ministry of Health, 2013b). Pregnant women should not eat cooked food that has been stored in the fridge for more than two days. Moreover, pregnant women need to heat food (until it is more than 70°C) before eating, and avoid eating chilled food.

2.5.1.2 Recommendations about nutrients

Current recommended nutrient intake for pregnant women is based on "Nutrient Reference Values" (National Health and Medical Research Council, 2006). Compared with non-pregnant women, the requirements for most of the essential nutrients are slightly higher. The Recommended Dietary Intakes (RDIs) of iron, iodine, and folate are substantially higher (approximately 1.5 times more than for non-pregnant women) (National Health and Medical Research Council, 2006). The following discussion will focus on these three nutrients.

● Iron

Haemoglobin, which transports oxygen in the blood, contains most of the body's iron (more than 60%). The liver contains around 25% of the iron, where it is stored as ferritin. Iron is crucial for pregnant women because blood volume expansion leads to high demands during pregnancy (Ministry of Health, 2006). Iron deficiency anaemia (i.e., anaemia with low iron status) relates to negative pregnancy outcomes, such as preterm delivery, low birth weight, infections, and even perinatal death (World Health Organization, 2012).

Most cases of anaemia result from inadequate iron intake (World Health Organization, 2012). The World Health Organization (2012) reported that nearly half (41.8%) of pregnant women around the world are anaemic. Since pregnant women are at high risk of suffering from anaemia, women should take adequate iron during pregnancy. The World Health Organization (2012) suggested that pregnant women should take 30-60 mg/day iron supplements. In New Zealand, the Ministry of Health suggested women should take 27 mg/day of iron during pregnancy, but the Ministry of Health does not make specific recommendation for iron supplements (Ministry of Health, 2006; National Health and Medical Research Council, 2006). Instead, the lead maternity carer will monitor blood iron levels in New Zealand and the use of iron supplements will be recommended if the woman is in iron deficient.

● Iodine

Both thyroid hormones, thyroxine (T4) and 3,5,3'-triiodothyronine (T3, active form of thyroid hormones), contain iodine. Thyroid hormones are involved in maternal

reproductive ability, energy generation, fetal growth, fetal development, and cognitive ability. Thus, inadequate maternal iodine during pregnancy impairs both maternal and fetal thyroid activity, leading to adverse pregnancy outcomes (e.g., abortion and stillbirth). Iodine deficiency also impairs fetal mental development, and when extreme leads to a high risk of dwarfism and cretinism (Ministry of Health, 2006).

Pregnant women are at a high risk of iodine deficiency. In one study of pregnant women in New Zealand, pregnant women's urinary iodine level (38 μg/L) was much lower than that considered reflecting adequate iodine intake (150 μg/L) (Pettigrew, Skeaff, Gray, Thomson, & Croxson, 2011). The Ministry of Health recommended that pregnant women should consume 0.22 mg/day of iodine (National Health and Medical Research Council, 2006). Although seafood and seaweed are good sources of iodine, the consumption of these foods was low in New Zealand (Ministry of Health, 2006). Moreover, the iodine content of food grown in New Zealand is relatively low. This is because the soil in New Zealand contains less iodine than in some other countries (Ministry of Health, 2006). Foods fortified with iodine (e.g., bread and iodised salt) are good sources of iodine, but generally will not provide sufficient iodine for pregnant women (Ministry of Health, 2006). Consequently, the Ministry of Health recommended that pregnant women should take iodine supplements containing 0.15 mg/day iodine (Ministry of Health, 2013b) to ensure they have adequate iodine intake.

● Folate

Folate plays a crucial role in the formation of DNA, RNA, and proteins via affecting nucleic and amino acid metabolism (Ministry of Health, 2006; World Health Organization, 2012). The main negative outcome of folate deficiency during pregnancy is an increased risk of neural tube defects. In addition, since the generation of methionine from homocysteine requires folate, low folate intake will lead to a high homocysteine level that, in turn, will result in unfavourable pregnant outcomes, such as pre-eclampsia, low birth weight, preterm delivery, and abortion. (Ministry of Health, 2006; World Health Organization, 2012)

Since New Zealand women's folate intake (about 0.275 mg/day) is much lower than recommended for pregnant women (0.6 mg/day), pregnant women are at a high risk

during pregnancy (Gibson, Heath, & Ferguson, 2002). The Ministry of Health suggested that women should obtain 0.6 mg/day of folate from food (e.g., vegetable, fruit, and cereals). Folic acid, the synthetic form of folate, is added to some foods (e.g., bread). It is difficult to obtain sufficient folate from food alone, even with consumption of fortified foods. World Health Organization (2012) suggested that pregnant women should take folic acid supplements (0.4 mg/day). In New Zealand, the Ministry of Health suggested that women should take one folic acid tablet every day (0.8mg/day) from four weeks before pregnancy to end of the first trimester of pregnancy. (Ministry of Health, 2006, 2013b; World Health Organization, 2012)

2.5.2 Traditional Chinese Medicine (TCM) nutrition recommendations

TCM uses both yin and yang to describe features of people's normal physiological functions and pathological processes. Yang represents positive features, such as active, external, rising, warm, and bright features (He, 2011). Oppositely, yin represents negative features, such as inactive, internal, declining, cold, and dark features (He, 2011). In addition, TCM teaches that qi and blood, which are generated by organs, are essential substances in maintaining good health (He, 2011).

TCM points out the importance of blood and qi supply in nutrition and good health. TCM recommendations are that people should maintain their normal stomach and spleen activities to strengthen qi and blood (see Section 2.5.2.2) (He, 2011; Lu et al., 2008a). In relation to pregnant women, their nutrition and health relies on sufficient qi and blood supply (An et al., 2009; He, 2011; Xu & Ge, 2009), which can help promote both fetal development and maternal health (Wang, 2004; Xu & Ge, 2009).

2.5.2.1 General TCM recommendations about eating for both pregnant and non-pregnant women

- Maintain harmony, balance TCM food features, adjust diets according to body constitutions and seasons

TCM nutrition theories emphasize the importance of maintaining harmony. There are three key points to maintain the harmony. First, TCM suggests people should balance

food with TCM food features (e.g., balance yin and yang, and balance hot and food) (Dang et al., 1995; He, 2011; Jiang et al., 1983; Lu et al., 2008b; Wang, Xu, & Wang, 2008). Second, since people's physiological characteristics are different, TCM concludes that their constitutions are different. Thus, people should adjust their diets according to their individual body constitutions (Deng, 2003; Fang, 2009; Zhong, Qin, & Wang, 2007). Regarding pregnant women, TCM points out that women's spleens and stomachs, yin substances, blood, and qi in kidneys are weak during pregnancy. Therefore, TCM advocates that women should choose food according to TCM food features (see Section 2.5.2.2 in detail) (Lu et al., 2008b He, 2011). Third, TCM teaches that people are a part of nature, so peoples' health relates to the seasons. Therefore, TCM suggests that people, especially pregnant women, should adjust their diets according to the seasons (Deng, 2003; Fang, 2009; He, 2011; Lu et al., 2008a; Ni et al., 2006; Wang et al., 2008; Zhong et al., 2007).

● Eat moderately and regularly, and eat various types of food

TCM suggests that people should eat a moderate amount of food because eating either too much or too little could impair spleen and stomach functions. This could decrease the generation of qi and blood, which would cause health problems (Dang et al., 1995; Deng, 2003; He, 2011; Jiang et al., 1983; Ni et al., 2006). In addition, TCM suggests that people should eat various types of food regularly to maintain spleen and stomach functions (Dang et al., 1995; Fang, 2009; He, 2011; Jiang et al., 1983; Lu et al, 2008b; Ni et al., 2006; Zhong et al., 2007). Similarly, TCM advises that pregnant women should eat regularly and control their total food consumption, eating neither too much nor too little (Wang, 2004; Xu & Ge, 2009; Zhu, 2000). During pregnancy, women should eat various types of food to maintain a balanced food intake (Ni et al., 2006; Wang, 2004; Zhu, 2000). In addition, because the digestion and absorption functions of pregnant women's spleens and stomachs are weak, TCM recommends that pregnant women should reduce the amount of food eaten at each meal and increase the frequency of eating (Pan, Pan, Huang & Yu, 2006).

● Choose light tasting food and less well-flavoured food

TCM recommends that people should eat light tasting food and avoid taking too much well-flavoured food to maintain the normal physiological functions (e.g., spleen and

stomach functions) (Deng, 2003; Zhong et al., 2007). More specifically, TCM believes that light tasting food, such as foods containing less oil and flavours (e.g., salt, sugar, and spices), are beneficial for both maintaining pregnant women's spleen and stomach functions and strengthening their qi and blood. Thus, these foods could increase pregnant women's appetite, help ensure pregnant women are well-nourished, and promote fetal development (Pan et al., 2006; Wang, 2004). On the contrary, TCM suggests that well-flavoured food, mainly including spicy, roasted, sweet, and greasy food, could generate damp and hot substances in women's bodies, influence the normal activity of spleen and stomach, and further cause abnormal fetal movements, abnormal fetal weight gain, and difficult labour (i.e., dystocia) (An et al., 2009; Hou, 1995; Xu & Ge, 2009). Consequently, TCM advises that pregnant women should choose food containing less oil, salt, sugar, and other flavours (Ni et al., 2006; Pan et al., 2006; Wang, 2004; Zhu, 2000).

● Drink plenty of water and eat fruit and vegetables

TCM recommends that people should drink water regularly to avoid thirst (Dang et al., 1995; He, 2011; Ni et al., 2006). In relation to pregnant women, TCM teaches that pregnant women's yin-blood is weak and pregnant women are more likely to suffer from constipation. Thus, TCM counsels pregnant women to drink plenty of water, and eat more fruits and vegetables (Lu et al., 2008b; Shen & Yan, 1993).

● Be aware of food safety and take less cold and raw foods

TCM stresses that people should be aware of food safety (He, 2011). In particular, TCM suggests that people should: consume clean food and drinks; choose fresh food; wash food and cook food well before eating; avoid consuming spoiled food and drinks (Dang et al., 1995; Fang, 2009; Wang & Dong, 2004). Similarly, TCM recommends that pregnant women should be aware of food safety (Xu & Ge, 2009). Moreover, TCM believes that cold and raw foods could disturb the normal function of a pregnant women's spleen and stomach (i.e., digestion and absorption), leading to diarrhoea and impairing fetal development (Hou, 1995; Xu & Ge, 2009; Zhang, 2002; Zhu, 2000). Thus, cold and raw foods are not recommended during pregnancy (Hou, 1995; Xu & Ge, 2009; Zhang, 2002; Zhu, 2000).

● Avoid drinking alcohol

TCM recommends that people should not drink too much alcohol because drinking too much alcohol impairs people's spleen and stomach functions as well as the supply of blood and qi (Deng, 2003). Moreover, TCM advises women not to drink alcohol during pregnancy. Because alcohol contains yang substances, drinking alcohol can raise yang in pregnant women's bodies, which will disturb their qi circulation and influence fetal development (Lu, Yao & Gu, 2007; Ni et al., 2006; Xu & Ge, 2009; Zhu, 2000).

2.5.2.2 Recommendations about food with different TCM food features

● Spleen and stomach strengthening food

TCM emphasizes that function of both the stomach and spleen are the basis of health (He, 2011; Jiang et al., 1983). The stomach and spleen are said to digest and absorb food, generate both yin and yang essential substances, form internal qi and blood, and strengthen physiological activities (He, 2011; Jiang et al., 1983). Thus, maintaining stomach and spleen functions is crucial. Moreover, TCM also emphasizes that stomach and spleen functions play a crucial role in maintaining both maternal and fetal health during pregnancy (Lu et al., 2008b; Pan et al., 2006). The first reason for this is that both the spleen and stomach are involved in the generation and transformation of maternal qi and blood. The second reason for this is that the spleen and stomach functions are the basis for the development of fetal constitutions after birth. Therefore, TCM recommends that women should eat spleen and stomach strengthening food (e.g., Chinese dates, Chinese yams, honey, milk, pork tripe, crucian, eels, and sticky rice) during pregnancy (Lu et al., 2008b; Pan et al., 2006).

● Yin and blood nourishing food vs. blood activating food

TCM states that women's fertility relates to their internal yin substances, and the maternal blood-supply affects fetal development. To strengthen the maternal blood-supply, TCM suggests that women should eat yin and blood nourishing food (e.g., milk, eggs, pork livers, cuttlefish, carrots, Chinese wolfberries, and sesames) during pregnancy. Additionally, TCM postulates that blood-activating food could impair maternal blood supply and fetal development during pregnancy. Thus, TCM concludes that women should not eat blood-activating food during pregnancy, such as peach kernels, hawthorns, and crab claws. (Lu et al., 2008b)

● Kidney nourishing food

TCM believes that kidneys provide the basic substances relating to fetal development and are responsible for pregnant women's fertility. Consequently, TCM says that women should eat kidney nourishing food during pregnancy, such as sea slugs, walnut seeds, Chinese yams, lotus seeds, and chicken, to maintain sufficient qi in their blood. (Lu et al., 2008b)

2.5.3 Comparison between Western and TCM nutrition recommendations

Table 2.3 shows the similarities and differences between Western and TCM nutrition recommendations according to the above discussions (Section 2.5.1 and Section 2.5.2). In general, most recommendations for both non-pregnant and pregnant women are similar, although the reasons for these recommendations are different. First, the two sets of recommendations advise women to eat various types of food moderately and regularly. Second, these two recommendations propose both pregnant and non-pregnant women to should eat plenty of fruits and vegetables and drink plenty of water every day. Third, Western nutrition recommends women to eat food low in fat, sugar, and salt. TCM also suggests women to choose more light tasting food (i.e. food low in oil, salt, sugar, and other flavours) and less well-flavoured food. This TCM recommendation could also help women to reduce their intake of fat, sugar, and salt. Fourth, the two sets of recommendations mandate that pregnant women should not drink alcohol during pregnancy. Additionally, both suggest women to keep their bodyweight within a normal range. Furthermore, both sets of recommendations mention that women should maintain food safety, such as eating fresh and clean food. Finally, both sets of recommendations suggest that women should eat well-cooked food and avoid eating cold food during pregnancy.

There are some differences between the two recommendations. Only TCM emphasizes that women should maintain harmony in their diets, and eat spleen and stomach strengthening food. Regarding pregnancy, Western nutrition focuses on nutrients while TCM nutrition focuses on TCM food features. However, Western and TCM nutrition recommendations are unlikely to be contradictory. On one hand, both Western and TCM

nutrition recommend certain foods. For example, milk, eggs, pork liver, cuttlefish, and carrots are recommended by both Western and TCM nutrition guidelines for pregnant women. From the perspective of Western nutrition theory, these foods are good sources of calcium, protein, iron, and vitamin A for pregnant women. From the perspective of TCM nutrition theory, these foods are yin and blood nourishing food, and are beneficial for pregnant women. On the other hand, although TCM emphasizes women should not eat certain blood activating food during pregnancy, TCM nutrition is not a barrier for people to follow Western nutrition recommendations and have a balanced diet. TCM only focuses on certain foods instead of food groups, so women have other options within a food group. Taking blood-activating food as an example, although TCM suggests women should not eat peach kernels, hawthorns, and crab claws during pregnancy, women could eat other foods to maintain a balanced nutrients intake. Women could eat cashews and peanuts instead of peach kernels, and eat other seafood, such as fish instead of crab claws, to obtain adequate unsaturated fatty acids during pregnancy. Similarly, women could eat other fruits, such as oranges instead of hawthorns, to obtain adequate vitamins.

In conclusion, both Western and TCM nutrition recommendations provide suggestions for pregnant and non-pregnant women.

Table 2.3 Comparison between Western and TCM nutrition recommendations for both pregnant and non-pregnant women

<table>
<tr><td></td><td>Western nutrition recommendations
(according to Section 2.5.1)</td><td>TCM nutrition recommendations
(according to Section 2.5.2)</td></tr>
<tr><td rowspan="8">Similarities</td><td colspan="2">● eat various types of food</td></tr>
<tr><td colspan="2">● eat moderately and regularly
(pregnant women: eat frequently small meals and snacks)</td></tr>
<tr><td colspan="2">● choose more fruits and vegetables and drink plenty of water</td></tr>
<tr><td>● choose low fat, low sugar and low salt food</td><td>● choose more light tasting food and less well flavoured food</td></tr>
<tr><td colspan="2">● pregnant women: avoid drinking alcohol</td></tr>
<tr><td colspan="2">● control bodyweight</td></tr>
<tr><td>● maintain food safety
(pregnant women: avoid eating cold food, and eat well cooked food)</td><td>● be aware of food safety
(pregnant women: eat less cold and raw foods)</td></tr>
<tr><td rowspan="3">Differences</td><td rowspan="3">● recommendations relating to nutrients for pregnant women:
① eat food rich in iron
(e.g., fish, lean meat, chicken, mussels, and liver);
② eat food rich in iodine
(e.g., seafood and seaweed) and take iodine supplements
③ eat food fortified with folic acid and take folic acid supplements during the first trimester of pregnancy</td><td>● maintaining harmony:
① balance food features (e.g., yin and yang; hot and cold);
② adjust food consumption according to body constitutions;
③ adjust food consumption according to seasons</td></tr>
<tr><td>● eat spleen and stomach strengthening food
(e.g., Chinese dates, milk, and pork)</td></tr>
<tr><td>● recommendations relating to TCM food features for pregnant women:
① eat yin and blood nourishing food
(e.g., milk, pork livers, cuttlefish, and carrots);
② avoid eating blood activating food
(e.g., peach kernels, hawthorns, and crab claws);
③ eat kidney nourishing food
(e.g., sea slugs, walnut, Chinese yam, and chicken)</td></tr>
</table>

2.6 Chinese immigrants in New Zealand

According to the above sections, Chinese immigrants' eating habits and attitudes towards nutrition might be influenced by acculturation. The changes in eating habits might further cause health problems, such as diabetes and obesity among Chinese immigrants. However, there is lack of evidence focusing on Chinese immigrants in New Zealand, especially during pregnancy. This section will give a general overview of Chinese immigrants in New Zealand and studies measuring Chinese immigrants' health status, eating habits, and nutritional status in New Zealand.

2.6.1 The population of Chinese immigrants in New Zealand

New Zealand's population consists of multiple ethnic groups. In New Zealand, 10.4% of people in New Zealand have origins from more than one ethnic group (Statistics New Zealand, 2006b). Following the European and Maori population, Asian has become the third largest ethnic group in New Zealand (Statistics New Zealand, 2006b). In 2006, there were 354,552 Asians (accounting for 9.2% of the whole population) in New Zealand, which was nearly four times as many as there were in 1991 (99,759) (Statistics New Zealand, 2006b). Moreover, between 2001 and 2006 the population of Asians increased faster than any other ethnic group (Statistics New Zealand, 2006b). The largest ethnic group among the Asians was Chinese, of which there were 147,570 in 2006 (Statistics New Zealand, 2006b). Table 2.4 shows the populations of Chinese people in New Zealand in 1991, 1996, 2001, and 2006. Generally, the Chinese population grew quickly from 1991 to 2006. The total Chinese population in 2006 was 3.3 times more than the total Chinese population in 1991. In 2006, nearly all Chinese living in New Zealand (94.7%) came from Mainland China. Following Mainland Chinese, Taiwanese and Malaysian Chinese were the second (3.7%) and third (0.9%) largest Chinese ethnic groups. Other Chinese groups included Singaporean Chinese, Hong Kong Chinese, Vietnamese Chinese, Cambodian Chinese, and Chinese from other places.

Table 2.4 Populations of people with Chinese cultural origins in New Zealand

	1991 (Statistics New Zealand, 2002)	1996 (Statistics New Zealand, 2002)	2001 (Statistics New Zealand, 2002)	2006 (Statistics New Zealand, 2006a)
Chinese (Total)	44,793	81,309	104,580	147,570
Mainland Chinese	44,136	78,663	100,203	139,728
Taiwanese	----	2,721	3,768	5,451
Malaysian Chinese	60	357	489	1,353
Singaporean Chinese	174	312	303	606
Hong Kong Chinese	69	225	87	129
Vietnamese Chinese	----	15	69	60
Cambodian Chinese	3	----	12	174
Chinese (other places)	471	27	48	90

Similar with the dramatic rise in the Asian and Chinese population in New Zealand, the number of Asian children aged 0 – 4 has also increased. In 1991, there were 9,603 Asians aged 0 – 4 in New Zealand (Statistics New Zealand, 2002). The number rose to 23,910 in 2006, which was about 2.5 times as many as in 1991 (Statistics New Zealand, 2006a). Moreover, most of the 0 – 4 years old Asians (20,682), including 7,512 Chinese children, were born in New Zealand in 2006 (Statistics New Zealand, 2006a). Thus, a significant number of Chinese were born in New Zealand between 2002 and 2006. Additionally, the population of Chinese women of reproductive age (15 – 44 years old) has more than tripled (shown in Table 2.5) between 1991 and 2006. There were 13,248 Chinese women of reproductive age in 1991 and 44,922 in 2006. Given the large number of New Zealand-born Chinese (0 – 14 years old) and Chinese women at reproductive age in New Zealand, and a large increase among these two groups of Chinese in New Zealand, there seems to be a large number of Chinese born in New Zealand every year and this number is likely to increase dramatically. Consequently, the current study focuses on pregnant women.

Table 2.5 The population of Chinese women of reproductive age

	1991 (Statistics New Zealand, 2002)	1996 (Statistics New Zealand, 2002)	2001 (Statistics New Zealand, 2002)	2006 (Statistics New Zealand, 2006a)
15- 19 years old	2,277	4,956	6,345	6,249
20 – 24 years old	2,151	4,188	5,811	13,194
25 – 34 years old	4,965	7,425	8,226	12,675
35 – 44 years old	3,855	7,599	9,741	12,804
Total	13,248	24,168	30,123	44,922

2.6.2 Investigations of Chinese immigrants' health, eating, and nutrition status in New Zealand

As a result of the large increase in the population of Chinese in New Zealand, some researchers have focused on Chinese immigrants and investigated issues relating to their eating habits and health in New Zealand.

Two studies focused on Chinese children in New Zealand. Soh et al. (2000) recorded eating habits of 17 Chinese children (14 – 47 months) in Dunedin by 24 hour food recall and food frequency questionnaire. Most of the children had adequate servings of meat, meat products, and dairy food every day. However, only a small number of the children had adequate servings of cereals, fruits, and vegetables compared to the recommended servings in New Zealand. In addition, the researchers reported that a majority of the children's families (71%) took balancing yin and yang into account when they chose food. Lu (2002) measured the food intake of 50 Chinese children (7 – 10 years old) in Auckland. Most of the children preferred Western food for breakfast and lunch. Meanwhile, the majority of their parents used traditional Chinese recommendations to select food for their children. Additionally, compared to the New Zealand

recommendations, these children's intake of fat and protein was high, but their intake of fibre and vitamin A was low.

There are also some studies focused on Chinese adults in New Zealand. Tan and Waton (2004) investigated Mainland Chinese women's (N = 55; average age 30) health and nutrition status in Auckland by 24 hour food recall and two day weighted food record. Relating to sources of energy, fat intake was high and carbohydrate intake was low compared to recommendations. In terms of other nutrients, participants' cholesterol and sodium intakes were high, but their fibre, vitamin A, selenium, and calcium intakes were inadequate. In addition, although all the participants' BMI were in the normal range (21.8 ± 2.4 kg/m^2), they had a high risk of abdominal obesity (26% of the participants' waist circumference and 50.9% of the participants' waist to hip ratio were higher than the normal range).

Another study investigated the influence of acculturation on both Chinese immigrants' eating habits and the risk of type 2 diabetes in the Manawatu (N = 46; age range 47.24 ± 13.33) (Jin, 2007). Jin used the Suinn-Lew Asian Self-Identity Acculturation Scale to measure participants' acculturation level, and used the 24 hour food recall and food frequency questionnaire (FFQ) to measure participants' eating habits and nutrient intake. With respect to energy and nutrient intake, the energy obtained from fat was higher than the recommended level. A high sodium intake was also found among these participants. However, the participants' dietary vitamin D, calcium, and folate intakes were low. Moreover, this study found some unfavourable health problems. More than half of these participants were overweight or obese. Additionally, participants with higher acculturation level had significantly lower BMI compared with participants with lower acculturation level ($p < 0.05$). However, there was no significant difference in nutrient intake between the low and high acculturation groups. This might be due to the small sample size (only 18 male and 28 female participants). Whether acculturation is associated with better health and diet among Chinese immigrants in New Zealand still needs more investigation.

Some health and nutrition problems have been found among Chinese immigrants in New Zealand, as demonstrated by the research discussed above. After immigrating to New Zealand, Chinese immigrants have a high risk of abdominal obesity, which might

be caused by a change in eating habits and nutrient intake (e.g., a high fat intake and a low intake of carbohydrate). This suggests that acculturation might be linked to diet and health. Moreover, Chinese immigrants consumed both Western and traditional Chinese food after living in New Zealand, and they considered their food selection according to both Western and TCM nutrition.

Additionally, adapting to the local lifestyle in New Zealand is difficult for Chinese immigrants and the language barrier results in a low capability of communication with local health organizations (Abbott, Wong, Williams, Au, & Young, 2000; Tse, Laverack, Nayar, & Foroughian, 2011; Zhang & Reid, 2010). Hence, Chinese immigrants may find it hard to obtain relevant nutrition knowledge and information in New Zealand, which might further impair their eating habits, nutritional status, and health.

There is no information about eating habits of pregnant Chinese women in New Zealand, and the influence of acculturation on the eating habits and nutrition attitude of pregnant women. Thus, understanding how Chinese immigrants combine the two types of nutrition information and apply this knowledge to their food choices will provide useful information for understanding possible factors influencing immigrants' nutrition attitudes and eating habits.

2.7 Summary

In summary, studies showed the influence of acculturation on the eating habits of Chinese immigrants in Western countries. These studies also showed that Western acculturation might be positively related to the risk of diet-related health problems, such as diabetes and CVD, among Chinese immigrants in Western countries.

Immigration may influence eating habits through many paths, including: availability, desire to assimilate, change in attitudes, etc. Previous studies reported that Chinese

immigrants thought food and nutrition were important for their health, and had positive attitudes towards recommended foods and nutrients (i.e., it was important for them to eat low fat food). Some studies found Chinese immigrants considered both Western and TCM nutrition when selecting food. However, there are not many details about Chinese immigrants' nutrition attitudes towards specific food and nutrients.

Pregnancy is a crucial time for nutrition because during pregnancy nutrition and eating influence both maternal and fetal health. There are both Western and TCM nutrition recommendations for pregnant women. Although some studies found that higher acculturation might be related to a higher risk of GDM among Chinese immigrants in Western countries, there is little information about the influence of immigration and acculturation on pregnant Chinese women's eating habits and nutrition attitudes in relation to both Western and TCM nutrition. It is still unclear whether and how could Western and TCM nutrition recommendations interact with each other and influence Chinese immigrants' eating habits.

The number of Chinese immigrants in New Zealand is rising dramatically, including the women of reproductive age. There is lack of evidence regarding pregnant Chinese women's health, nutrition, and eating related issues in New Zealand. Therefore, the aim of this study is to investigate Chinese immigrant women's eating habits during pregnancy and the associated attitudes towards nutrition in New Zealand. This study will:

- describe Chinese women's eating habits during pregnancy and compare to nutrition recommendations;
- describe Chinese women's attitudes towards nutrition (including Western nutrition and TCM nutrition);
- describe relationship between:
  - ① acculturation and eating habits,
  - ② acculturation and attitudes towards nutrition (including both TCM and Western nutrition),
  - ③ eating habits and attitudes towards nutrition (including both TCM and Western nutrition).

Chapter 3 Methodology

3.1 Participants

3.1.1 Participants' inclusion criteria

Participants who met the following criteria were invited to participate in the current study:

● Chinese women who were born in Mainland China, or who have one or both parents who were born in Mainland China;

● currently living in New Zealand; and

● currently pregnant or have been pregnant in the last five years.

Questions about participants' basic information relating to the recruitment criteria were asked in the first section of the online questionnaire (Appendix A) to make sure all participants met the criteria. Only people who met the above recruitment criteria were eligible to complete the survey. The current study only used the data of participants who were currently pregnant.

3.1.2 Ethical considerations

The current study was regarded as low risk research according to Massey's Screening Questionnaire of the Massey University Human Ethic Committee: "This project has been evaluated by peer review and judged to be low risk." (Appendix B). Relevant information about this study (primarily consisting of the aim of the study, recruitment criteria, what the participants needed to do, participants' rights, and the protection of participants' privacy) was explained to the participants in an information sheet (Appendix C). Since all the data were collected via an online questionnaire, the participant consent form was shown on the first page of the online questionnaire (Appendix A) and completing the survey implied consent. Both the information sheet and the consent form had both English and Chinese versions.

3.1.3 Recruitment of the participants

Both English and Chinese versions of the advertisement (including links to the information sheet and the online questionnaire) (Appendix D) were sent or published in the following ways to encourage participation in the study:

(1) Online communities in www.skykiwi.com - a Chinese website based in New Zealand, which reaches 80% of the Chinese community and has more than 700,777 views on average every day (Skykiwi, 2014):

- The advertisement was published on an online community for pregnant women in New Zealand.
- The advertisement was published on the online communities for people living in different regions of New Zealand, including Auckland, Wellington, Hamilton, Christchurch, and Palmerston North.

(2) Emails to Chinese associations:

- The invitation letter and the advertisement were sent to Chinese communities in Rotorua and Dunedin via email.
- The invitation letter and the advertisement were sent to a Chinese church in Palmerston North.

(3) Media:

- Information about the study was published in the research news on the Massey University website (http://www.massey.ac.nz/massey/about-massey/news/article.cfm?mnarticle_uuid=13FB22E2-F007-32E9-2D8E-AC432FCDC555).
- Information about the study was broadcasted by World TC, which is the biggest Chinese television broadcaster in New Zealand.
- News articles about the study were published by China's official Xinhua News Agency in New Zealand on the websites of Xinhua News Agency (http://news.xinhuanet.com/english/health/2013-11/04/c_132858017.htm), China Daily (http://www.chinadaily.com.cn/xinhua/2013-11-04/content_10499208.html), Shanghai Daily (http://www.shanghaidaily.com/article/article_xinhua.aspx?id=177862), Sina (http://english.sina.com/culture/2013/1104/643025.html),

and the Chinese government (http://www.china.org.cn/world/Off_the_Wire/2013-11/04/content_30493915.htm).

(4) Using the "snowball" model:

- People were asked to introduce the study to others who meet the recruitment criteria.

3.2 Questionnaire

An online questionnaire was developed to measure participants' eating habits, nutrition attitudes, acculturation, and other related factors. The main sections of the questionnaire are: (1) personal information; (2) eating habits – focused on food consumption, food safety, and weight control; (3) nutrition attitudes – including general care about nutrition, eating, and health, western nutrition attitudes, and TCM nutrition attitudes; (4) the acculturation scale.

Previous researchers have reported advantages of using an online questionnaire. First of all, using an online FFQ cost less, was easier for people to read and understand, and took less time to complete than the traditional paper questionnaire (Carrascosa, Monto, Barreira, Segovia, & Martinez, 2011; Gonzalez, Garcia, & Martinez, 2011; Reslan, Saules, & Greenwald, 2012; Scarborough, Rayner, Stockley, & Black, 2007). Second, an online FFQ is a valid tool for measuring consumption of food groups (e.g., fruit, vegetables, and cereals) (Gonzalez et al., 2011). An online FFQ is also a valid and reliable tool for measuring the intake of nutrients (e.g., calcium, folate, and B vitamin intakes) (Dunn et al., 2011; Hacker, Robertson, & Sellmeyer, 2009; Johansson et al., 2010; Scarborough et al., 2007). Third, an online questionnaire is a valid method for measuring other factors relating to eating habits (e.g., food preference, knowledge, attitudes, and demographic factors) (Hanning et al., 2009; Reslan et al., 2012). Thus, the present study used an online questionnaire.

3.2.1 Eating habits

The present study measured Chinese immigrant women's eating habits during pregnancy with respect to the New Zealand nutrition recommendations. The questions are based on a short questionnaire (containing 35 questions) used by the 2008 New Zealand Adult Health Survey (Ministry of Health, 2011b). The eating habits questionnaire in the 2008 New Zealand Adult Health Survey was based, in turn, on the valid FFQ used in the 1997 New Zealand National Survey, as well as other nutrition and eating habits surveys in Western countries (Ministry of Health, 2011b).

In the 2008 New Zealand Adult Health Survey, cards were used to show the portion size during interviews. Similarly, the current study included photos to illustrate food portion size. This is because using photos that show the portion size of different foods helped people estimate their food intake more accurately than when photos were not used (Carrascosa et al., 2011; Gonzalez et al., 2011).

Moreover, since the present study focused on eating habits during pregnancy, questions about food, supplements, food safety, and weight control during pregnancy were added according to both Western and TCM nutrition recommendations for pregnant women.

3.2.2 Nutrition attitudes

Previous studies measured pregnant women's nutrition attitudes, and most focused on general attitudes towards food, nutrition, and health (Anderson & Shepherd, 1989; Fouda, Ahmed, & Shehab, 2012; Verbeke & De Bourdeaudhuij, 2007). However, these studies did not investigate attitudes towards nutrition in pregnancy in detail.

With respect to attitudes towards TCM nutrition, there is still lack of research to refer to (see Section 2.4.4). These studies only used several questions or interviews to explore Chinese immigrants' general attitudes towards Western and traditional Chinese food, balancing yin/cold and yang/hot, or the food natures during eating (Chau et al., 1990; Satia et al., 2002; Satia et al., 2000). However, Kwok et al. (2009) used a questionnaire that measured Chinese-Canadian's traditional health beliefs, which include attitudes

towards TCM nutrition more comprehensively than previous studies.

In the present study, the main questions of the nutrition attitudes section are based on Western and TCM nutrition recommendations for healthy adults and pregnant women (see Section 2.5). The questions measured attitudes towards both Western and TCM nutrition separately. The development of the attitude questions was mainly based on the studies by Byrdbredbenner, Oconnell, Shannon, and Eddy (1984) and Kwok et al. (2009). Questions relating to the general nutrition attitudes were adapted from Byrdbredbenner et al. (1984), including general caring about nutrition, eating, and the influence of diet on health. The general TCM nutrition attitude questions were based on Kwok et al. (2009), which included attitudes about balancing yin and yang as well as adjusting food with seasons and body constitution. Since both Western and TCM nutrition recommendations mention the importance of taking food low in fat, sugar, and salt, relevant attitude questions were added. Furthermore, since the current study focuses on pregnant Chinese women, the attitudes relating to special foods and supplements recommended for pregnant women by Western and TCM were also asked.

3.2.3 Acculturation scale

In previous studies, acculturation scales, all of which are high in validity and reliability, have been developed in order to investigate acculturation level for various purposes (Anderson, Campbell, & Shepherd, 1993; Cuellar, Harris, & Jasso, 1980; Marin, Sabogal, Marin, Oterol, & Perez, 1987; Suinn, Rickard, Lew, & Vigil, 1987). Cuellar et al. (1980) developed an acculturation rating scale for Mexican-Americans (ARSMA). This scale asks 20 questions via the following four dimensions: (1) language level; (2) ethnic origins; (3) reading, writing, and cultural exposure; and (4) ethnic interaction. Based on this scale, Suinn et al. (1987) developed the Suinn-Lew Asian Self-Identity Acculturation Scale (SL-ASIA), which focuses on Asian populations. The SL-ASIA scale contains 21 questions, and measures Asian immigrants' acculturation level from six aspects: language, identity, friendship choice, behaviours, geographic history, and attitudes. Although the ARSMA and SL-ASIA cover several aspects relating to the acculturation level, both are quite long. In order to increase the feasibility of the

acculturation scale, other researchers have developed two short acculturation scales. The acculturation scale for Southeast Asians (ASSA) uses 13 questions to ask about immigrants' use of language, social relationships (friends and neighbours), and their food preferences (Anderson et al., 1993). The short acculturation scale for Hispanics (SASH) uses 13 questions to measure the acculturation level (Marin et al., 1987). The SASH not only covers language usage and social relationships, but it also measures immigrants' media preferences. To this end, there are several acculturation scales measuring immigrants with different cultural origins.

The SASH was chosen for the present study because a lengthy acculturation scale was not suitable. The short acculturation scales (ASSA and SASH) both ask about the use of language and the social relationships. However, media preferences are a crucial indicator for acculturation level among Chinese or Asian immigrants (Salant & Lauderdale, 2003; Satia et al., 2001). Therefore, because the SASH includes media preferences, the current study used the SASH to measure acculturation level. Although the SASH was originally intended for Hispanic immigrants in the US, a recent study showed that it also successfully measured acculturation level among Korean immigrants in the US (Choi & Reed, 2011). The SASH covers all the key acculturation indicators (including the use of language, social relationships, and the media preferences) that have been frequently used in previous studies measuring Chinese immigrants' acculturation level (Liu, Berhane, & Tseng, 2010; Lv & Cason, 2004; Satia et al., 2001). In the current study, the SASH was adapted for use with Chinese immigrants in New Zealand, and translated into Chinese. The adapted scale used the word "Chinese" instead of the word "Spanish", and used the description "Chinese/People with Chinese cultural origins" instead of the word "Latinos/Hispanics".

3.2.4 Questionnaire development

The questionnaire used in the current study was developed by the following three steps. First, the main measurements and questions in this project were discussed with supervisors and specialists who were interested in nutrition in pregnancy, acculturation, and public health. Second, a cognitive interview (Carbone, Campbell, & Honess, 2002)

was held with Chinese (n = 15) and Westerners (n = 5). Several questions were asked to investigate participants' understanding of both the Chinese and English versions of the questionnaire. For example, whether they understood the question, why they chose the answer, whether anything in the questionnaire was unclear, and whether they could differentiate between the different options for each question. This step helped the researchers to check whether the questions could represent the researchers' intention, and whether the options could represent the participants' ideas accurately. Third, back translation (Brislin, 1970) was done separately by three people, who all use both Chinese and English regularly, to check whether there were differences between the two versions of the questionnaire. This step helped to ensure consistency between the English version and Chinese version of the questionnaire.

The questionnaire was adjusted according to the feedback from the above three steps. The revised questionnaire was tested again by another four people (two people whose mother language was Chinese and two people whose mother language was English). Finally, the online version of the revised questionnaire was tested by another five people (three people whose mother language was Chinese and two people whose mother language was English). Since there were no unclear descriptions of the questions in the revised questionnaire according to feedback from the revised questionnaire, the final questionnaire was confirmed.

3.3 Data collection, handling, and analysis

The final questionnaire was published on an online survey website - www.51diaocha.com (see Appendix A). The online link was open for two months (from 1st Oct 2013 to 30th Nov 2013). All of the participants' answers were collected from the online questionnaire system directly into a spreadsheet.

Only responses from pregnant women are analysed in this study. The data were cleaned to ensure that all of the participants met the recruitment criteria and completed the

questionnaire (answered more than 95% of all questions). The data were given numerical codes before data analysis (see Appendix L for detail). ① In the eating habits section, the highest number was given to the most frequent practice of nutrition recommendations. Conversely, the lowest number was assigned to the least frequent practice of nutrition recommendations. For example, the answers of the question "how often do you choose low or reduced salt varieties of foods instead of the standard variety?" were coded as don't know (0), never (1), rarely (2), sometimes (3), regularly (4), always (5). ② In the nutrition attitudes questions, answers were coded as don't know (0), strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), strongly agree (5). Except for questions (28-1, 28-2, 28-4, 28-5, 28-6, 29-2, 29-3, 30-1, 30-3, 30-4, 30-7, 30-8, 31-3, 32-1, 32-3, 32-4, 32-6, 32-9, and 33-1) which were reverse coded. ③ In terms of the acculturation scale, the highest number (5) is used for response that suggests the most acculturated to NZ, for example, only English for language and media, and only socialised with New Zealanders. The lowest number (1) is defined as used English the least, preferred English media the least, and socialised with New Zealanders the least.

SPSS (version 21) was used for data analysis. The scores for eating habits, attitudes towards nutrition, and acculturation were calculated. The eating habits scores (Table 3.1) were the sum of the items (Appendix L) for each group of eating habits questions. The nutrition attitudes scores (Table 3.2) were the sum of the item for each group of nutrition attitudes questions. The acculturation score was the average of the items for all acculturation questions (Q35 – Q37). If the participants missed some questions on a certain scale, the final score of that scale was not calculated and that participant was not included in the relevant analysis.

The degree of internal consistency was assessed by the Cronbach's alpha. The Cronbach's alphas for acculturation and nutrition attitudes were acceptable (Cronbach's alpha > 0.6) (Mayers, 2013).

The normality of variables was tested by the Kolmogorov-Smirnov test. Parametric data (i.e. the acculturation score) were analysed by parametric tests, including the independent one-way analysis of variance (ANOVA), independent *t*-test, and linear

regression. Non-parametric data (including eating habits scores and nutrition attitudes scores) were analysed by non-parametric tests, including the Kruskal-Wallis test, adjusted independent non-parametric test., and Spearman's rank correlation.

Table 3.1 Details of each eating habits score

Eating habits scores (7 scores)		Questions contributed to the eating habits scores
Two eating habits scores relating to New Zealand nutrition recommendations only	Whether participants met the recommended servings of food groups for pregnancy	Q8 – Q12
	Consumption of supplements and food recommended for pregnancy	26(2), Q27(1) – Q27(6)
One eating habits score relating to TCM nutrition recommendations only	Consumption of food with specific TCM features regarding TCM recommendations for pregnancy	Q27(7) – Q 27(9)
Four eating habits scores regarding or recommended by both New Zealand and TCM	Healthy eating for adults (e.g., controlling fat, sugar, salt, and fiber intake)	Q19 – Q23, Q24(1) – Q24(5), Q25(1) – Q25(4)
	Maintaining food safety	Q 25(5) – Q25(7), Q26(1)
	Controlling weight gain	Q 26(3) & Q26(4)
	Avoiding drinking alcohol	Q27(10)

Table 3.2 Details of each nutrition attitudes score

Nutrition attitudes scores (12 scores)		Questions contributed to the nutrition attitudes scores
Four nutrition attitudes scores elating to New Zealand nutrition recommendations only	Caring and learning about Western nutrition	Q30(1) – Q30(5)
	Attitudes towards overall Western nutrition	Q30(6) & Q30(7)
	Attitudes towards New Zealand recommendations of healthy eating for adults	Q30(8) – Q30(12)
	Attitudes towards New Zealand recommendations for pregnancy	Q31
Four nutrition attitudes scores relating to TCM nutrition recommendations only	Caring and learning about TCM nutrition	Q32(1) – Q32(5)
	Attitudes towards overall TCM nutrition	Q32(6) – Q32(8)
	Attitudes towards TCM recommendations of healthy eating for adults	Q32(9) – Q32(11)
	Attitudes towards TCM recommendations for pregnancy	Q33
Four nutrition attitudes scores regarding or recommended by both New Zealand and TCM	General caring about eating habits	Q28(1) – Q28(7)
	Attitudes towards maintaining food safety	Q28(8)
	Attitudes towards controlling weight gain	Q29(2) & Q29(3)
	Attitudes towards avoiding drinking alcohol	Q29(1)

Chapter 4 Results

4.1 Participants4.1.1 Participants' description

In total, 254 Chinese women participated in this study. Of these participants, 23 women did not meet the recruitment criteria, 54 women did not complete the questionnaire. Finally, 177 eligible women completed the questionnaire, including 84 pregnant women and 93 non-pregnant women. In this study, responses from these 84 eligible pregnant women were analysed. The participants' age ranged from 21 to 41 years old, and the median age was 30.0 years old (95% CI 29.0 - 30.6).

Table 4.1 displays participants' basic information. Nearly all of the participants (98.8%) were born in Mainland China. All of the participants' parents were Chinese and most of them (97.6%) were born in Mainland China. The participants' education level was high. The majority (80.7%) had an undergraduate level of education and 13.3% of the participants had a postgraduate level of education. Approximately half of the participants had lived in New Zealand for at least seven years while only 3.7% of the participants had lived in New Zealand for less than one year. Regarding parity, nearly half of the participants (44.6%) were experiencing their first pregnancy, 44.6% were pregnant for the second time, and only 10.8% had been pregnant three or more times. Furthermore, 44.6% lived with a Chinese parent or parent-in-law, and more participants regularly ate with other Chinese (65.9%) than those who did not.

Table 4.1 Participants' basic information

Characteristics	Variables	n (%)
⑴ Birth place	Mainland China	83 (98.8)
	Taiwan	1 (1.2)
⑵ Parents	Both of them are/were Chinese, and were born in Mainland China	82 (97.6)
	Both of them are/were Chinese, but only one of them was born in Mainland China	2 (2.4)
⑶ Education	High school	5 (6.0)
	Undergraduate and college	67 (80.7)
	Postgraduate	11 (13.3)

Table 4.1 Participants' basic information (continued)

Characteristics	Variables	n (%)
⑷ Duration of living in New Zealand	Less than a year	3 (3.7)
	1 to less than 3 years	11 (13.6)
	3 to less than 5 years	11 (13.6)
	5 to less than 7 years	12 (14.8)
	7 or more years	44 (54.3)
⑸ Number of pregnancies (including current pregnancy)	1	37 (44.6)
	2	37 (44.6)
	3 or more	9 (10.8)
⑹ Living with Chinese parent / parent in-law	Yes	37 (44.6)
	No	46 (55.4)
⑺ Regularly eat with other Chinese	Yes	54 (65.9%)
	No	28 (34.1%)

4.1.2 Participants' acculturation level

Eighty participants answered all questions in the acculturation scale and their acculturation levels were calculated. Participants' acculturation score was normally distributed and ranged from 1.0 to 4.0 at of possible 5.0, and the mean acculturation level was 1.98 ± 0.592. Participants' answers to the acculturation questions are shown in Appendix E.

Participants were divided into tertiles based on acculturation level: lower (acculturation score ≤ 1.7), medium (acculturation score 1.8 – 2.1), and higher acculturation (acculturation score ≥ 2.2) groups, consisting of 28, 25, and 27 participants, respectively. The relationships between the participants' acculturation score and basic information were assessed (Appendix F). Participants with postgraduate education had significantly higher acculturation scores than those with high school education ($p < 0.05$). In addition, participants who regularly ate with other Chinese had significantly higher acculturation scores than those who did not regularly eat with other Chinese ($p <$

0.05). Other factors were not significantly related to acculturation level, including birth place, age, duration of living in New Zealand, number of pregnancies, and living with Chinese parents / parents-in-law.

4.2 Eating habits

4.2.1 Consumption of food groups

Figure 4.1 and Figure 4.2 illustrate participants' consumption of different food groups. First, most participants' consumption of fruits met the daily recommendation for fruit intake of two serves/day (72.3%). Second, nearly all of the participants (94.0%) did not meet the recommended vegetable intake of four serves/day for pregnancy. Approximately one in three ate three servings of vegetables every day. Third, almost all of the participants (97.6%) did not consume sufficient cereals according to the NZ recommendation (6 serves/day). Only 15.2% of them ate two to three servings of bread every day. A large proportion of the participants (86.9%) ate at least one serving of other cereals as their main food every day, such as pasta, noodles, rice, and steamed buns. Additionally, participants' consumption of other cereals, such as biscuits, crackers, muesli, and cornflakes, was comparatively small. Less than half of the participants (45.3%) ate one or more servings of other cereals every day, and 7.4% of the participants did not eat other cereals. Fourth, 92.8% of the participants' dairy food intake did not meet the recommendation of three servings/day. A considerable proportion of the participants (21.7%) never consumed or consumed less than one serving of dairy food per day. Finally, in relation to the participants' intake of meat, eggs, and seafood, more than half of the participants (66.3%) met the recommended intake of two servings/day.

Figure 4.1 Consumption of food groups

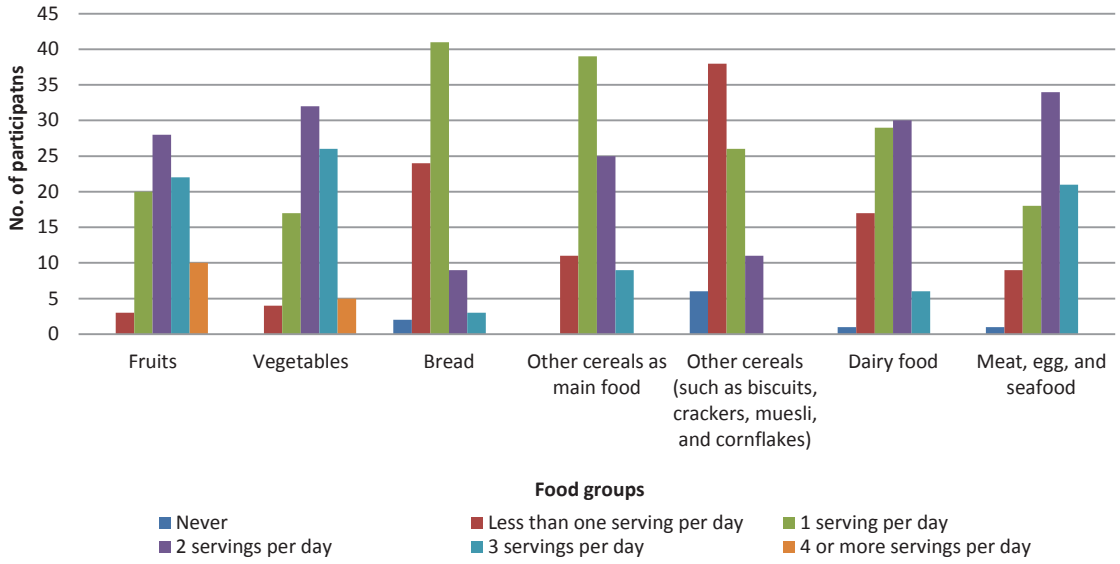


Figure 4.2 Met nutrition recommendations for pregnancy

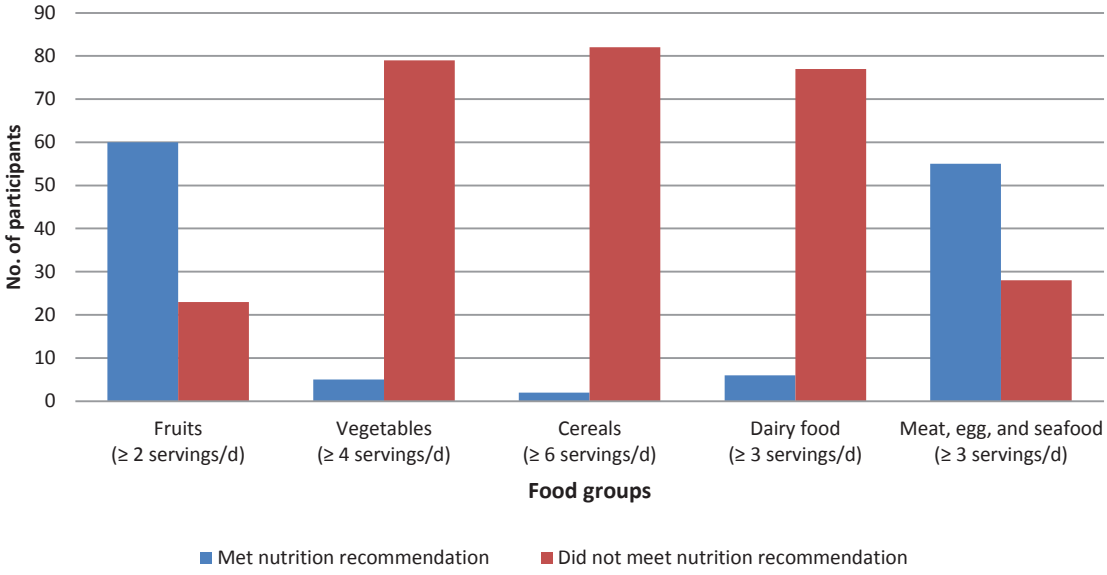
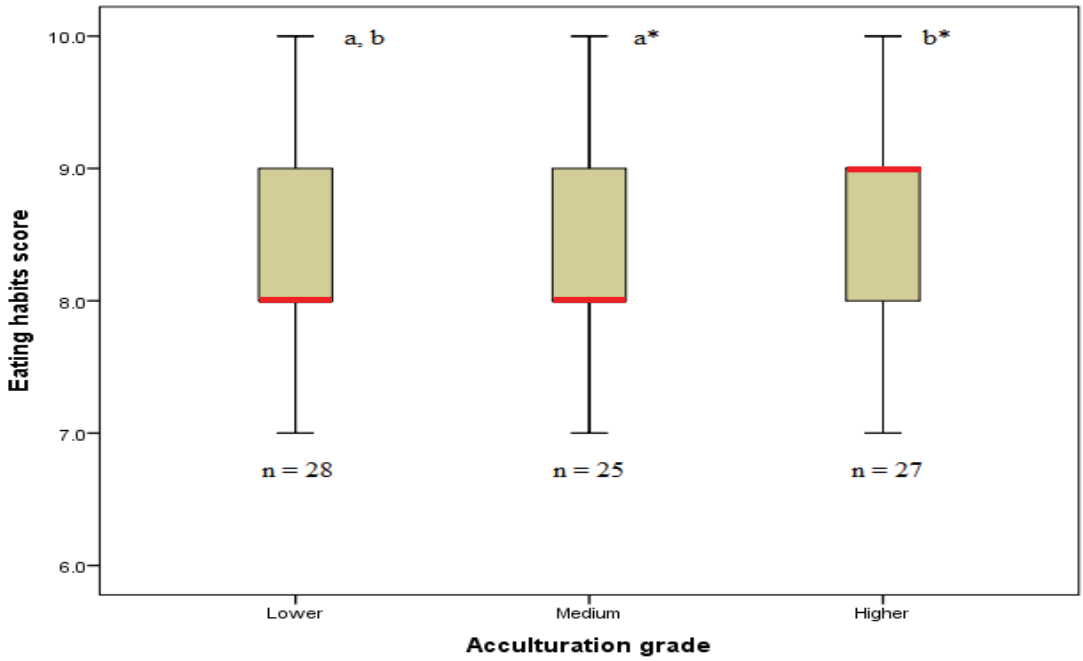


Figure 4.3 shows participants' eating habits score for the consumption of different food groups according to whether the food consumption met the recommended intake. This eating habits score (median 8.0, 95% CI 8.2 - 8.6) was in the middle of the theoretical score range of 5.0 to 10.0. Furthermore, the eating habits score in the higher acculturation group was significantly higher than their counterparts in the medium acculturation groups ($p = 0.033$). (Appendix G)

Figure 4.3 Eating habits score of different acculturation groups - whether met recommended servings of food groups



Medians marked by the same superscript mean the distribution are similar, and marked with the different superscripts are significantly different by the adjusted independent non-parametric test.

** Adjust sig = 0.033.*

4.2.2 Consumption of recommended supplements and food during pregnancy

Figures 4.4 and 4.5 illustrate the frequency of participants' consumption of supplements and food recommended by Western nutrition for pregnant women. First, participants' reported infrequent consumption of iron rich food (Figure 4.4). About half of the participants said they ate iron rich food less than three times every week. Only 4.8% of the participants took iron rich food every day. However, participants' consumption of iron supplements differed (Figure 4.4). About one third of the participants never took iron supplements, and one third of the participants took iron supplements every day.

Second, a majority of the participants (63%) reported that they did not often eat iodine rich food (i.e., less than 3 times per week) (Figure 4.4). A minority of the participants (9.5%) reported they ate iodine rich food every day (Figure 4.4). The frequency with which participants took iodine supplements differed (Figure 4.5). Approximately one in three participants never took iodine supplements, and one in three participants frequently took iodine supplements (i.e., at least 7 times per week). Regarding

participants' consumption of iodised salt, more than half of them reported that they often selected iodised salt during pregnancy, and about one third of them never or seldom selected iodised salt (Figure 4.6).

Third, the participants' reported frequency of eating food fortified with folic acid ranged greatly from 28.1% for less than once per week to 15.9% for seven or more times per week. In addition, most participants (67.9%) frequently consumed folic acid supplements. (Figure 4.5)

Figure 4.4 Consumption of food and supplements relating to Western nutrition recommendations for pregnancy

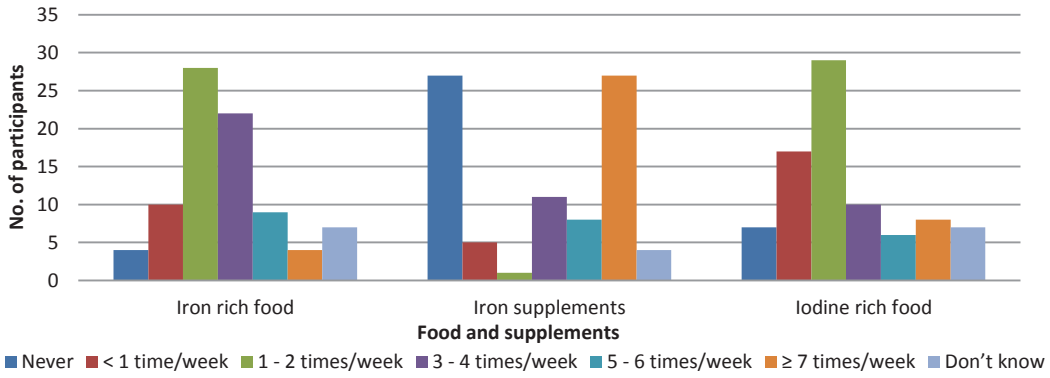


Figure 4.5 Consumption of food and supplements relating to Western nutrition recommendations for pregnancy

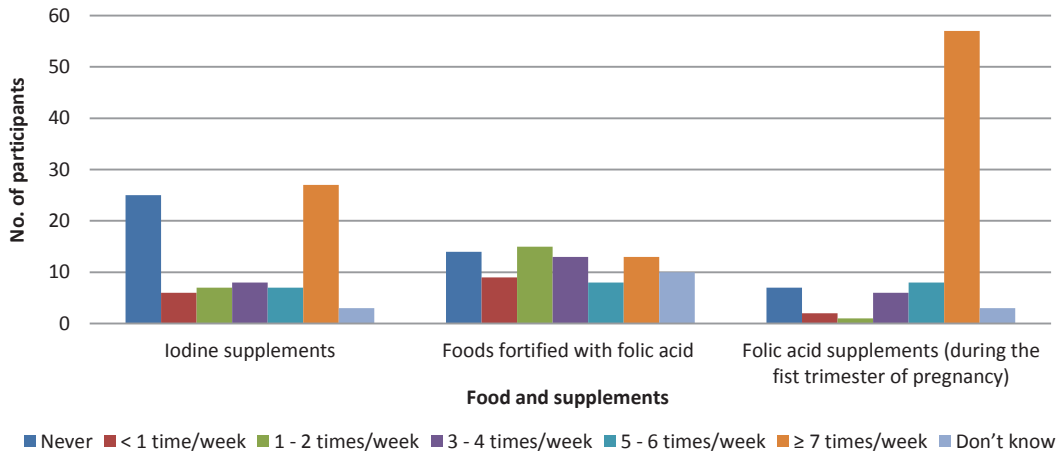
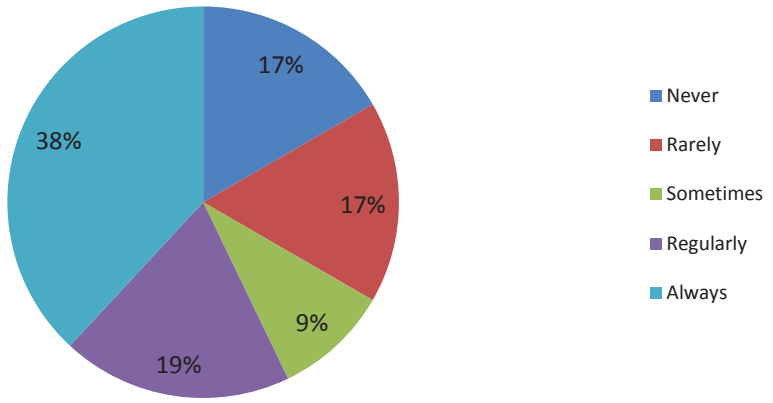


Figure 4.6 Consumption of iodised salt during pregnancy



Fourth, comparing participants' consumption of foods and supplements, a considerable proportion of the total participants (26.9%) consumed both iron rich food and iron supplements for 2 or less than 2 times per week (Figure 4.7). In contrast, 29.8% of the total participants often consumed both iron rich food and iron supplements (Figure 4.7). Among participants who seldom consumed iodine supplements, nearly all of them seldom ate iodine rich food (Figure 4.8). Although most of the participants frequently took folic acid supplements during the first trimester of pregnancy, nearly half of these participants did not often consume food fortified with folic acid (Figure 4.9). In addition, less than half of the total participants often consumed both iodine supplements and folic acid supplements, both of which are recommended by the nutrition guidelines in New Zealand (Figure 4.10).

Figure 4.7 Number of participants consuming iron rich food and iron supplements

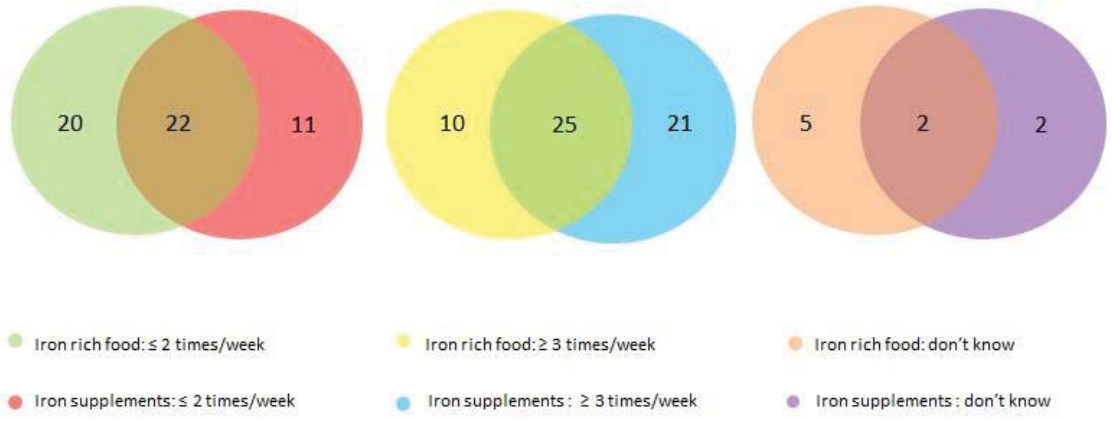


Figure 4.8 Number of participants consuming iodine rich food and iron supplements

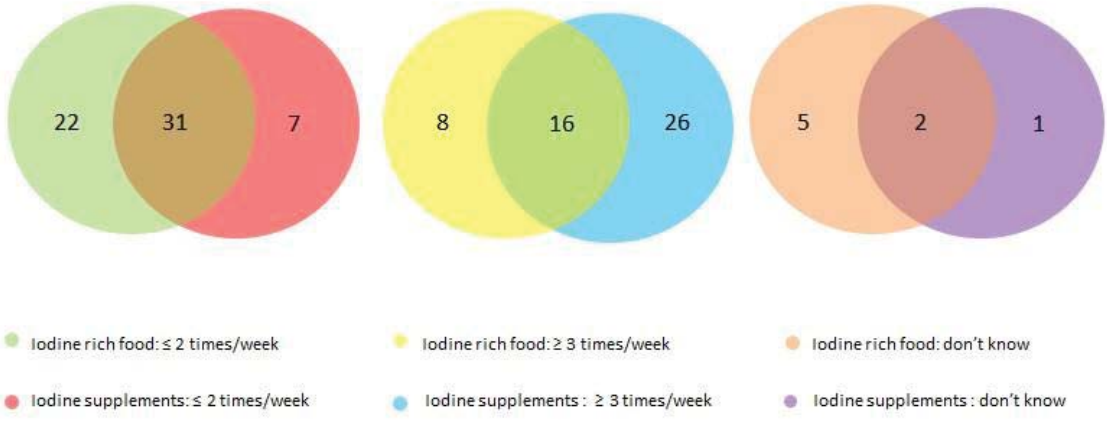


Figure 4.9 Number of participants consuming food fortified with folic acid and folic acid supplements

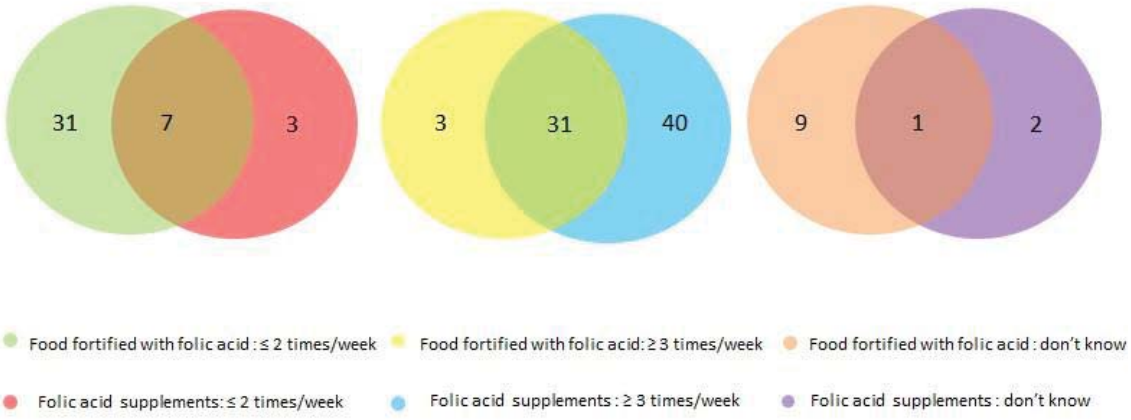
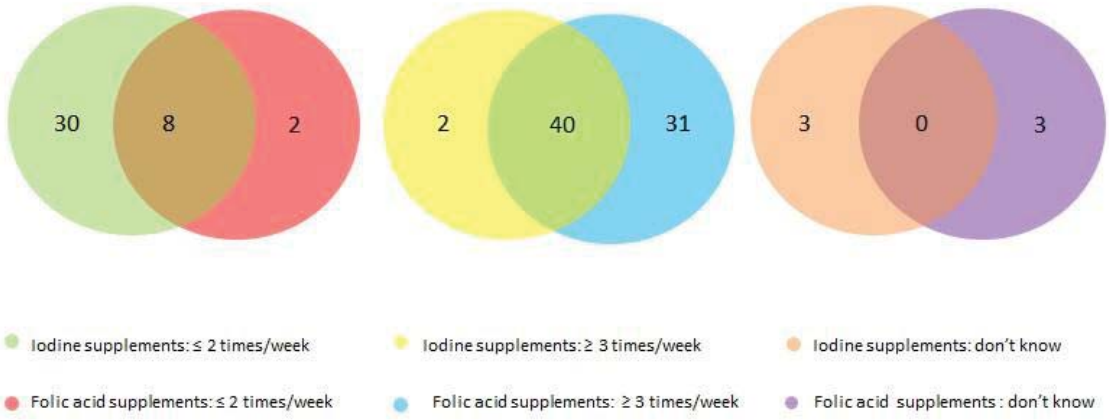


Figure 4.10 Number of participants consuming Western nutrition recommended supplements



The median eating habits score for food and supplements recommended for pregnancy according to Western nutrition recommendations was 25.0 (95% CI 23.0 - 26.4), with a theoretical score range of 1.0 – 41.0 (Appendix G). The scores were similar among different acculturation groups (Appendix G).

According to TCM nutrition recommendations, women should have yin and blood nourishing food as well as kidney nourishing food during pregnancy. In contrast, they should not eat blood activating food during pregnancy. More than 70% of the participants reported that they seldom ate these foods with specific TCM features (Figure 4.11). Among the participants who seldom consumed food with specific TCM features, most of them seldom consumed all three types of food (Figure 4.12). Moreover, approximately 13% of the participants did not know if they consumed any of the three types of food (Figure 4.13).

Figure 4.11 Consumption of food and supplements relating to TCM nutrition recommendations for pregnant women

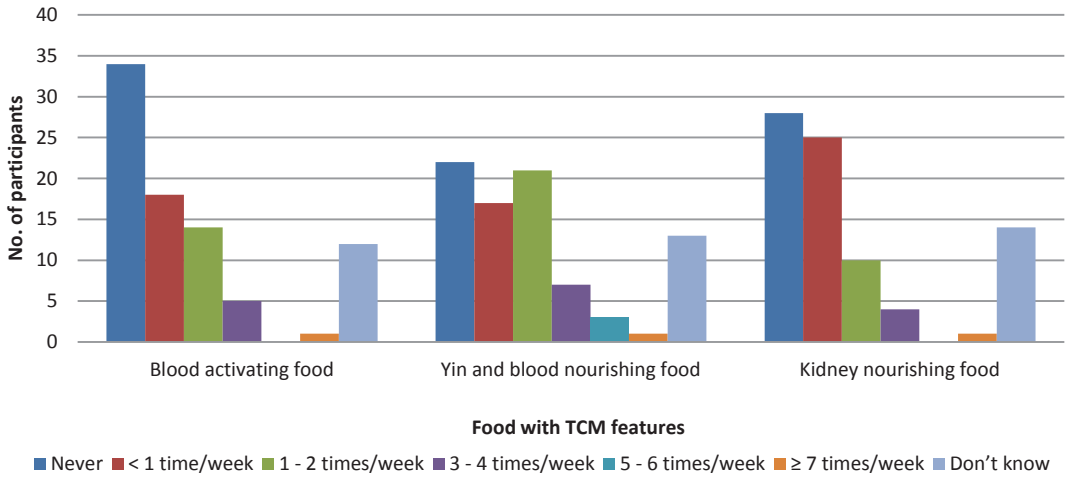


Figure 4.12 Number of participants who seldom (≤ 2 times/week) consumed food with TCM features

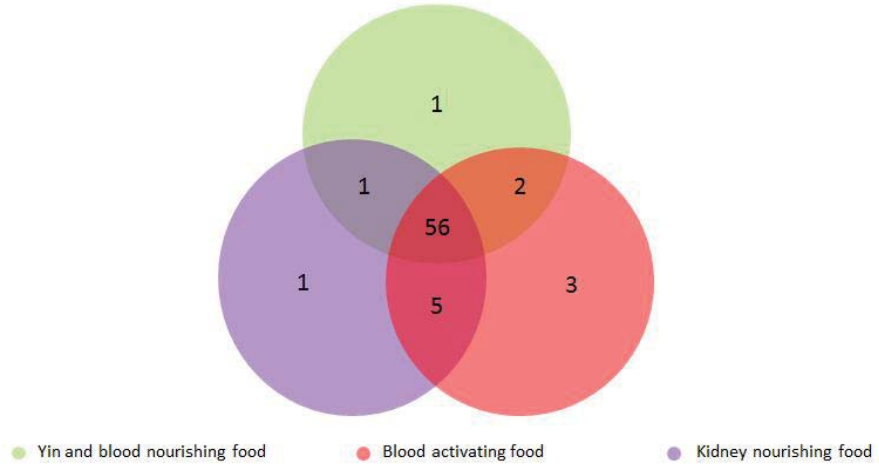
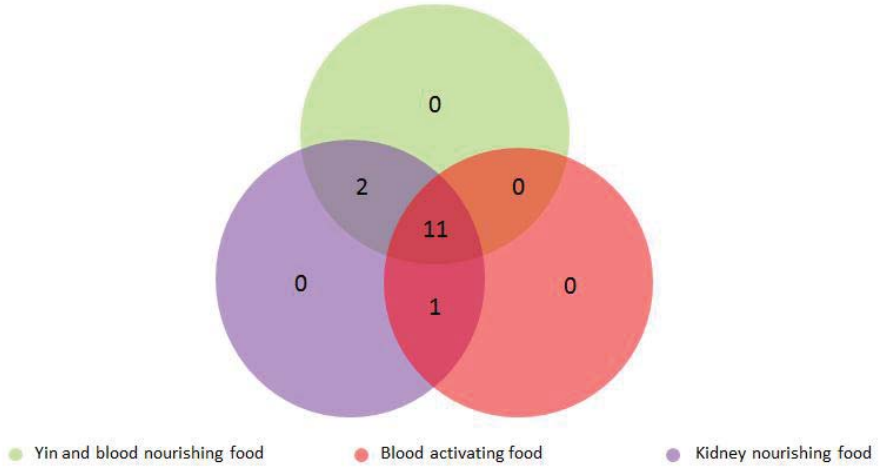


Figure 4.13 Number of participants who did not know about their consumptions of food with TCM features



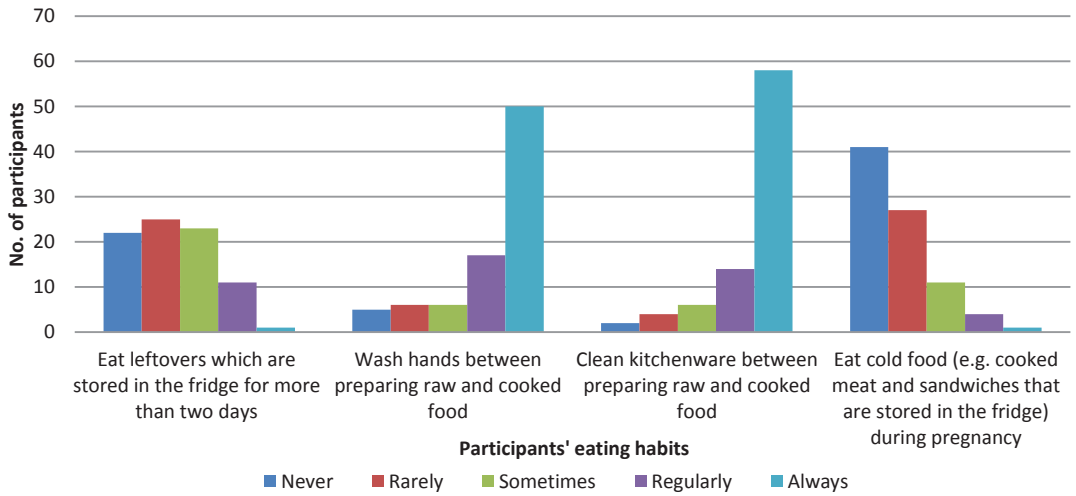
Participants' eating habits score for consuming foods with TCM features (median 9.0, 95% CI 7.2 - 8.7) was in the middle of the theoretical score range (0 - 18) (Appendix G). There was no significant difference between different acculturation groups (Appendix G).

In addition, there is no significant correlation between participants' eating habits score for Western recommendations for pregnancy and recommendations by TCM (Spearman's correlation coefficient = 0.134, $p = 0.241$, $df = 76$).

4.2.3 Food safety, weight control, and the frequency of alcohol consumption.

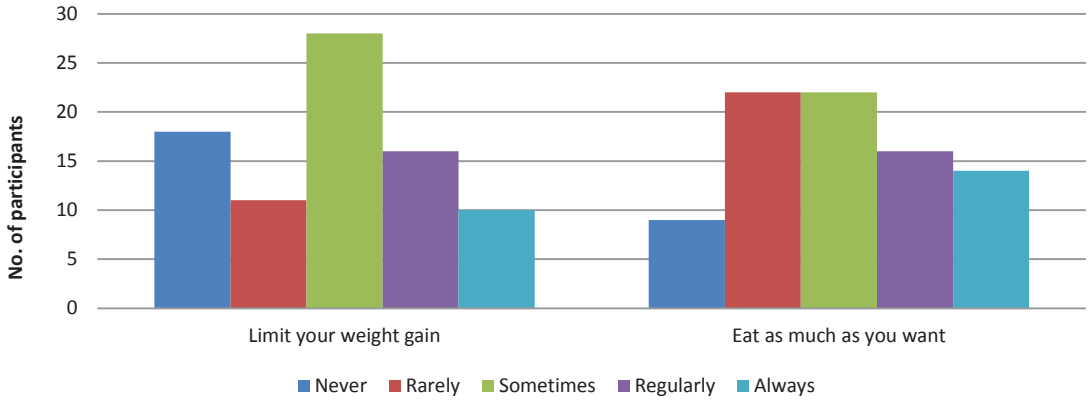
Both Western and TCM nutrition recommendations advise pregnant women to maintain food safety and avoid drinking alcohol. In addition, both of these recommendations advise pregnant women to keep a moderate diet intake. Most participants' reported eating habits followed food safety guidelines. Figure 4.14 displays participants' habits relevant to food safety. Only a small proportion (14.6%) of the participants frequently ate leftovers that were stored in the fridge for more than two days. A large number of the participants usually washed hands and cleaned kitchenware between preparing raw and cooked food, respectively accounting for 79.5% and 85.7% of the participants. In addition, most of the participants (80.9%) rarely or never ate cold food during pregnancy.

Figure 4.14 Participants' eating habits - food safety



However, participants' reports of weight control during pregnancy varied (Figure 4.15). One in three participants reported that they always or regularly limited their weight gain during pregnancy. Meanwhile, a similar proportion of the participants (37.3%) always or regularly controlled their food intake. Furthermore, nearly all of the participants (96.4%) never drank alcohol during pregnancy. Two participants (2.4%) rarely drank alcohol and only one participant (1.2%) drank alcohol three to four times each week.

Figure 4.15 Participants' eating habits - weight control



The participants' eating habits scores for maintaining food safety (median 17.0, 95% CI 16.0 - 17.1) and avoiding alcohol (median 6.0, 95% CI 5.9 - 6.0) were high according to the theoretical score range for food safety (4 - 20) and avoiding alcohol (0 - 6). However, the score for weight control during pregnancy (median 6.0, 95% CI 5.3 - 6.3) was relatively low compared to the theoretical range of 2 to 10. Moreover, there was no significant association of these eating habits with acculturation (Appendix G).

4.2.4 Eating habits relating to fat, sugar, and salt intake

This section describes participants' selection of oil, bread, rice, and milk. First, almost all of the participants used oil more frequently than butter during cooking (Figure 4.16). Olive oil (31.6%) and soya oil (22.8%) were the most frequently used (Figure 4.16). Relating to butter or margarine spread, nearly half of the participants did not use the spread (Figure 4.17). Among those who used spread, butter was more frequently used than other types of spread, accounting for 22.6% of the participants (Figure 4.17). Some participants (14.3%) used light or reduced fat margarines and low fat varieties (Figure 4.17).

Figure 4.16 Participants' selection on oil and butter

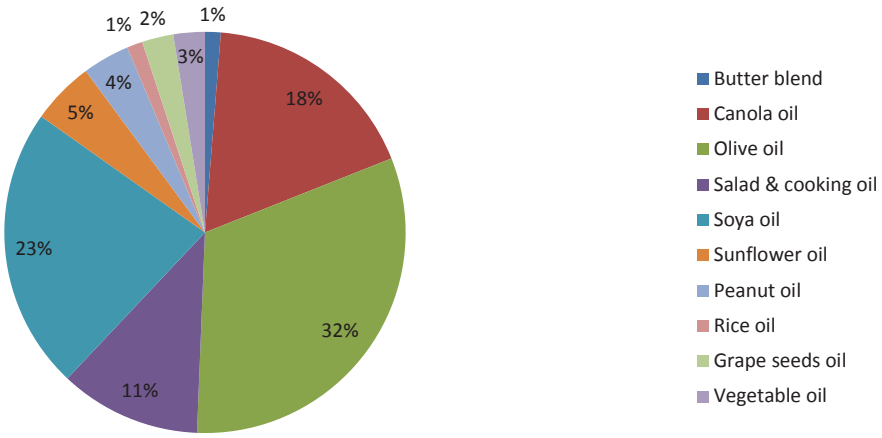
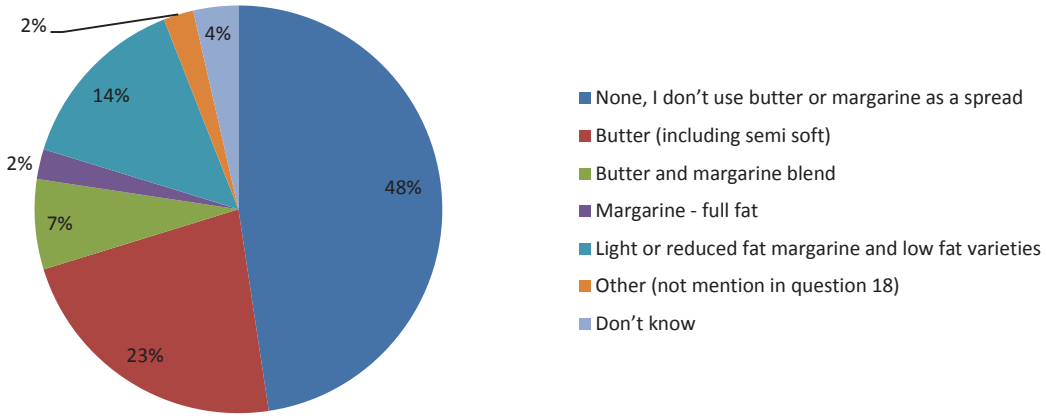


Figure 4.17 Participants' selection on butter or margarine spread



Second, considering participants' selection of bread, approximately equal proportions of participants consumed light grain bread/wholemeal bread, heavy grain bread, and white bread, accounting for nearly 30% of the participants each (Figure 4.18). In terms of participants' selection of rice, although 63.2% of the participants ate brown rice at least some of the time, white rice was more commonly consumed than brown rice (Figure 4.19). Specifically, about one in three participants only ate white rice and the majority of the participants ate white rice more often than brown rice (Figure 4.19).

Figure 4.18 Participants' selection of bread, rolls, or toast

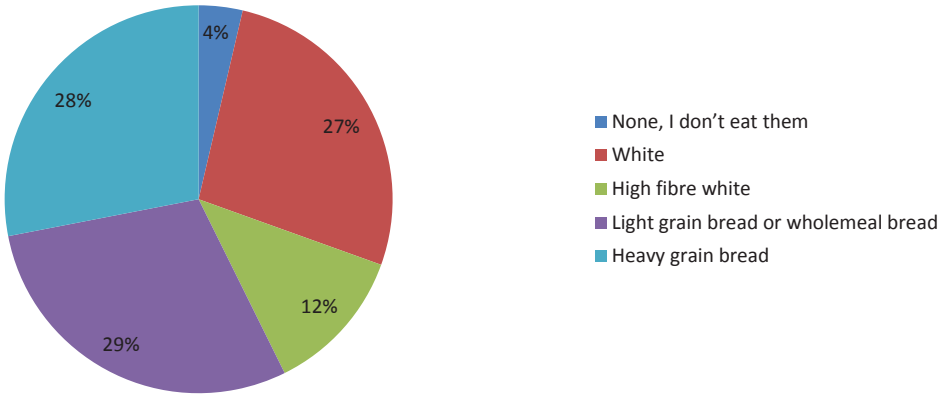
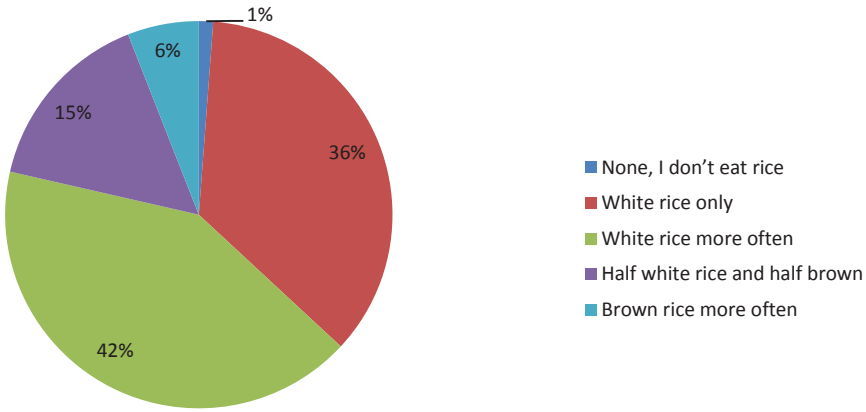


Figure 4.19 Participants' selection of rice



Last, whole or standard milk were consumed by half of the participants, reduced fat, skim, and trim milk were consumed by about 40% of the participants, and soy milk was consumed by the fewest participants (8.3%). Moreover, only 4.8% of the participants did not consume milk. (Figure 4.20)

Figure 4.20 Participants' selection of milk

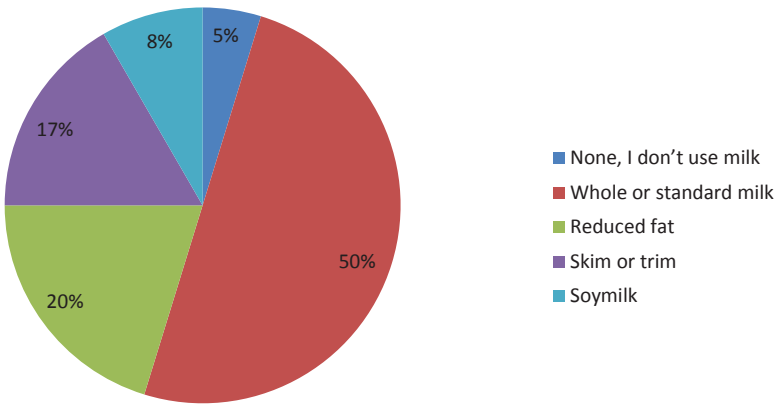


Figure 4.21 shows participants' consumption of fries, confectionary, drinks, and fish/shellfish. Firstly, chips/fries (73.8%), and battered/fried fish/shellfish (92.8%) were never consumed or only consumed less than once per week by most of the participants. However, half of the participants consumed confectionary one to four times per week. Moreover, 7.2% of the participants consumed confectionary at least five times per week.

Secondly, regarding participants' consumption of drinks, most of the participants (80.5%) consumed soft/energy drinks less than once per week. Although about half of the participants (53.7%) never or seldom drank fruit juice/drinks, more than one in three (37.8%) consumed juice/drinks one to four times per week.

Lastly, fresh/frozen/canned fish/shellfish, which are high in ω-3 fatty acids, were not frequently consumed. Half of the participants ate these foods less than once per week. Only 14.4% of the participants ate these foods three to six times a week.

Figure 4.21 Participants' eating habits

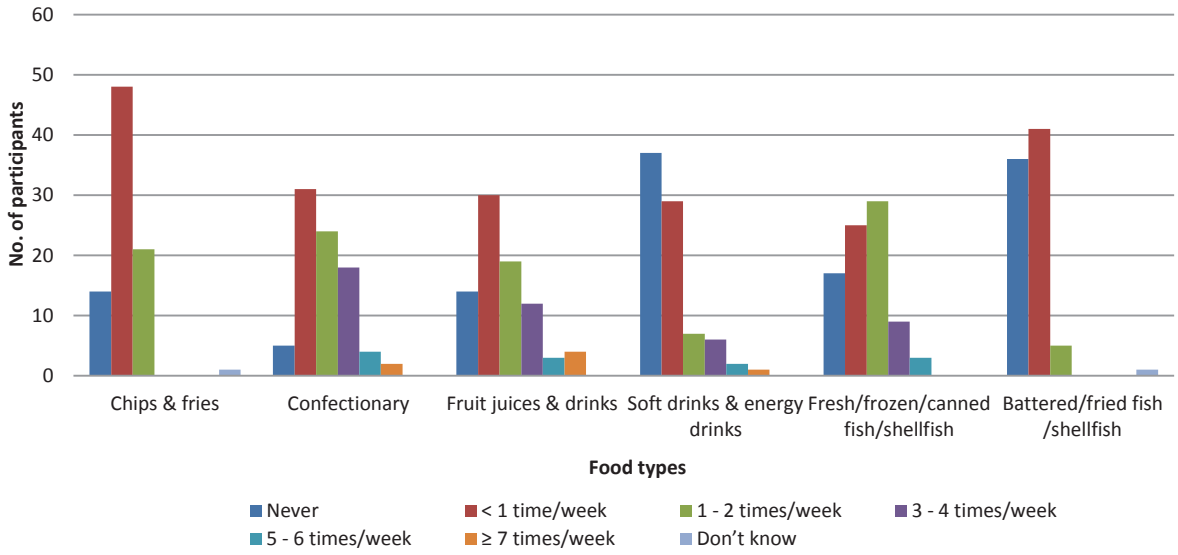
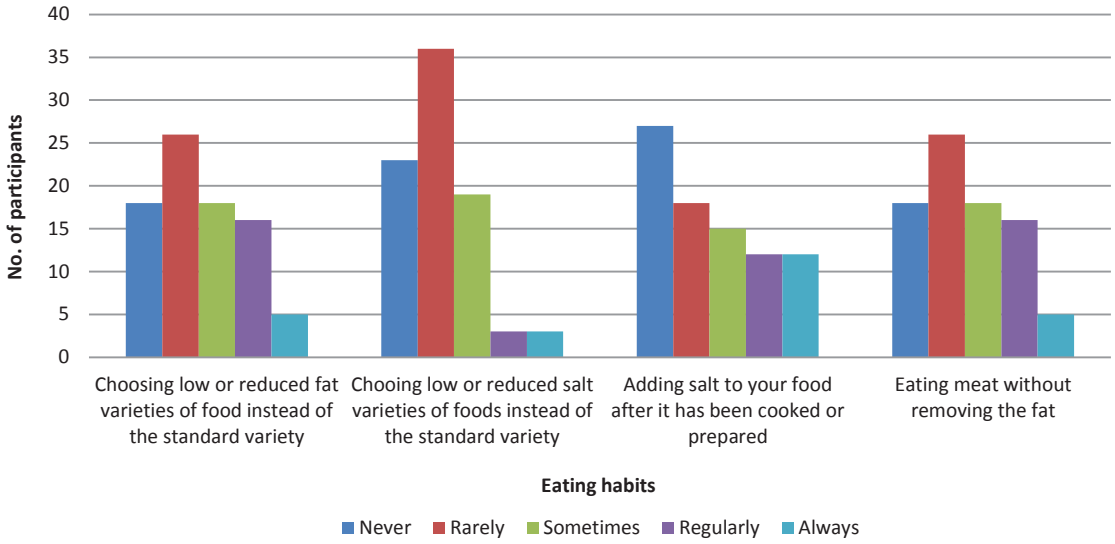


Figure 4.22 illustrates participants' eating habits related to reducing fat and salt. Approximately half of the participants seldom or never chose low or reduced fat varieties instead of the standard variety. Similarly, a large proportion of the participants (70.3%) never or rarely chose low or reduced salt varieties. There is a diversity in participants' eating habits regarding adding salt after food has been cooked or prepared. About half of the participants never or rarely added salt. Whereas, a considerable

proportion of the participants (28.6%) regularly or always added salt to their food at the table. Likewise, although more than half of the participants regularly or always removed the fat, 29% of the participants did not remove the fat.

Figure 4.22 Participants' eating habits relating to limiting fat and salt intake



The median score of healthy eating for adults (e.g., limiting fat, sugar, and salt intake) (19.5, 95% CI 19.2 - 20.0) was comparatively high according to the theoretical score range (3 - 24). There was no significant difference of the score among different acculturation groups (Appendix G) .

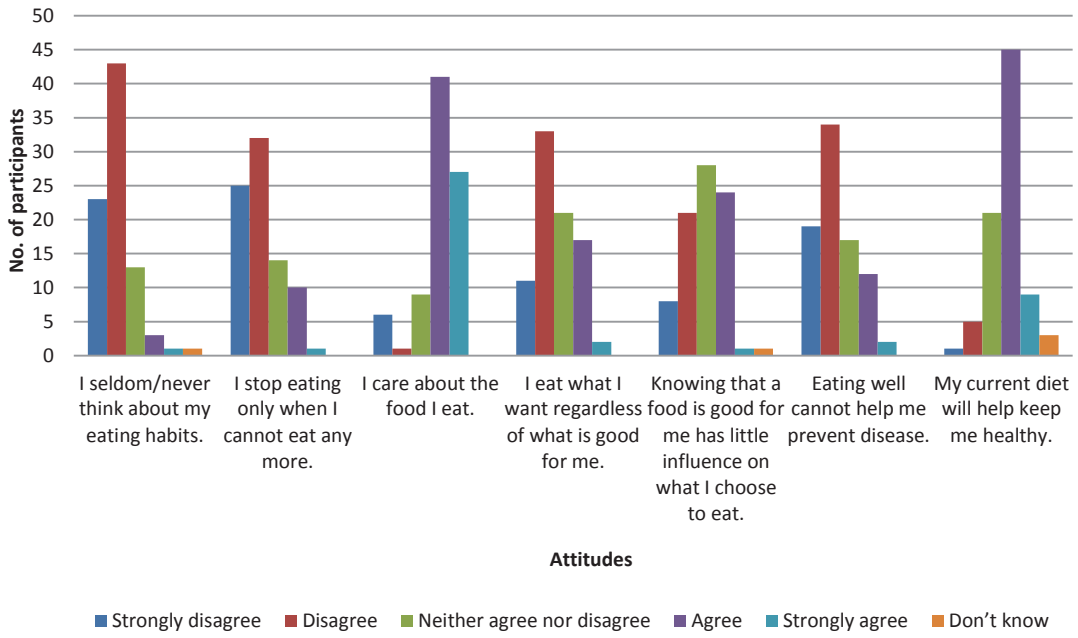
4.3 Nutrition attitudes

4.3.1 Nutrition attitudes relevant to both Western and TCM nutrition recommendations

Figure 4.23 shows participants' attitudes towards general caring about eating habits. A majority of the participants (80%) had positive attitudes towards thinking about their eating habits and caring about the food they ate. More than half of the participants had other positive attitudes, including choosing food which was good for them (52.4%), the

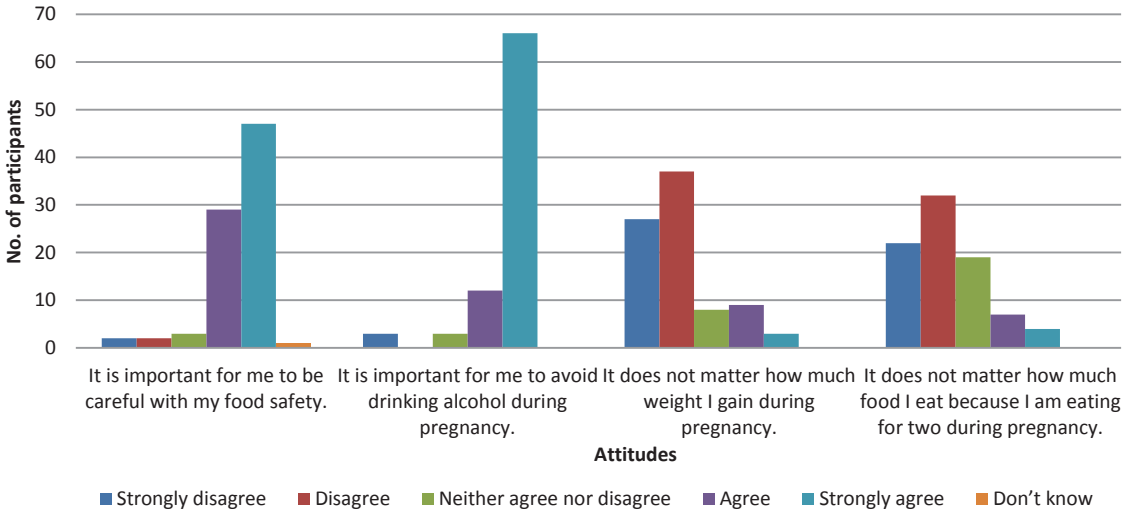
importance of the influence of nutrition on preventing disease (63.1%), and the importance of their current diet on their health (64.3%). However, only about a third of the participants thought whether a food was good for them would influence their food choice. The score for caring about eating habits (median 25.0, 95% CI 24.6 - 26.2) was high according to the theoretical score range (0 - 35) (Appendix H). Participants' in the different acculturation groups had similar scores (Appendix H).

Figure 4.23 Attitudes towards general caring about eating habits



Most of the participants had positive attitudes towards maintaining food safety (90.5%) and avoiding alcohol (92.9%) during pregnancy (Figure 4.24). In addition, a majority of the participants (76.1%) disagreed with the statement that weight gain during pregnancy did not matter (Figure 4.24). However, a small proportion of the participants (about 13%) either did not care about their weight gain or did not care about how much food they ate during pregnancy (Figure 4.24). There was no significant association between acculturation and attitudes scores for maintaining food safety (median 5.0, 95% CI 4.1 - 4.6), avoiding drinking alcohol (median 5.0, 95% CI 4.5 - 4.8), and controlling weight gain (median 10.0, 95% CI 8.0 - 8.9) (Appendix H).

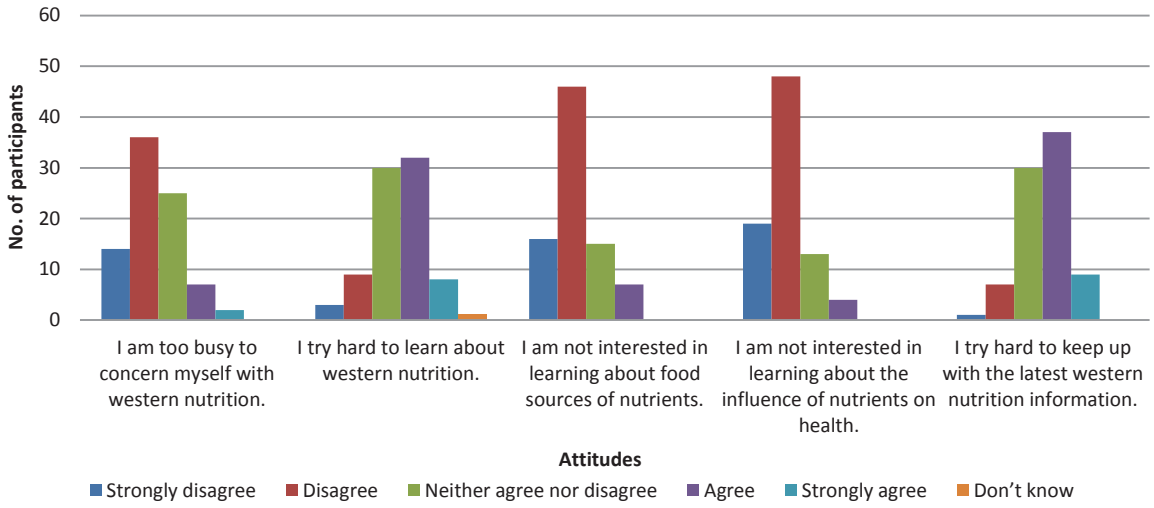
Figure 4.24 Attitudes' towards consuming alcohol, maintaining food safety, and controlling weight gain



4.3.2 Western nutrition attitudes

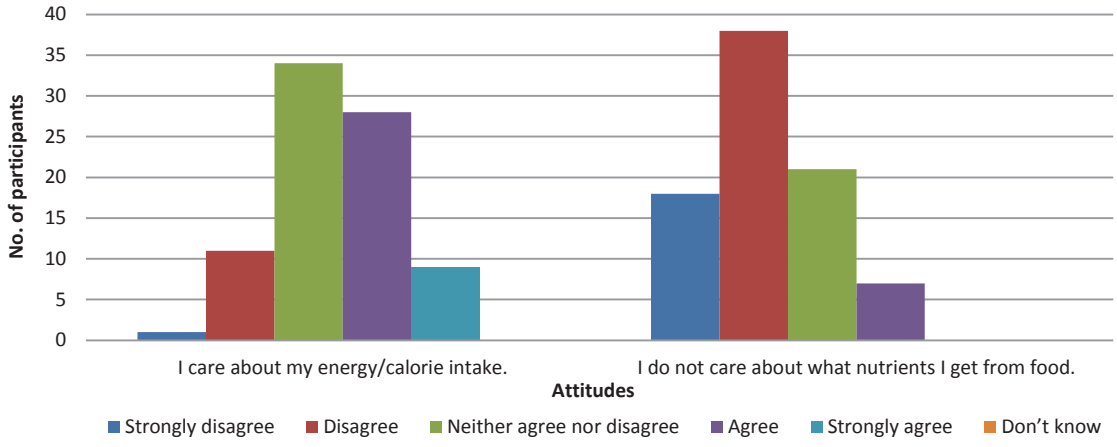
This section describes participants' attitudes towards Western nutrition. First, a majority of the participants reported that they were interested in learning about the influence of nutrients on health (79.7%) and food sources of nutrients (73.8%) (Figure 4.25). Around half of the participants reported that they were not too busy to concern themselves with Western nutrition (59.6%), tried hard to learn about Western nutrition (54.7%), and kept up with the latest nutrition information (48.2%) (Figure 4.25). Participants' score for caring and learning about Western nutrition (median 19.0, 95% CI 17.1 - 19.1) was high compared with the theoretical score range (0 - 25) (Appendix H). Caring and learning about nutrition did not differ among the three acculturation groups (Appendix H).

Figure 4.25 Attitudes towards caring and learning about Western nutrition



Second, with regard to the attitudes towards overall Western nutrition, a large proportion of the participants (66.6%) cared about nutrients they obtained from food, but less than half of the participants (44.5%) cared about their energy/calorie intake (Figure 4.26). Participants had high score for attitudes towards overall Western nutrition (median 7.0, 95% CI 6.9 - 7.5) relative to the theoretical score range (0 - 10) (Appendix H). No significant difference was found among the three acculturation groups (Appendix H).

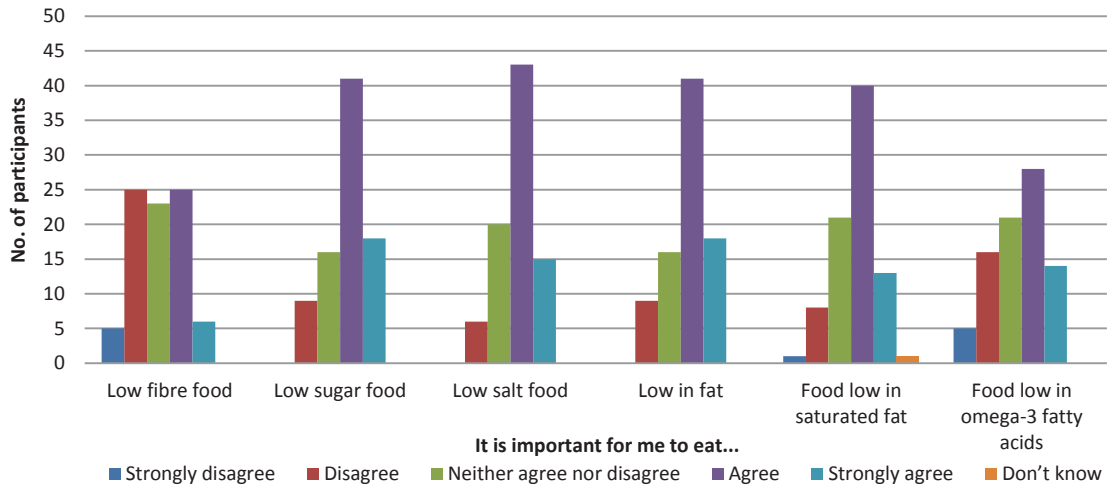
Figure 4.26 Attitudes towards overall Western nutrition



Third, participants' attitudes towards Western nutrition recommendations of healthy eating for adults ranged dramatically depending on the nutrient (Figure 4.27). The percentage of participants who thought high fibre was important was similar to the

percentage of the participants who thought high fibre was not important, each accounting for about 36% of the participants. A large proportion of the participants (about 70%) agreed that it was important for them to eat food low in sugar and salt. In addition, participants' attitudes towards fat varied considerably. A large margin of the participants thought it was important for them to eat food low in fat (70.2%), as well as eat food low in saturated fat (63.1%). However, only a quarter of the participants disagreed with the idea that it was important for them to eat food low in ω-3 fatty acids. Regarding participants' attitudes towards Western nutrition recommendations for adults, the median score (18.0, 95% CI 17.4 - 18.7) was high compared to the theoretical score range (0 - 25) (Appendix H). Furthermore, participants' nutrition attitudes scores related to Western nutrition recommendations for adults were similar among all acculturation groups (Appendix H).

Figure 4.27 Attitudes towards Western nutrition recommendations of healthy eating for adults



In general participants' had positive attitudes towards Western nutrition recommendations for pregnant women (Figure 4.28). Nearly all of the participants (94.1%) thought it was important for them to take folic acid supplements during the first trimester of pregnancy, and a majority of the participants (76.2%) reported that taking food fortified with folic acid was important for them. Similarly, a large proportion of the participants agreed that eating iron rich food (83.4%) and taking iron supplements (65.6%) during pregnancy was important for them. However, participants' attitudes towards iodine were diverse. Although only a quarter of the participants had positive attitudes towards iodine rich food, a large proportion of the participants agreed that it

was important for them to take iodine supplements and used iodised salt during pregnancy, accounting for about 60% each. Moreover, the median score for attitudes towards Western nutrition recommendations for pregnancy (26.0, 95% CI 25.3 - 27.3) was high compared with the theoretical score range (0 - 35) (Appendix H). Participants in the higher acculturation group had a significantly higher score than the scores in the low (p = 0.033) and medium acculturation groups (p = 0.048) (Figure 4.29 and Appendix H).

Figure 4.28 Attitudes towards Western nutrition recommendations for pregnancy

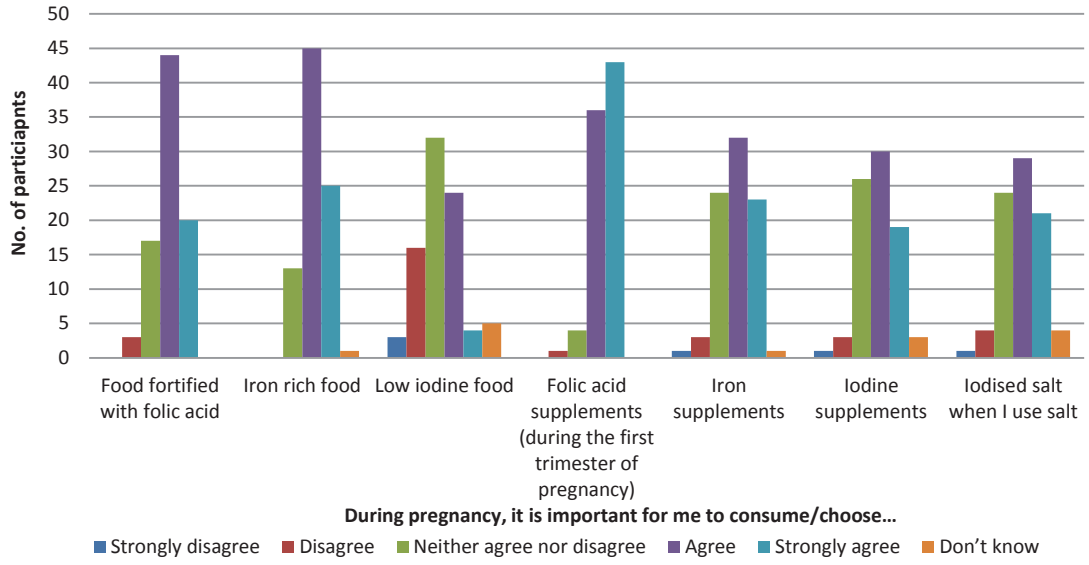
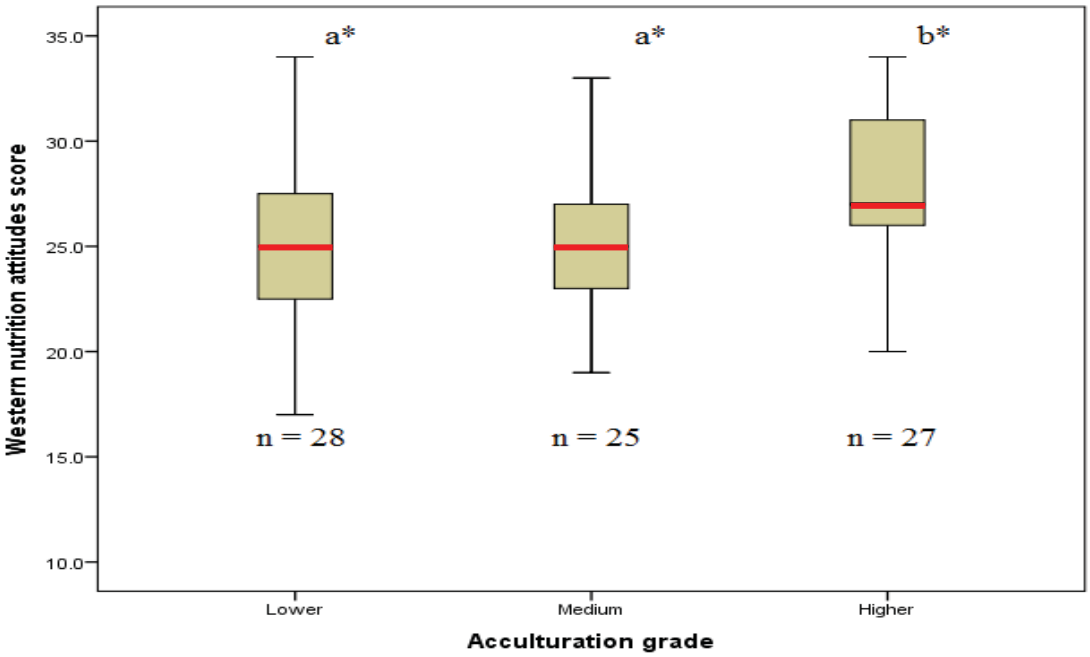


Figure 4.29 Attitudes score of different acculturation groups
- Attitudes towards Western nutrition recommendations for pregnancy



Medians marked by the same superscript mean the distribution are similar, and marked with the different superscripts are significantly different by the adjusted independent non-parametric test.

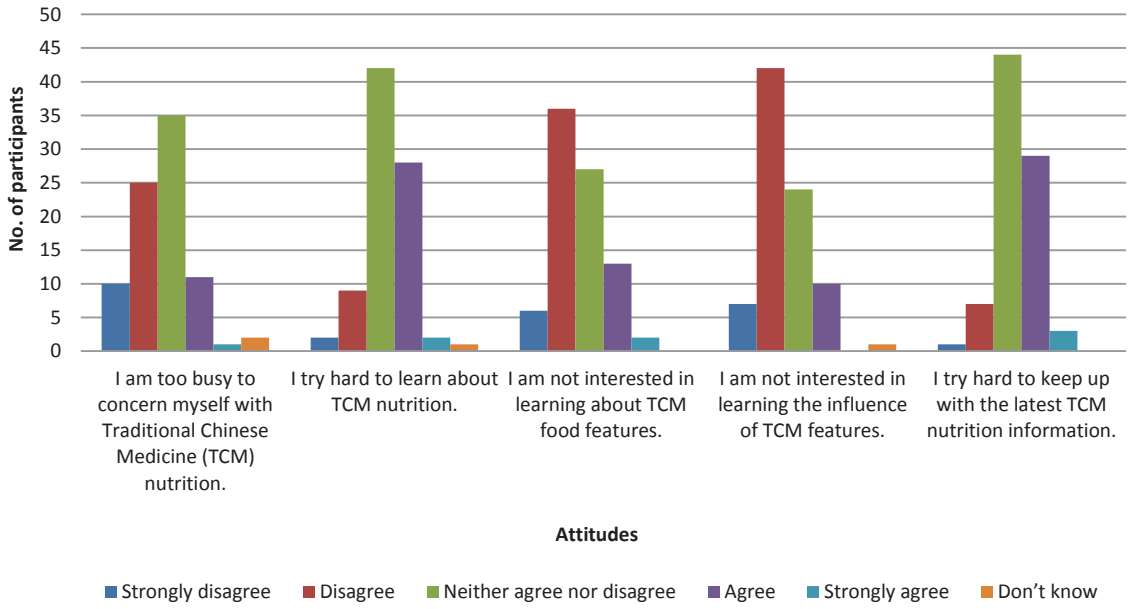
** Adjust sig between lower and higher acculturation groups = 0.033; adjust sig between medium and higher acculturation groups = 0.048.*

4.3.3 TCM nutrition attitudes

This section shows participants' attitudes towards TCM nutrition. First, a series of questions assess attitudes towards caring and learning about TCM nutrition (Figure 4.30). Just over half of the participants were interested in learning about TCM food features (e.g., yin and yang features of food) and 58.3% of the participants were interested in learning about the influence of TCM features on health. A minority of the participants disagreed with the idea that they were too busy to concern themselves with TCM nutrition (41.7%). A small proportion of them reported they tried hard to keep up with the latest TCM nutrition information (38.1%), and were interested in learning about TCM nutrition (35.7%). But a considerable proportion of the participants showed neutral attitudes towards nutrition. Nearly one third of the participants showed neutral attitudes towards learning about TCM food features and learning about the influence of TCM features on health. Moreover, many participants had neutral attitudes towards concerning themselves with TCN nutrition (41.7%), learning about TCM nutrition

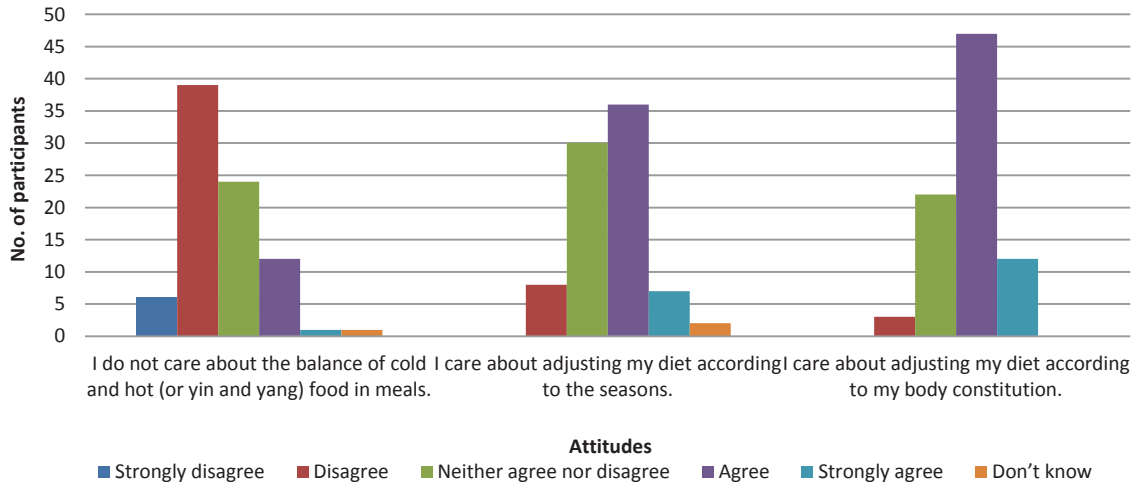
(50.0%), and keeping up with the latest TCM nutrition information (52.4%). Participants' median score for caring and learning about TCM nutrition (16.5, 95% CI 16.1 - 17.3) was within the theoretical score range (0 - 25) (Appendix H). Moreover, the scores were similar among different acculturation groups (Appendix H).

Figure 4.30 Attitudes towards caring and learning about TCM nutrition



Second, concerning participants' general attitudes towards TCM nutrition (Figure 4.31), approximately half of the participants (54.2%) cared about balancing food features. About half of the participants (51.8%) cared about adjusting their diet according to the seasons; more than one in three participants showed neutral attitudes. Regarding participants' attitudes towards adjusting their diets according to their body constitution, a majority of the participants (70.3%) had positive attitudes. Based on these three questions, participants' had a high score for overall TCM nutrition attitudes (median 11.0, 95% CI 10.1 - 11.1) according to the theoretical score range (0 - 15) (Appendix H). There was no significant difference among the scores in different acculturation groups (Appendix H).

Figure 4.31 Attitudes towards overall TCM nutrition



Thirdly, participants had positive attitudes towards TCM nutrition recommendations regarding healthy eating for adults (Figure 4.32). A majority of the participants believed that it was important for them to eat spleen and stomach strengthening food (60.7%) as well as light food (71.1%). Also, a large margin of the participants (82.1%) disagreed with eating greasy food. Nevertheless, a considerable proportion of participants had neutral attitudes towards greasy food (10.7%), light food (25.3%), and spleen and stomach strengthening food (29.8%). Participants' overall score regarding attitudes about the TCM nutrition recommendations for adults (median 12.0, 95% CI 11.1 - 11.8) was high compared to the theoretical score range (0 - 15) (Appendix H). The score in the higher acculturation group was significantly higher than the attitudes score in the loweracculturation group ($p = 0.041$) (Figure 4.33 and Appendix H).

Figure 4.32 Attitudes towards TCM nutrition recommendations of healthy eating for adults

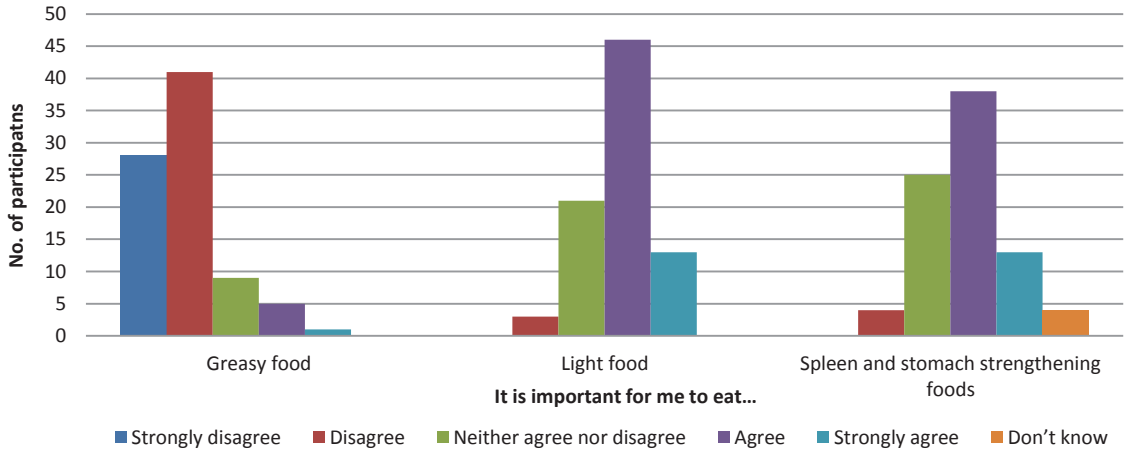
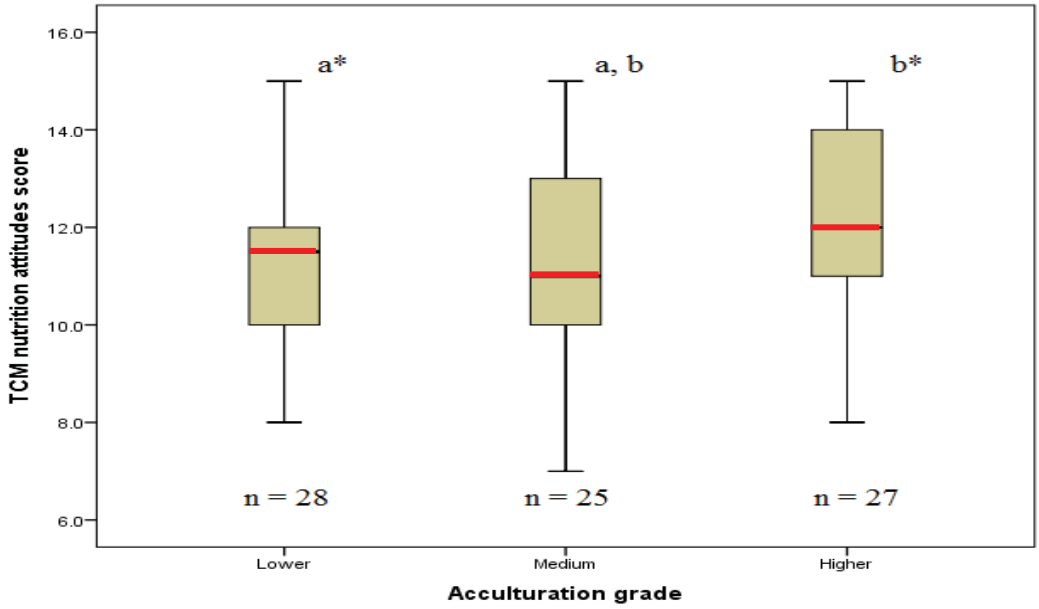


Figure 4.33 Attitudes score of different acculturation groups
- Attitudes towards TCM nutrition recommendations of healthy eating for adults



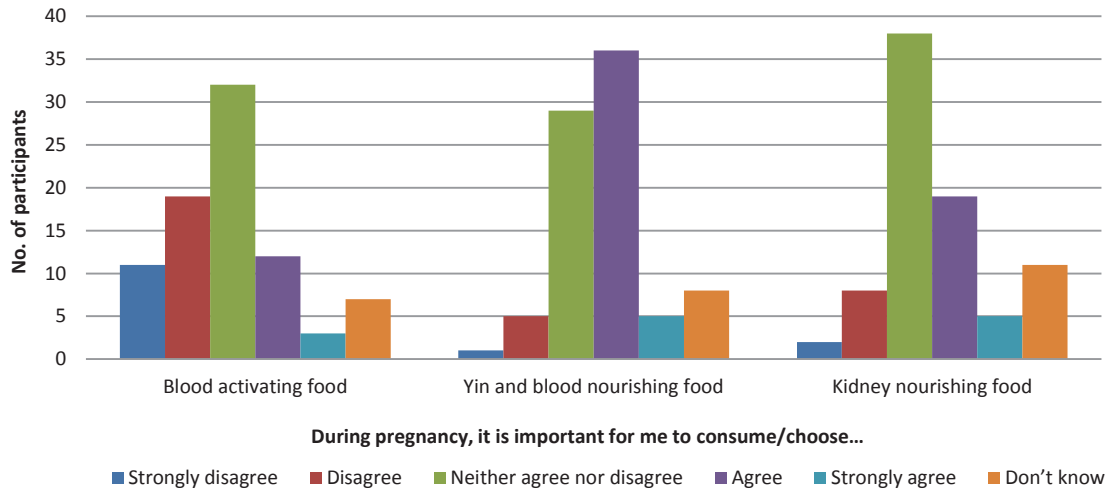
Medians marked by the same superscript mean the distribution are similar, and marked with the different superscripts are significantly different by the adjusted independent non-parametric test.

** Adjust sig = 0.041.*

Pregnant women had diverse attitudes towards TCM nutrition recommendations (Figure 4.34). In terms of blood activating food, TCM recommends that women should not eat this type of food during pregnancy. However, only 35.7% of the participants showed negative attitudes towards this type of food. TCM nutrition recommends women to eat yin and blood nourishing food as well as kidney nourishing food during pregnancy. Nearly half of the participants (48.9%) showed positive attitudes towards the eating yin

and blood nourishing food during pregnancy. By contrast, only 28.9% of the participants had positive attitudes towards eating kidney nourishing food during pregnancy. Meanwhile, many participants showed neutral attitudes towards eating blood activating food (38.1%), yin and blood nourishing food (34.5%), and kidney nourishing food (45.8%) during pregnancy. Furthermore, some participants did not know about blood activating food (8.3%), yin and blood nourishing food (9.5%), and kidney nourishing food (13.3%). The median score of attitudes towards TCM nutrition recommendations for pregnancy 10.0 (95% CI 8.3 - 9.7) is in the theoretical score range of 0 - 15 (Appendix H). Additionally, participants' attitudes scores among different acculturation groups were similar (Appendix H).

Figure 4.34 Attitudes towards TCM nutrition recommendations for pregnancy



4.3.4 Relationships between attitudes towards Western nutrition and TCM nutrition

Table 4.2 shows correlations between attitudes towards Western and TCM nutrition. There is a statistically significant moderate correlation between caring and learning about Western and TCM nutrition (r = 0.462, p = 0.000). There is a weak statistically significant correlation between attitudes towards ① overall Western and overall TCM nutrition, ② Western and TCM nutrition recommendations of healthy eating for adults, and ③ Western and TCM nutrition recommendations for pregnancy.

Table 4.2 Correlations between attitudes towards Western nutrition and TCM nutrition

Western nutrition	TCM nutrition	Spearman's correlation coefficient	P *(one-tailed)*	Degree of freedom
Caring and learning about Western nutrition	Caring and learning about TCM nutrition	0.462	0.000	81
Overall Western nutrition attitudes	Overall TCM nutrition attitudes	0.304	0.003	79
Western nutrition recommendations of healthy eating for adults	TCM nutrition recommendations of healthy eating for adults	0.308	0.002	81
Western nutrition recommendations for pregnancy	TCM nutrition recommendations for pregnancy	0.244	0.015	78

4.4 Relationships between eating habits and nutrition attitudes and other analysis

In general, nutrition attitudes scores were significantly able to predict variance in the eating habits scores (Table 4.3). Women's attitudes towards Western and TCM nutrition recommendations in pregnancy are strongly associated with their practices (Western nutrition: $r = 0.53$, $p = 0.000$; TCM nutrition: $r = 0.37$, $p = 0.000$). For most other attitude- practice relationships the relationship is moderate to weak. Participants' scores for attitudes towards controlling weight gain ($p < 0.001$) and avoiding drinking alcohol ($p < 0.001$) are positively associated with relevant eating habits scores. Moreover, the scores of both Western ($p < 0.01$) and TCM ($p < 0.05$) nutrition attitudes towards healthy eating for adults are positively associated with the related eating habits scores. However, there is no significant association between the scores for the attitudes towards overall Western nutrition, attitudes towards overall TCM nutrition, and attitudes towards maintaining food safety and the scores for the corresponding eating habits.

Table 4.3 Correlations between nutrition attitudes and eating habits

Nutrition attitudes	Eating habits	Spearman's correlation coefficient	P *(one-tailed)*	Degree of freedom
Attitudes towards overall Western nutrition	Whether met recommended serves of food groups for pregnancy	-0.14	0.111	78
Attitudes towards overall TCM nutrition	Whether met recommended serves of food groups for pregnancy	-.017	0.442	77
Attitudes towards Western nutrition recommendations for pregnancy	Consumption of supplements and food relating to Western nutrition recommendations for pregnancy	0.53	0.000	75
Attitudes towards TCM nutrition recommendations for pregnancy	Consumption of food with specific TCM features relating to TCM nutrition recommendations for pregnancy	0.37	0.000	79
Attitudes towards maintaining food safety	Maintaining food safety	0.18	0.056	80
Attitudes towards controlling weight gain	Controlling weight gain	0.56	0.000	80
Attitudes towards avoiding drinking alcohol	Avoiding drinking alcohol	0.40	0.000	82
Attitudes towards Western nutrition recommendation of healthy eating for adults	Healthy eating for adults	0.36	0.001	75
Attitudes towards TCM nutrition recommendation of healthy eating for adults	Healthy eating for adults	0.31	0.004	74

Furthermore, confounding factors (including participants' education level and whether regularly ate with other Chinese, which could influence the scores for eating habits and nutrition attitudes among different acculturation groups) were measured. However, these confounding factors are not associated with participants' scores for eating habits and nutrition attitudes (Appendix I).

Chapter 5 Discussion

5.1 Participants

5.1.1 Participants' characteristics in general

The present study describes eating habits and nutrition attitudes of 84 pregnant Chinese women living in New Zealand. There were 7,512 Chinese children aged 0 – 4 in New Zealand in 2006 (Statistics New Zealand, 2006a), so about 1,500 Chinese women give birth each year. Thus, the current study might cover about 6% of these women.

The median age of the participants was 30.0 years old, which is the same as the median age of all women giving birth in New Zealand (Statistics New Zealand, 2013). Moreover, nearly half of all immigrants aged 20 to 39 and nearly half of all Chinese immigrants have lived in New Zealand for at least five years (Statistics New Zealand, 2006a). In the present study, the majority of the participants lived in New Zealand for at least 5 years. Hence, the duration for living in New Zealand among these participants is similar with the duration among Chinese women in general. Consequently, the sample in the current study could be a fair representative of the overall sample of pregnant Chinese women residing in New Zealand.

5.1.2 Participants' acculturation level

Participants' acculturation level (1.98 ± 0.592) was low according to the theoretical score range of 1 to 5. The lower acculturation level in general indicates that the participants do not involve themselves much in New Zealand culture and that the influence of acculturation on their eating habits and attitudes towards nutrition might be small. This small influence might be the reason why the acculturation did not relate to most of the eating habits and nutrition attitudes in the present study. In the current study, only a minority of the participants used English more often than Chinese, preferred English media over Chinese media, and socialized with more New Zealanders than Chinese. Thus, the participants might have less chance to receive nutrition information and recommendations from New Zealand media and New Zealanders. It might also be

hard for them to understand the nutrition recommendations as the participants used English less than they used Chinese.

5.2 Eating habits

The current study measured Chinese women's eating habits during pregnancy in New Zealand. First, most participants did not follow most New Zealand nutrition recommendations for pregnancy, including not consuming the recommended number of serves from the vegetable, cereals, and dairy products and not consuming iodine supplements and food recommended for pregnancy (including iron rich food, iodine rich food, and food fortified with folic acid). On the other hand, a large proportion of the participants followed recommendations of healthy eating for adults in general, such as limiting fat, sugar, and salt intake. Second, regarding TCM nutrition recommendations for pregnancy, participants did not often intentionally consume food with specific TCM features - either recommended or not. Third, women followed the recommendations given by both New Zealand and TCM nutrition, including avoiding drinking alcohol, maintaining food safety, and consuming a moderate food intake.

5.2.1 Consumption of different food groups

In this study, the majority of the participants met New Zealand nutrition guidelines for pregnant women for serves from the fruit group and the meat, eggs, seafood, and beans group. However, more than 90% of the participants in this study did not consume enough vegetables, cereals, and dairy products according to these guidelines. In the total New Zealand population, the majority of women also met guidelines for the fruit group and the meat, eggs, seafood, and bean group (Ministry of Health, 2011a). However, unlike the participants in the present study, more than half of women in New Zealand met the recommended vegetable intake (Ministry of Health, 2011a). This is similar with the findings that fewer Asian women in New Zealand consumed recommended servings

of vegetables than women overall (Ministry of Health, 2013c).

The current study identified a high consumption of fruits and low consumption of dairy products. By comparison, previous studies investigating the eating habits among Chinese immigrants in other Western countries found similar trends for the consumption of fruit and dairy products. Firstly, Chau et al. (1990) reported a high frequency of eating fruit among most of the Chinese-American women in their study. Secondly, a majority of the Chinese-Americans did not often consume milk (Chau et al., 1990) and seldom consumed other dairy products, such as cheese (Grivetti & Paquette, 1978). Lv and Brown (2010) also suggested a low consumption of dairy products. This similar trend of low dairy products consumption among Chinese immigrants indicates that Chinese immigrants might not obtain sufficient calcium.

The low consumption of vegetables might be explained by a lack of skill in cooking local vegetables among Chinese immigrants. Lv and Brown (2010) reported that it was hard for Chinese-American women to cook Western dishes and suggested Chinese immigrants might not know much about how to prepare Western dishes. Consequently, helping Chinese women to learn about how to include local food, such as local vegetables, in the preparation of dishes might help them meet the recommended servings.

In the current study, approximately one-third of the participants either ate less than one serving of bread a day or never ate bread. In contrast, only 13.1% of the participants ate less than one serving of other cereals (e.g., rice and noodles) as main cereals every day. Likewise, Lv and Cason (2004) found that the frequency of eating rice was higher than the frequency of eating bread among Chinese-Americans. Other studies have found Chinese immigrants still consumed traditional Chinese main cereals (e.g., rice and noodles) at lunch and dinner after migrating to Western countries (Chau et al., 1990; Grivetti & Paquette, 1978; Lv & Brown, 2010). In New Zealand, pregnant women's consumption of bread was not this low (Mallard, Gray, & Houghton, 2012). A recent study showed that 35% of pregnant women in New Zealand consumed at least three slices of bread every day (Mallard et al., 2012). In contrast, only 3.8% of the Chinese women consumed three slices of bread or more in the present study. The low bread consumption among Chinese women is very relevant because of iodine fortification in New Zealand manufactured bread.

5.2.2 Consumption of food relating to healthy eating for adults

5.2.2.1 Eating habits relating to fat, sugar, and salt intake

The New Zealand Food and Nutrition guidelines advise adults to control their fat, sugar, and salt intake. Similarly, TCM advises people to eat light food and less greasy food. In this study, participants reported some eating habits indicating that they were following these nutrition recommendations. First, nearly all of the participants used oils more often than butter, and about half of the participants never used butter or margarine spreads. The low consumption of butter or margarine spreads may be largely linked to the low bread consumption among these participants. In contrast, most people in New Zealand often used oil and butter or margarine spread (Ministry of Health, 2011a). Regarding other previous studies focusing on Chinese immigrants, a low frequency of butter consumption among Chinese immigrants was also found. Yang and Read (1996) found that although Asian-Americans (most of whom were of Chinese cultural origins) added butter and margarine to vegetables and consumed cheese significantly more frequently after immigration than before, their total fat intake and saturated fat intake were still in the recommended range. Both Grivetti and Paquette (1978) and Lv and Cason (2004) reported that Chinese-Americans seldom used butter either before or after immigration. In addition, Chinese-Americans used cooking oil more frequently than butter in the US (Lv & Cason, 2004).

Second, concerning foods high in fat, sugar, and salt, a majority of the participants in the current study never or seldom consumed chips, confectionary, fruit juice/drinks, soft/energy drinks, and battered/fried fish or shellfish. Similarly, Chinese-Americans' consumption of fast food and confectionary was low in other studies (Liou & Contento, 2001; Lv & Cason, 2004; Newman & Ludman, 1984; Pan et al., 1999). Compared to the general population of New Zealand women (Ministry of Health, 2011a), participants in the present study consumed these foods less frequently. Other studies also showed a lower frequency of consuming these foods among Chinese immigrants than among Westerners (Tam et al., 2011; Yang & Read, 1996).

Participants reported low consumption of food high in sugar, fat, and salt in the present study might be because all participants were not highly acculturated. Satia et al. (2001) found that Chinese-American and Chinese-Canadian women with lower consumption of

fat were less acculturated than those with higher consumption of fat. In addition, the high overall education level of participants might also result in a low consumption of food high in fat, sugar, and salt. Previous studies of Chinese immigrants show that a higher education level is associated with lower energy and sugar intake, reduced energy density in the foods selected, a lower contribution of fat to total energy, and reduced soft drink intake (Liu et al., 2010; Tseng & Fang, 2012).

Participants reported other eating habits that are beneficial for reducing fat and salt intake. More than half of the participants removed fat from meat. Approximately half of the participants never or seldom added salt to their food after the food had been cooked or prepared. Likewise, Yang and Read (1996) reported that Asian-Americans removed fat from meat significantly more frequently after immigration than before. A similar trend was also reported among New Zealand women in general: A majority of them often removed fat from meat and about half never or seldom added salt to their food (Ministry of Health, 2011a).

However, a large proportion of the participants did not follow the recommendation to choose low salt and low fat food. First, a majority of the participants never or seldom chose low salt foods. Likewise, the New Zealand nutrition survey reported that in New Zealand, a majority of all women never or seldom chose low salt food (Ministry of Health, 2011a).

Second, only a minority of the participants reported that they used reduced or low fat milk. Similarly, Lv and Cason (2004) found that Chinese-Americans seldom consumed low fat milk (between once per week to once per month). The proportion of participants consuming skim/trim milk in the present study was only half the proportion for all women in New Zealand (Ministry of Health, 2011a). Since participants' consumption of dairy products was low in general, the low frequency of using reduced or low fat milk might not have a major influence on reducing fat intake.

Third, about half of the participants seldom or never chose low fat food instead of the standard varieties. This is in contrast to the total New Zealand population in which less than one in three women seldom or never chose low fat food (Ministry of Health, 2011a). Although this suggests that, in New Zealand, women in general are more likely

to consume low fat food than Chinese women, it is unclear whether this is related to women's overall fat intakes. For example, if Chinese women do not often eat food high in fat, then their low frequency of consuming low fat food instead of the standard varieties might not lead to high overall fat intakes.

5.2.2.2 Eating habits relating to food rich in ω-3 fatty acids

The New Zealand Food and Nutrition guidelines recommend people consume food rich in ω-3 fatty acids, such as fresh/frozen/canned fish or shellfish (Ministry of Health, 2006). In the current study, the Chinese women did not follow this recommendation. A large proportion of women never consumed fish or shellfish or consumed them less than once per week. The low frequency of consuming these foods during pregnancy might result in insufficient intakes of ω-3 fatty acids and iodine among pregnant Chinese women in New Zealand. In contrast, only a minority of New Zealand women consumed these foods less than once per week (Ministry of Health, 2011a). The low consumption of fish or shellfish is consistent with the fact that only a quarter of the participants had positive attitudes towards consuming food high in ω-3 fatty acids. A low consumption of fish and seafood among pregnant women was also reported in China. A national study in China reported that the average daily consumption of fish and seafood among pregnant women was only 28.5g every day (Yin et al., 2008). This is much lower than the standard one serving of fish and seafood (80g) per day in the New Zealand nutrition guidelines for pregnant women (Ministry of Health, 2013b).

5.2.3 Consumption of food and supplements relating to healthy eating for pregnant women

5.2.3.1 Consumption of folic acid supplements and food fortified with folic acid

Both folic acid supplements and food fortified with folic acid are recommended for pregnant women in New Zealand (Ministry of Health, 2013b). On the one hand, a large proportion of the participants followed the recommendation to take folic acid

supplements during the first trimester of pregnancy. This is consistent with the finding that most participants thought it was important for them to taking folic acid supplements. On the other hand, they did not follow the recommendation to choose food fortified with folic acid during pregnancy. In New Zealand, breakfast cereals are the main food fortified with folic acid (Australian Institute of Health and Welfare, 2011). Other food, such as some breads, also might be fortified with folic acid (Australian Institute of Health and Welfare, 2011). The current study shows that approximately one quarter of the participants reported that they frequently ate food fortified with folic acid. Meanwhile, a majority of the participants consumed one serving per week or less of bread and cereals. Thus, pregnant Chinese women are unlikely to consume folate fortified food. Although a majority of the participants did not often consume food fortified with folic acid, most of them often consumed folic acid supplements. This suggested that despite the low consumption of food fortified with folic acid, the Chinese women in this study might obtain sufficient folic acid from supplements.

Compared with previous studies in China (Yin et al., 2008), a larger proportion of participants in the current study took folic acid supplements during pregnancy (20.1% Chinese women living in China and 67.9% Chinese women living in New Zealand took folic acid supplements during pregnancy). Therefore, living in New Zealand may have a positive influence on Chinese women's consumption of folic acid supplements during pregnancy.

Compared with previous studies of pregnant women in New Zealand, it appears that the Chinese immigrants consume folic acid supplements more frequently than the total New Zealand population. Previous researchers found that a minority of New Zealand women (33.2%) took folic acid supplements during the peri-gestational period (Mallard et al., 2012) and the first trimester of pregnancy (Australian Institute of Health and Welfare, 2011). Similar to this study, low consumption of food fortified with folic acid was found among women in New Zealand. A majority of women in New Zealand did not consume sufficient bread fortified with folic acid (≥ 3 slice/day) during the peri-gestational period (Mallard et al., 2012), but this bread consumption is still higher than in the Chinese women. Additionally, Australian Institute of Health and Welfare (2011) pointed out that New Zealand women of reproductive age (16 - 44 years' old) did not obtain enough folic acid from food compared with the recommended folic acid intake from food in

New Zealand. Moreover, Watson and McDonald (2009) showed that most New Zealand pregnant women's folic acid intakes were lower than recommended in New Zealand.

The low consumption of food fortified with folic acid is inconsistent with the current finding that a majority of the participants had positive attitudes towards eating food fortified with folic acid during pregnancy. This inconsistency may be because in New Zealand women are not aware of which foods are fortified with folic acid. Mallard and Houghton (2012) found that few pregnant women in New Zealand knew bread (24.5%) and breakfast cereals (21.4%) were a good source of folic acid.

5.2.3.2 Consumption of iodine supplements and iodine rich food

The Ministry of Health (2011) suggests women consume iodine supplements and iodine rich food during pregnancy (particularly including seafood and food fortified with iodine, such as iodised salt and bread). In the current study, a majority of the participants often used iodised salt. This is consistent with the finding that a majority of the participants had positive attitudes towards using iodised salt. However, only a minority of the participants consumed iodine supplements and iodine rich food, both of which are recommended for pregnancy. Moreover, a considerable proportion of the participants did not frequently consume fresh/frozen/canned fish or shellfish (85.5%) or iodised salt (42.9%), and ate less than one serving of bread every day (84.5%). Consequently, these eating habits might impair Chinese women's iodine intake during pregnancy. Because a majority of the participants had positive attitudes towards taking iodine supplements during pregnancy, there might be some other barrier for the participants to consume iodine supplements. However, the low consumption of iodine rich food might be because a majority of them did not think it was important for them to eat iodine rich food during pregnancy. This suggests that health professionals need to educate Chinese women about the importance of obtaining iodine and how to obtain sufficient iodine during pregnancy, as well as provide Chinese women with relevant nutrition information in New Zealand.

A similar trend was also found among other studies in China and New Zealand. A national nutrition survey in China found that only a few Chinese women (8.4%) took iodine supplements during pregnancy (Yin et al., 2008). The Australian Institute of

Health and Welfare (2011) reported that in New Zealand, the majority of all women's intake of iodine from food was lower than the recommended iodine intake. Moreover, Pettigrew et al. (2011) found a low iodine intake and iodine status among pregnant women in general in New Zealand.

5.2.3.3 Consumption of iron supplements and iron rich food

Although iron supplements are not routinely recommended in New Zealand during pregnancy, women should consume more food rich in iron (Ministry of Health, 2013b). However, the participants in this study did not follow this recommendation. This study shows that in general, a majority of the participants did not often consume iron supplements and iron rich food. First, although a majority of the participants ate breads with additional grains (including light grain or wholemeal bread and heavy grain bread), most of the participants' consumption of bread was low and so they might obtain little iron from wholegrain bread. Second, nearly all of the participants did not frequently use brown rice, which is high in iron. Third, a majority of the participants' consumption of breakfast cereals was low (≤ 1 serving/day). Therefore, although about two in three Chinese women in this study consumed recommended servings of the meat, eggs, and seafood group, which contains iron, the low consumption of other foods rich in iron might lead to a low iron intake among pregnant Chinese women in New Zealand. Similarly, a large proportion of New Zealand women did not have adequate iron intake during pregnancy when compared with the recommended iron intake (Watson & McDonald, 2009). In addition, only a small proportion of Chinese women in China took iron supplements during pregnancy (Yin et al., 2008), which is consistent with the current findings. Since 83 % of the participants thought it was important for them to eat iron rich food, why the Chinese immigrants did not follow the recommendation of eating food rich in iron still needs to be investigated.

5.2.3.4 Consumption of foods with specific TCM features

In the present study, a majority of the participants reported that they did not often consume food with TCM features no matter whether it is recommended for pregnant women (i.e., yin and blood nourishing food and kidney nourishing food) or not (i.e., blood activating food). In addition, around 15% of the participants did not know about these foods. This is consistent with the finding that only a minority of the participants

had positive attitudes towards TCM nutrition recommendations. In contrast, only a minority of the participants did not care or know about balancing cold and hot or yin and yang food in meals. This suggests that specific TCM features might be more particular and harder for Chinese women to care about in their diets when compared to cold and hot (or yin and yang) features. Similarly, other studies reported a low consumption of food with specific TCM features among Chinese immigrants in the US. Grivetti and Paquette (1978) reported that Chinese-Americans seldom consumed some foods with TCM features, such as lotus seeds and slugs. Pan et al. (1999) found that only a small percentage of Asian students (most were with Chinese cultural origins) took TCM supplements (e.g., ginseng, angelica root, and medlar) in the US.

5.2.4 General eating habits recommended by both Western and TCM nutrition

Maintaining food safety and avoiding drinking alcohol are recommended by both Western and TCM nutrition. In this study, the participants followed these recommendations, which is consistent with their attitudes. First, nearly all the participants never drank alcohol during pregnancy. Likewise, Tam et al. (2011) reported low alcohol consumption (less than one serving of alcohol per day on average) among Chinese who lived in Canada for 10 years or less. In New Zealand, a majority of pregnant women reported that they never consumed alcohol or consumed less alcohol than when not pregnant (Ho & Jacquemard, 2009). Similarly, Mallard, Connor, and Houghton (2013) found that only a minority of New Zealand women's alcohol consumption during pregnancy was higher than the upper limit of consuming alcohol. Second, with regard to food safety, a majority of the participants reported that they often washed their hands, cleaned kitchenware between preparing raw and cooked food, avoided eating leftovers, and avoided eating cold food during pregnancy.

Although there is no clear recommendations relating to weight control during pregnancy, both Western and TCM nutrition advise women to pay attention to maintain a moderate food intake and keep body weight in a normal range. In the current study, a majority of the participants did not often control their weight gain and the amount of food they ate during pregnancy. Because the current questions only asked about

controlling weight gain in general, whether those who ate as much as they want were more likely not to limit weight gain, whether controlling weight gain has positive (i.e. controlling within the normal weight range) or negative (i.e. control too much weight gain) effect is still not clear. Further studies should investigate practices relating to weight control in detail (e.g., body weight and weight gain during pregnancy).

5.2.5 Relationships between eating habits and acculturation

The present study shows that participants' eating habits score for the consumption of recommended serves from food groups is significantly higher in the higher acculturation group than in the medium acculturation group ($p < 0.05$). This indicates that pregnant Chinese women with a higher acculturation level might be more likely to meet the recommended food intake than those with a lower acculturation level. Similarly, Lv and Cason (2004) found that Chinese-Americans' acculturation level was positively associated with higher frequency of eating vegetables, grains, fruit, meat, and meat products.

The high education level might be the reason that participants in the higher acculturation group were more likely to meet recommended food consumption than these in the lower acculturation group. In the present study, participants with a higher acculturation level had a significantly higher education level than those with a lower acculturation level ($p < 0.05$) (Appendix F). Satia et al. (2001) suggested a positive association between education level and Western dietary acculturation among Chinese-American and Chinese-Canadian women. They also found that immigrants with higher Western dietary acculturation score had higher intake of vegetables and fruit and higher score for fat-related eating habits than those with a lower Western dietary acculturation score.

However, first, the current study did not show a strong association between eating habits and acculturation in general. This might be because a nutrition transition has already occurred in China. Yang and Read (1996) pointed out that dietary changes occurred in developing Asian countries due to common availability of Western food. In particular,

with the economic development in the 1980s onwards, Chinese people ate more animal products, confectionary, and soft drinks and fewer cereals and beans (Du et al., 2002; Popkin, 2014; Zhai et al., 2009). Hence in China, Chinese people's diets are high in energy and fat, but low in fibre (Du et al., 2002). Thus, participants' eating habits might have been similar to the Western dietary pattern when they lived in China before immigrating to New Zealand. This might cause a lack of significant changes in the participants' eating habits after living in New Zealand.

Second, the present study did not find a relationship between acculturation level and consumption of supplements and food recommended for pregnancy, or with controlling the intakes of sugar, fat, and salt. One possible reason is that participants lived in New Zealand for a shorter period of time when compared to the amount of time Chinese immigrants lived in Western countries in other studies. For example, only 19.8% of Chinese Americans lived in the US for five years or less in Lv and Cason's (2004) study. However, nearly half of the participants in the current study lived in New Zealand for less than seven years. This is similar to the general population of Chinese immigrants in New Zealand, among which approximately 80% Chinese immigrants have lived in New Zealand for less than ten years (Statistics New Zealand, 2006a). Thus, although half the participants lived in New Zealand for seven years or more, there might be only a small proportion of the participants who lived in New Zealand for ten years or more. Consequently, the short duration of living in New Zealand might diminish the influence of acculturation on participants' eating habits.

Third, the current study did not find a relationship between acculturation level and the eating habits recommended for adults in general by both Western and TCM nutrition (such as maintaining food safety and avoiding drinking alcohol). These particular recommendations are, perhaps, universal or more strongly emphasised regardless of pregnancy status.

Finally, the current study shows no association between consuming TCM recommended food during pregnancy and acculturation. One possible explanation is that before coming to New Zealand, the participants seldom consumed food with specific TCM features in China. Chung, Wong, Woo, Vi Lo, and Griffiths (2007) reported that TCM health care was seldom used among people in Hong Kong. This lack of association is

possibly because participants did not know much about specific TCM features of foods and they might not be aware that they had actually consumed some food with specific TCM features. Thus, the consumption of these foods may not be accurately reported, and the influence of acculturation on consumption of these foods might be underestimated. Another possible explanation is that since the current study found there is no strong association between eating habits and acculturation in general, this is the similar trend that there is no relationship between consumption of TCM recommended food for pregnancy and acculturation. Thus, further studies could list the food items with specific TCM features to confirm whether consumption of these foods relates to acculturation. In addition, it might also be because the acculturation level is quite low and does not vary enough among participants to notice a difference.

5.3 Nutrition attitudes

In the current study, the participants reported positive attitudes towards nutrition. Regarding attitudes towards Western nutrition, the participants had positive attitudes towards most of the recommendations for adults (e.g., limiting fat, sugar, and salt intake) and pregnant women (e.g., consuming folic acid supplements, iron rich food, and food fortified with folic acid). Concerning attitudes towards TCM nutrition, the participants reported positive attitudes towards overall nutrition recommendations (e.g., balancing yin and yang food) and recommendations regarding healthy eating for adults (e.g., eating light food). However, only a minority of the participants had positive attitudes towards specific nutrition recommendations for pregnancy (e.g., eating yin and blood nourishing food). The following section will discuss the findings about participants' nutrition attitudes in detail.

5.3.1 General care about nutrition

Prescott, Young, O'Neill, Yau, and Stevens (2002) pointed out that concern about health is an important consideration for people in New Zealand, among whom health was the third most frequently cited reason for choosing food. A similar trend was also found in this study. In general, participants had positive attitudes towards caring about nutrition. Most of the participants reported that they often thought about their eating habits, cared about the food they ate, and controlled their food intake (including avoiding eating too much and choosing healthy food). In addition, a majority of the participants believed that eating well could help them prevent disease and their current eating habits would help keep them healthy. However, only about one third of the participants thought knowing a food was good for them had a large influence on their food choice.

Previous studies show that Chinese immigrants cared about nutrition, health, and eating habits in other Western countries. As for their health, a large percentage of Asian-Americans (most with Chinese cultural origins) in the US reported that they cared greatly about health (Yang & Read, 1996). Similarly, Liou and Contento (2001) found that Chinese-Americans' concern about general health was high. Additionally, Chinese immigrants also linked their health with eating habits. Nearly half of Chinese-American and Chinese-Canadian women thought the food they ate was associated with the risk of cancer and heart disease (Satia et al., 2002). Chinese-American women thought about healthy eating, such as not eating too much, eating various types of food, and eating regularly (Satia et al., 2001). Chinese-Canadians also cared about the nutritional content of their food and selected healthy food when eating out (Rosenmoller et al., 2011).

5.3.2 Western nutrition attitudes

In general, a majority of the participants in the current study said they cared about Western nutrition. However, a considerable proportion of the participants had either neutral or negative attitudes towards learning about Western nutrition (36.1% for neutral attitudes and 14.4% for negative attitudes) and keeping up with the latest Western nutrition information (35.7% for neutral attitudes and 9.5% for negative attitudes).

The current study found positive attitudes towards overall Western nutrition and specific recommendations for adults. A majority of the participants cared about the nutrient content of food, and felt it was important for them to eat food low in sugar, salt, fat, and saturated fat. Similarly, Chinese-Americans and Chinese-Canadians had positive attitudes towards limiting their fat intake. Schultz et al. (1994) found that a majority of Chinese-American women cared about limiting their fat, saturated fat, and cholesterol intake. Likewise, Chinese-Americans showed positive attitudes towards reducing fat consumption (Liou & Contento, 2001). In addition, most Chinese-American and Chinese-Canadian women reported it was crucial for them to eat a diet low in fat and high in fruits and vegetables (Satia et al., 2002).

However, more than half of the participants did not care about their energy/calorie intake. In addition, a majority of them did not think it was crucial for them to eat food high in fibre and ω-3 fatty acids. This is consistent with their eating habits since they did not often consume food high in fibre (e.g., brown rice) and food rich in ω-3 fatty acids (e.g., fresh/frozen/canned seafood and fish), which suggests that health professionals should take into greater consideration to pregnant Chinese women's attitudes and eating practices relating to ω-3 fatty acids and fibre intake.

Regarding nutritional recommendations for pregnancy, a large proportion of the participants thought it was important for them to consume food fortified with folic acid, iron rich food, iodised salt, and supplements (including folic acid supplements, iron supplements, and iodine supplements) during pregnancy. Nevertheless, only a minority of the participants identified the importance of eating iodine rich food during pregnancy.

There are a number of possible reasons why some pregnant Chinese women in New Zealand did not have positive attitudes towards keeping up with the latest Western nutrition recommendations and some New Zealand nutrition recommendations (e.g., eating food high in fibre, iodine, and ω-3 fatty acids). One possible reason is that it is difficult for them to understand nutrition guidelines that are not in their first language. In the current study, participants were more familiar with Chinese (Appendix E). About half of the participants (51.3%) reported that their Chinese was better than their English. Moreover, a majority of them only used Chinese or used Chinese more than English

when they spoke at home, when they were thinking, and when they spoke with their friends. Thus, participants might face a language barrier when reading New Zealand nutritional recommendations. In other research settings, a similar language barrier appeared to have similar outcome; for example, just under a quarter of Chinese-Americans and Chinese-Canadians reported they knew or could understand the governmental nutrition information and suggestions (Satia et al., 2002). It is also possible that the participants might not be aware of the nutrition guidelines for New Zealanders. Similarly, Satia et al. (2002) also found that a majority of Chinese-American and Chinese-Canadian women reported that they were not aware of governmental nutrition recommendations.

5.3.3 TCM nutrition attitudes

In the current study, approximately half of the participants showed interest in learning about TCM nutrition. Only a minority of them concerned themselves with TCM nutrition and tried hard to learn about nutrition or keep informed about the latest nutrition information. Meanwhile, a considerable proportion of participants showed neutral attitudes towards caring and learning about TCM nutrition. This is similar in the participants' attitudes towards learning about Western nutrition: Although a majority of the participants reported they were interested in learning about Western nutrition, a considerable proportion of them did not try hard to learn Western nutrition or keep up with the latest nutrition information.

Participants showed positive attitudes towards overall TCM nutrition recommendations. More than half of the participants in the present study said they cared about balancing cold and hot (or yin and yang) food, adjusting their diets according to the seasons, and adjusting their diets according to their body constitution. These positive attitudes towards overall TCM nutrition, in particular balancing hot and cold food, were also found among Chinese immigrants in other Western countries (Chau et al., 1990; Kwok et al., 2009; Satia et al., 2001).

In addition, most of the participants in the current study had positive attitudes towards

TCM nutrition recommendations regarding healthy eating for adults, including the importance of eating more light food, more spleen and stomach strengthening foods, and eating less greasy food. Participants' positive attitudes towards eating less greasy food are consistent with Kwok et al.'s (2009) study, which reported that many Chinese-Canadians thought greasy food could result in cancer and heart disease. Participants' positive attitudes towards these questions might be because these recommendations are in line with Western nutrition recommendations.

Only a few participants had positive attitudes towards specific TCM nutrition recommendations for pregnancy. Less than half of the participants had attitudes consistent with TCM nutrition recommendations, i.e., it was important for them to eat yin and blood nourishing food (48.9%), eat kidney nourishing food (28.9%), and avoid eating blood activating food during pregnancy (35.7%). In contrast, more than one in three of the participants had neutral attitudes, and around 10% of the participants did not know about these foods. This indicates that the majority of the participants did not consider specific TCM features of foods when choosing food.

Furthermore, there is a significant positive association between Western nutrition attitudes and relevant TCM nutrition attitudes. This identifies that there is no conflict between attitudes towards Western and TCM nutrition. This also indicates that participants who cared more about Western nutrition were more likely to care about TCM nutrition. One possible reason is that participants cared about their eating habits and health in general, so they cared and followed nutrition suggestions regardless of the source (whether the suggestions are based on Western nutrition or TCM nutrition).

5.3.4 Attitudes towards recommendations suggested by both Western and TCM nutrition

Both Western and TCM nutrition advise women to maintain food safety, not drink alcohol, and eat neither too much nor too little during pregnancy. In the current study, most of the participants had positive attitudes towards these recommendations. This is similar with previous findings. First, although there is lack of evidence about attitudes

towards food safety in New Zealand and Chinese immigrants, Redmond and Griffith (2003) found a similar trend showing most Westerners in New Zealand and Australia had positive attitudes towards food safety, such as washing hands, and separating or washing kitchenware between preparing raw and cooked food. Second, concerning attitudes towards alcohol consumption, Asian women in New Zealand thought women should not drink alcohol during pregnancy or drink no more than one standard drink per day (Parackal, Parackal, Harraway, & Ferguson, 2009), which is similar with the current study. Third, positive attitudes towards weight control were also reported by previous researchers. Yang and Read (1996) reported that about two out of three Asian-Americans (most with Chinese cultural origins) cared about their weight. Satia et al. (2001) also discovered that Chinese-American women cared about controlling their weight to maintain healthy eating habits.

5.3.5 Relationships between acculturation and nutrition attitudes

5.3.5.1 Relationship between acculturation and attitudes towards Western nutrition

There is no association was found between acculturation and most other Western nutrition attitudes (including attitudes towards caring and learning about Western nutrition, care about energy and nutrient content of food, and care about consumption of fibre, sugar, salt, and fat) in the current study. The participants' nutrition attitudes score relating to Western nutrition recommendations for pregnancy was significantly higher in the higher acculturation groups than in the lower acculturation group.

Previous researchers found possible associations between general Western nutrition attitudes and acculturation level. Satia et al. (2002) found that non-pregnant Chinese-American and Chinese-Canadian women with higher Western dietary acculturation level were more likely to be aware of the governmental nutrition recommendations. Yang and Read (1996) reported that Asian-Americans' interest in health and weight control was significantly higher after immigration than before. Other studies compared the attitudes of first- and second-generation Chinese immigrants and suggested a positive influence of acculturation on Chinese immigrants' attitudes towards Western nutrition (Hrboticky

& Krondl, 1984; Schultz et al., 1994).

The reason there is no significant association between most attitudes towards Western nutrition and acculturation in the current study is perhaps because the participants' acculturation level was low in general, so the influence may be weak. In addition, because the governmental nutrition recommendations in China are similar to the nutrition recommendations in New Zealand, participants' attitudes towards Western nutrition might not change much after immigration. Thus, Chinese immigrants might not need to change their attitudes towards Western nutrition recommendations for adults. However, immigrants who were never pregnant in China may not have learned about nutrition in pregnancy while in China. Therefore, these immigrants need to be more acculturated to pick up the specific recommendations for pregnancy.

5.3.5.2 Relationship between acculturation and attitudes towards TCM nutrition

Attitudes towards caring and learning about TCM, balancing yin and yang (or cold and hot) food, adjusting diets according to seasons and body constitution, and TCM recommendations for pregnancy were similar among participants in all acculturation groups. But there is a positive association between acculturation and TCM nutrition attitudes towards healthy eating for adults (including the importance of eating light food, eating spleen and stomach strengthening food, and not eating too much greasy food). The positive association between acculturation level and TCM nutrition attitudes could be due to a trend of returning to their traditional cuisine. Chinese-American women showed signs of returning to traditional Chinese eating habits, including the frequency and variety of food consumption, meal pattern, and the "social aspects of food" (i.e., whom they ate with and what special food they ate for festivals) after they had lived in the US for more than five years (Newman & Linke, 1982). Since the current study did not find any relation of TCM nutrition attitudes towards healthy eating to both education and duration of living in New Zealand, why this trend occurred is still not clear. Further studies might need to measure other possible confounding factors. It is possible this might also be because some of these recommendations (i.e., eating less greasy food, eating more light food, and eating more spleen and stomach strengthening food) are similar to the Western nutrition recommendations (including eating food low in fat, salt, and sugar and eating food high in fibre) for adults.

5.4 Associations between eating habits and nutrition attitudes

In the present study, eating habits are significantly positively related to the corresponding nutrition attitudes. Similarly, Anderson and Shepherd (1989) found that pregnant women's attitudes towards healthy eating, including attitudes towards fat, fibre, and carbohydrate intake on health, were significantly positively related to their intention to have a healthy diet. Fouda et al. (2012) also reported that pregnant women's dietary practices (including the consumption of food rich in vitamins, calcium, and protein) were positively related to nutrition attitudes. The influence of nutrition attitudes on eating habits could be explained by the knowledge attitude model (Contento, 2011; Worsley, 2008). In this model, a change in attitude will result in a change in behaviour (Contento, 2011; Worsley, 2008).

However, there was no significant association between participants' eating habits and nutrition attitudes relating to food safety. Similarly, Redmond and Griffith (2003) pointed out that people's attitudes towards food safety were inconsistent with the relevant eating practice. The possible reason for this inconsistency in the current study might be that nearly all participants had high nutrition attitude scores for food safety in general. However, a minority of participants did not follow the recommendations for food safety, even though they had a positive attitude. This could be because participants do not know how to maintain food safety in practice. For example, some participants might not know that they should not eat leftovers stored for more than two days. Redmond and Griffith (2003) also pointed out that in New Zealand, people lacked some knowledge about food safety, such as how to store cooked food, how to store raw food, and how to judge whether food was well cooked. Therefore, although pregnant Chinese women in New Zealand were aware of the importance of food safety, lack of knowledge might be a barrier for them to maintain food safety in practice.

The current study shows that participants' eating habits score for whether the consumption of different food groups met the New Zealand nutrition recommendations is not significantly associated with attitudes towards Western nutrition, including caring about nutrient and energy intake. This eating habits score is also not significantly associated with TCM nutrition attitudes, including caring about balancing yin and yang (or hot and cold) food in their diets, adjusting diets according to seasons, and adjusting

diet based on body constitution. This indicates that the TCM does not seem to be detrimental in terms of Western nutrition recommendations.

5.5 Strengths and limitations of the study

In this section, the strengths and limitations of the study will be discussed, starting with the recruitment of the participants. On one hand, the advantage of using an online questionnaire is that it was more convenient than a printed questionnaire for recruiting participants around all the regions in New Zealand. It was also easier for participants to submit their answers. On the other hand, there were three limitations of using an online questionnaire. First, only the Chinese immigrants who had access to the Internet could answer the questionnaire. Koopman and Reid (2009) found that in New Zealand, elderly people's Internet use was significantly associated with their personal characteristics (e.g., age, gender, and education level), levels of exercise, and health. Similarly, pregnant Chinese women's characteristics and health status might also relate to their Internet use in New Zealand.

Second, the participants were mainly recruited through the skykiwi website (www.skykiwi.com), which is the largest website for Chinese people in New Zealand. However, as this web used Chinese as the main language, only people who could read Chinese could understand the information. In the current study, nearly all of the participants were born in Mainland China. Birthplace might influence Chinese immigrants' adaption to Western culture (Liu et al., 2010), so the findings of this study might be limited by participants' birthplace. Other studies have suggested that birthplace has some influence on Chinese immigrants' eating habits (Hsu‐Hage et al., 1995; Lv & Cason, 2004) and preference for Western food (Lv & Brown, 2010). There is a lack of information about eating habits and nutrition attitudes among ethnic Chinese immigrants born in New Zealand and other countries (e.g., Hong Kong and Taiwan).

Third, whether participants met the recruitment criteria was only judged by questions at the beginning of the questionnaire, so it could not identify whether people answered

these questions honestly. Hence, people who were interested in the cash rewards but did not meet the recruitment criteria might have cheated to meet the criteria while reporting their basic information (e.g., birth place and whether their parents were Chinese).

Regarding the questionnaire, the first advantage of the current questionnaire is that it is based on validated questionnaires that have been used in previous studies (Anderson et al., 1993; Kwok et al., 2009; Ministry of Health, 2011b). However, the limitation of using these questionnaires is that all of these questionnaires were only validated among other population groups different from the participants in this study and in different continents. Ministry of Health (2011b) measured the eating habits among New Zealand adults including Asians, but this was only a small part of a large survey. Kwok et al. (2009) measured the TCM nutrition attitudes among Chinese-Canadians. The validity and reliability was only tested among other Asian immigrants (i.e. Korean immigrants) in the US (Choi & Reed, 2011). Since the current study focuses on nutrition in pregnancy, some specific questions relating to nutrition and eating habits during pregnancy were added in the questionnaire, and some questions that did not follow this topic were deleted. Thus, the current questionnaire still needs further validation among pregnant Chinese immigrants in New Zealand.

The second advantage of the current questionnaire is that this study provided an overview of both eating habits and attitudes towards nutrition (including nutrition in general, Western nutrition, and TCM nutrition). However, one limitation of using a long questionnaire is that completing the questionnaire was time consuming. Many participants (n = 54) who met the recruitment criteria but did not complete the questionnaire had spent at least 13 minutes answering the questionnaire. Moreover, 17% of them had already spent more than the recommended 15 minutes in answering the questionnaire. Therefore, the length of the questionnaire might have reduced the sample size in the current study. Another limitation is that using a long questionnaire might have introduced bias. People who could answer the questions more easily and/or who cared more about the topic might be more likely to complete the questionnaire. Thus, this study might overestimate the positive eating habits and positive attitudes towards nutrition.

Next, the current study also has some limitations in measuring participants' food intake

and attitudes towards nutrition. All of the participants' eating habits and nutrition attitudes were reported by the participants themselves. So there might have been some errors while answering the questionnaire. For example, they might not have estimated the portion size accurately. They might optimistically estimate their eating habits and attitudes towards nutrition (i.e., optimistic bias). This would impair the accuracy of the results.

A strength of the current sample is that it may cover around 6% of pregnant Chinese women in New Zealand (see Section 5.1). However, the current sample has some limitations. First, the sample was too small for some statistical analysis. Second, the participants' acculturation scores were low. This might be a reason for lack of associations between acculturation and both the participants' eating habits and nutrition attitudes. Moreover, the lower acculturation level might also be related to the short duration of living in New Zealand among the participants in general (see Section 5.1). Likewise, Lv and Cason (2004) pointed out that the significant association between acculturation and Chinese immigrants' eating habits might be a result of living in the new country for a long time. This is possibly because the relationship may not be linear both between eating habits and duration of living in New Zealand and between attitudes towards nutrition and duration of living in New Zealand. Similarly, in the previous studies that showed changes in eating habits after immigration, Chinese immigrants had lived in the Western countries for a long time (>16 years) (Lv & Brown, 2010; Rosenmoller et al., 2011). In addition, the top category for duration of living in New Zealand was "seven years or more" and, therefore, did not measure how much longer than seven years the participants may have lived in New Zealand. Due to this limitation, the study is unable to examine the possible impact of long duration (e.g., 10 to 15 years) of living in New Zealand on acculturation, eating habits, and attitudes towards nutrition.

Chapter 6 Conclusion and Recommendations

6.1 Main findings of the current study

The current study measures Chinese immigrant women's eating habits and attitudes towards nutrition during pregnancy. This information could be useful for health professionals who work with Chinese immigrants in New Zealand.

In summary, the pregnant Chinese immigrants did not meet the New Zealand recommended servings for some food groups during pregnancy, including vegetables, cereals, and dairy food. Compared with New Zealand women in general, the pregnant Chinese women ate fewer vegetables, and possibly had low iodine and folic acid intake due to low bread and supplements consumption.

Regarding New Zealand nutrition recommendations in detail, some positive results relating to New Zealand nutrition recommendations for adults were found in this study. The Chinese immigrants had positive attitudes towards caring about their nutrient intake. In particular, they had positive attitudes towards the recommendations to limit sugar, fat, and salt intake. They also said they followed these recommendations in practice. The Chinese immigrants followed the recommendation of taking folic acid supplements during the first trimester of pregnancy. However, some findings require attention. The immigrants did not have positive attitudes towards ω-3 fatty acids and did not often consume food rich in ω-3 fatty acids. Although participants had some positive attitudes towards the recommendations for pregnancy, they did not consume the recommended food and supplements (e.g., iodine supplements, food fortified with folic acid, and iron rich food). Thus, health professionals should identify alternative sources of iodine and make a particular effort to explain iodine supplements to Chinese immigrants. They also need to encourage Chinese immigrants to consume sufficient amounts of recommended food and supplements during pregnancy.

In relation to traditional Chinese Medicine (TCM) nutrition recommendations, Chinese immigrants had positive attitudes towards TCM nutrition recommendations, including: ⑴ the overall TCM nutrition recommendations (i.e., balancing cold and hot food and adjusting diets according to seasons and body constitutions) and ⑵ recommendations of

healthy eating for adults (i.e., eating more light food, eating more spleen and stomach strengthening food, and eating less greasy food). However, a minority of them had positive attitudes towards foods with specific TCM features no matter whether they were recommended for pregnancy or not and did not often consume these foods in practice. Meanwhile, a considerable proportion of participants reported neutral attitudes towards most TCM nutrition questions. This indicates that although the specific TCM features did not influence most eating habits, they still have the overall concept of TCM nutrition (e.g., balancing yin and yang). Consequently, it might be useful if health professionals were familiar with the overall concept of TCM nutrition. Additionally, they could either ask if specific food recommendations would fit in, and/or be aware when these recommendations would not.

This study also shows that acculturation did not significantly relate to most eating habits and attitudes towards nutrition. It only found that the Chinese immigrants with a higher acculturation level were more likely than women who were less acculturated to (1) meet the recommended serves from food groups, (2) have positive attitudes towards food and supplements recommended for pregnancy by New Zealand nutrition recommendations, and (3) have positive attitudes towards TCM nutrition recommendations for adults. This suggests that living in New Zealand is not accompanied by many changes to eating habits and attitudes towards nutrition.

In addition, most of the Chinese immigrants' nutrition attitudes were significantly positively related to the relevant eating habits, including limiting fat, sugar, and salt intake, avoiding alcohol, maintaining food safety, and following specific recommendations for pregnancy. This means that, at least for these areas, there are not significant barriers for Chinese immigrants to choose their food.

6.2 Recommendations

The following gives some recommendations according to the findings of the current study. Firstly, health professionals need to help pregnant Chinese women to know the New Zealand recommendations for consumption of different food groups, and help them plan how to obtain sufficient servings of foods, especially eating enough vegetables, cereals, and dairy products. Secondly, health professionals should help Chinese immigrants understand: (1) the importance of eating foods rich in ω-3 fatty acids and fibre, which are recommended for adults by New Zealand nutrition; (2) the importance of consuming iodine supplements and eating iodine rich food during pregnancy. Lastly, health professionals need to learn about the Chinese immigrants' diet and check if it is appropriate to suggest low fat or low salt foods.

The current study shows that although participants reported that they cared about Western nutrition and were interested in learning about Western nutrition, they did not keep up with the latest nutrition information. This suggests there might be some barriers preventing pregnant Chinese women from keeping up with the latest nutrition information. One possible reason is that it might be hard for Chinese immigrants to obtain and understand relevant nutrition information because they are limited by their English language ability. For example, the New Zealand nutrition recommendations for pregnant women have not been translated into Chinese yet. In order to help Chinese immigrants learn about Western nutrition more easily, the governmental health organizations could translate nutrition recommendations into Chinese and spread these recommendations among Chinese communities. Although there are some translated nutrition recommendations, the nutrition recommendations regarding healthy eating for adults and pregnancy have not been translated yet.

Finally, there are some recommendations for future studies. (1) The current study only measured pregnant Chinese immigrants' eating habits in general. Since a majority of the participants reported they did not often consume food rich in iron, iron supplements, food rich in iodine, and iodine supplements during pregnancy, it is necessary to investigate pregnant Chinese women's iodine and iron intake and status in New Zealand. (2) More studies are needed to investigate possible reasons why there was

some inconsistency in participants' eating habits and nutrition attitudes. For example, why the Chinese immigrants were interested in learning about Western nutrition but did not keep up with the latest nutrition information. Similarly, why they showed positive attitudes towards iron rich food and food fortified with folic acid but did not frequently consume these foods. In addition, why they had positive attitudes towards limiting fat and salt intake but did not frequently consume low fat/salt foods instead of the standard varieties. (3) Future researchers also need to investigate the reasons why the immigrants did not have positive attitudes towards some New Zealand nutrition recommendations (e.g., the recommendations of eating food high in iodine and ω-3 fatty acids) and why some of their eating habits did not often follow the recommendations (e.g., choosing low fat/low salt food and consuming recommended servings of vegetables, cereals and dairy intake). For example, whether they knew about these recommendations and if they did know about them, why they did not follow them. (4) In the current study, a majority of participants cared about general TCM nutrition recommendations in their diets (e.g., balancing yin and yang food, adjusting diets according to seasons and body constitutions). Qualitative studies are needed to investigate how the Chinese immigrants use TCM nutrition recommendations in detail. For example, how they choose hot and cold foods in their diet, if they eat any food with specific TCM features when they are sick, and how the attitudes towards TCM nutrition relate to their understanding and use of Western dietary recommendations. (5) The sample size of the current study is relatively small for statistical analysis. Therefore, further studies should recruit more pregnant Chinese immigrant women in New Zealand. (6) Further studies should attempt to recruit pregnant Chinese immigrants living in New Zealand for a longer period (e.g., more than 10 years) to widen the range of acculturation scores.

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Appendices

Appendix A The Online Questionnaire (Questions for Pregnant Chinese Women)

Nutrition ideas and eating habits relating to pregnancy among Chinese Women in New Zealand

新西兰华人女性的与孕期相关的营养观念及饮食习惯

This study will investigate the eating habits and ideas about nutrition relating to pregnancy among Chinese women living in New Zealand.

此研究将调查新西兰华人女性的与孕期营养相关的饮食习惯及营养观念。

All the information and data in the questionnaire will be stored securely to protect your privacy.

问卷中所有信息都将会加密以保护您的个人隐私。

Participant Consent Form 参与调查同意书

Before completing the questionnaire, please make sure that:

在完成问卷之前，请您确认：

1. You have read and understood the Information Sheet for this study.
   您已经阅读并理解此次研究提供的调查说明书。
2. The questions about the study have been answered to your satisfaction, and you understand that you may ask further questions at any time.
   您对于此次研究的疑惑已经得到满意的答复，并且您明白您有权在调查的任何阶段候提出疑问。
3. You understand that you are free to withdraw from the study at any time, and are free to decline to answer any particular questions in the study.
   您明白您有权随时退出此次调查，或者拒绝回答调查中的个别问题。
4. You agree to participate in this study under the conditions set out in the Information Sheet.
   您同意在遵照调查说明书情况下参与这次调查。

Return of the completed questionnaire is considered to indicate your consent to participate this study

回答并反馈完成的问卷将视为您同意参与此调查

Welcome to our study. We would like you to tell us about your basic information. Please tick the relevant answer.

欢迎您参与我们的研究。我们希望您能告诉我们一些您的基本信息。请您选择与您相符的答案。

1. Are you pregnant now?

您是否正怀孕？

□ Yes 是　　□ No 否

(People who choose "No" for both of the two questions cannot meet the recruitment criteria and the study will end)

2. Are you currently living in New Zealand?

您现在是否居住在新西兰？

□ Yes 是　　□ No 否

(People who choose "No" for this question cannot meet the recruitment criteria and the study will end)

3. Where were you born?

您在哪里出生？

□ Mainland of China 中国大陆

□ Other regions using Chinese language (e.g. Hong Kong, Macon, Taiwan, Singapore, and Malaysia)
其它使用中文的地区 （例如香港，澳门，台湾，新加坡，马来西亚）

□ New Zealand and other regions not using Chinese language
新西兰以及其它不使用中文的地区

4. Please write down in which country you were born. _____

请填写您出生于哪个国家。_____

(People who choose "other regions using Chinese language, such as Hong Kong, Macon, and Taiwan" in question 4 need to answer question 5)

5. Are/were both of your parents Chinese and were they born in mainland of China?

您的父母都是华人并且在中国大陆出生吗？

□ Neither of them are/were Chinese, and neither of them were born in mainland of China
他们都不是华人，并且都没有在中国大陆出生

□ Only one of them is/was Chinese, but neither of them were born in mainland of China
只有一位是华人，但是他们都没有在中国大陆出生

□ Only one of them is/was Chinese, and born in mainland of China
只有一位是华人，并且在中国大陆出生

□ Both of them are/were Chinese, but only one of them was born in mainland of China
他们都是华人，但是只有一位在中国大陆出生

□ Both of them are/were Chinese, and were born in mainland of China
他们都是华人，并且都在中国大陆出生

(Basing on question 2 & 3, people who do not meet the recruitment criteria "Born in China or have at least one Chinese parents born in China" cannot attend this study)

6. Your age is _____ years old

您的年龄是 _____岁

7. What is your highest education level?

您的最高学历是？

□ Below high school 高中以下

□ High school 高中及中专

□ Undergraduate and college 本科以及大专

□ Postgraduate 研究生

To start with, we'll ask you about your consumption of food from different food groups during the last four weeks. Please include all meals (breakfast, lunch and dinner) and snacks. Please also include food eaten away from your home.

在问卷调查的开始，我们将询问您在最近四周内的食物摄入量。请您考虑到所有三餐（早餐，午餐，晚餐）以及零食，同样也请您考虑到您在家里以及其它场所吃的所有食物。

8. On average, how many servings of fruits do you eat per day (includes fresh, frozen, canned or stewed fruits)?

您平均每天摄入多少份水果 （包括新鲜的，冷冻的，罐装的或者煮熟的水果）？

The following pictures show fruit serving size examples;

every item in the picture equals to one serving；

e.g. half a cup of fresh fruit = 1 fruit serving

下图为水果份量举例：每种食物相当于一份食物，例如，半杯新鲜的水果 = 1 份水果

□ Never 从不

□ Less than one serving per day 每天少于 1 份

□ 1 serving per day 每天 1 份

□ 2 servings per day 每天 2 份

□ 3 servings per day 每天 3 份

□ 4 or more servings per day 每天 4 份或更多

9. On average, how many servings of vegetables do you eat per day (includes fresh, frozen or canned vegetables)?

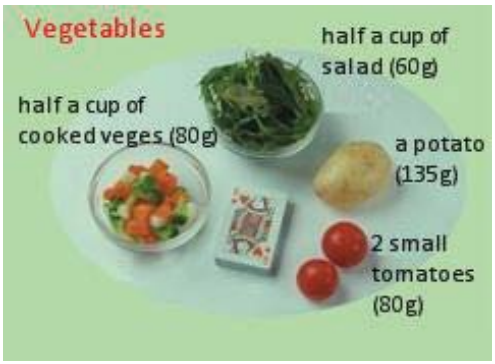
您平均每天摄入多少份蔬菜 （包括新鲜的，冷冻的或者罐装的蔬菜）？

The following pictures show fruit serving size examples;

every item in the picture equals to one serving；

e.g. half a cup of salad = 1 vegetable serving

下图为蔬菜份量举例：每种食物相当于一份食物；例如，半杯蔬菜沙拉 = 1 份蔬菜



□ Never 从不
□ Less than one serving per day 每天少于 1 份
□ 1 serving per day 每天 1 份
□ 2 servings per day 每天 2 份
□ 3 servings per day 每天 3 份
□ 4 or more servings per day 每天 4 份或更多

10. On average, how many servings of the following cereals do you eat per day?
您平均每天摄入多少份下列谷物？
The following pictures show fruit serving size examples;
every item in the picture equals to one serving；
e.g. 2 plain sweet biscuits = 1 cereal serving
下图为谷物份量举例：每种食物相当于一份食物；例如，2 块普通饼干 = 1 份谷物

Cereals 谷类食物	Never 从不	Less than one serving per day 每天少于 1 份	1 serving per day 每天 1 份	2 servings per day 每天 2 份	3 servings per day 每天 3 份	4 or more servings per day 每天 4 份或更多
(1) Bread 面包	□	□	□	□	□	□
(2) Other cereals as main food (such as pasta, noodles, rice, steamed buns) 其它作为主食的谷类食物（例如，面食，米饭，馒头）	□	□	□	□	□	□
(3) Other cereals (such as biscuits, crackers, muesli, and cornflakes) 其它谷类食物（例如，饼干，什锦麦片，玉米片）	□	□	□	□	□	□

11. On average, how many servings of dairy food do you eat per day (such as milk, yoghourt and cheese)?

您平均每天摄入多少份奶制品 （例如牛奶，酸奶和奶酪）？

The following pictures show fruit serving size examples;

every item in the picture equals to one serving：

e.g. 2 slices of cheese = 1 dairy food serving

下图为奶制品份量举例：每种食物相当于一份食物；例如，2 片奶酪 = 1 份奶制品

□ Never 从不

□ Less than one serving per day 每天少于 1 份

□ 1 serving per day 每天 1 份

□ 2 servings per day 每天 2 份

□ 3 servings per day 每天 3 份

□ 4 or more servings per day 每天 4 份或更多

12. On average, how many servings of meat, eggs, seafood and beans do you eat per day?

您平均每天摄入多少肉类，蛋类，海鲜以及豆类食物？

The following pictures show fruit serving size examples;

every item in the picture equals to one serving；

e.g. 1 egg = 1 serving food

下图为肉类，蛋类，海鲜以及豆类食物份量举例；每种食物相当于一份食物；例如，1 个鸡蛋 = 1 份食物

□ Never 从不

□ Less than one serving per day 每天少于 1 份

□ 1 serving per day 每天 1 份

□ 2 servings per day 每天 2 份

□ 3 servings per day 每天 3 份

□ 4 or more servings per day 每天 4 份或更多

Next, we'd like to know about some of your food choice during the last four weeks. Please include all meals (breakfast, lunch and dinner) and snacks. Please also include food eaten away from your home.
接下来，我们需要了解您在最近四周内的食物选择习惯。请您考虑到所有三餐（早餐，午餐，晚餐）以及零食，同样也请您考虑到您在家里以及其它场所吃的所有食物。

13. What type of fat or oil do you use most often when cooking?
您在烹饪的时候最经常使用的是哪种脂类或油？
□ None, I don't use fat or oil 我从不使用油或脂肪
□ Butter and margarine 黄油
□ Oil 食用油
□ Dripping or lard 烤油或猪油
□ Other 其它
□ Don't know 不知道

14. What type of oil do you use most often when cooking?
您在烹饪的时候最经常使用的是哪种油？
(People who choose "oil" in question 13 need to answer question 14)
□ Canola oil 菜籽油
□ Olive oil 橄榄油
□ Salad & cooking oil 色拉油
□ Soya oil 豆油
□ Sunflower oil 葵花油
□ Peanut oil 花生油
□ Other 其它
□ Don't know 不知道

15. What type of butter do you use most often when cooking?
您在烹饪的时候最经常使用的是哪种黄油？
(People who choose "butter and margarine" in question 13 need to answer question 15)

□ Butter 天然黄油
□ Margarine 人造黄油
□ Butter blend 混合黄油
□ Other 其它
□ Don't know 不知道

16. Please write down the type of fat or oil you use most often when cooking. _____
请您填写在烹饪的时候最经常使用的脂类或油的名称 _____
(People who choose "other" in question 13 - 15 need to answer question 16)

17. What type of butter or margarine spread do you use the most?

您往食物上涂抹最多的是下列哪种天然黄油或人造黄油？

□ None, I don't use butter or margarine as a spread 我从不往食物上涂抹天然黄油或人造黄油

□ Butter (including semi soft) 天然黄油（包括半软的黄油）

□ Butter and margarine blend 混合的天然黄油和人工黄油

□ Margarine - full fat 全脂人造黄油

□ Lite or reduced fat margarine and low fat varieties 低脂人造黄油或低脂替代品

□ Other 其它

□ Don't know 不知道

18. Please write down the type of butter or margarine spread you use the most _____

请您填写在您往食物上涂抹的最多的天然黄油或人造黄油的名称 _____

(People who choose "other" in question 17 need to answer question 18)

19. What type of bread, rolls or toast do you eat the most?

您最多食用的是下列哪种面包，面包卷和土司（烤面包）？

□ None, I don't eat them 我从不吃面包

□ White 普通小麦面包（白面包）

□ High fibre white 高纤维小麦面包（白面包）

□ Light grain bread or wholemeal bread (e.g. Freya's, Ploughmans, and Mackenzie High Country) 低谷物面包或全麦面包（ 例如，Freya's, Ploughmans, 和 Mackenzie High Country）

□ Heavy grain bread (e.g. Vogels and Burgen) 高谷物面包 （例如，Vogels 和 Burgen）

□ Other 其它种类面包

□ Don't Know 不知道

20. Please write down the type of bread you eat the most _____

请您填写您最多吃的面包的种类 _____

(People who choose "other" in question 19 need to answer question 20)

21. What type(s) of rice do you usually eat?

您经常吃的是哪种米？

□ None, I don't eat rice 我从不吃米饭

□ White rice only 只吃精米（白米）

□ White rice more often 多数时候吃精米（白米）

□ Half white rice and half brown 一半时候吃精米，一半时候吃糙米

□ Brown rice more often 多数时候吃糙米

□ Brown rice only 只吃糙米

□ Don't Know 不知道

22. What type of milk do you use the most?

您最多使用/喝的是下列哪种奶？

□ None, I don’t use milk 我从不使用/喝奶

□ Whole or standard milk (e.g. dark blue or silver) 全脂或普通牛奶 （例如，dark blue 或 silver）

□ Reduced fat (e.g. light blue) 低脂牛奶 （例如，light blue）

□ Skim or trim (e.g. green or yellow) 脱脂牛奶 （例如，green 或 yellow）

□ Soymilk 豆奶

□ Other (e.g. rice and goat’s milk) 其它（例如，米奶和羊奶）

□ Don’t know 不知道

23. Please write down the type of milk you use the most. _____

请您填写在您使用/喝的最多的奶的种类 _____

(People who choose “other” in question 22 need to answer question 23)

Thanks for telling us your food choice. We'd like to know about some of your other eating habits during the last four weeks. Please include all meals (breakfast, lunch and dinner) and snacks. Please also include food eaten away from your home.

谢谢您告诉我们您的食物选择习惯。我们需要了解您在最近四周内的其它饮食习惯。请您考虑到所有三餐（早餐，午餐，晚餐）以及零食，同样也请您考虑到您在家里以及其它场所吃的所有食物。

24. How often do you eat/drink…? 您多久（多经常）吃/喝…?	Never 从不	Less than once per week 每周少于 1 次	1 - 2 times per week 每周 1- 2 次	3 - 4 times per week 每周 3 - 4 次	5 - 6 times per week 每周 5 – 6 次	7 or more times per week 每周 7 次或更多	Don't known 不知道
⑴ hot chips, French fries, wedges, or kumara chips 油炸食物，炸薯条，炸薯块，炸红薯条	□	□	□	□	□	□	□
⑵ lollies, sweets, chocolate and confectionary 糖果，巧克力和糕点	□	□	□	□	□	□	□
⑶ fruit juices and drinks (includes freshly squeezed varieties, and brands such as Just Juice, Fresh-up, Keri, Golden Circle, Ribena, Thextons, McCoy and Charlie's) 果汁饮品（包括鲜榨果汁和罐装的成品果汁，例如， Just Juice, Fresh-up, Keri, Golden Circle, Ribena, Thextons, McCoy and Charlie's）	□	□	□	□	□	□	□

24. How often do you eat/drink…? 您多久（多经常）吃/喝…?	Never 从不	Less than once per week 每周少于 1 次	1 - 2 times per week 每周 1- 2 次	3 - 4 times per week 每周 3 - 4 次	5 - 6 times per week 每周 5 – 6 次	7 or more times per week 每周 7 次或更多	Don't known 不知道
⑷ soft drinks and energy drinks (includes soft drinks are often carbonated or "fizzy", such as Coca-cola, Pepsi, Lemonade and Ginger beer; and energy drinks, such as "V", Red Bull, Lift plus, Powerade, E2 and G-force) 碳酸汽水以及能量饮料（包括碳酸饮料包括加入二氧化碳的或"起泡沫的"汽水，例如，可乐，柠檬汽水和 Ginger beer；和能量饮料，例如，"V", Red Bull, Lift plus, Powerade, E2 和 G-force）	□	□	□	□	□	□	□
⑸ battered/fried fish or shellfish 油炸的（裹面糊炸的/不裹面糊直接炸的）鱼或者贝类	□	□	□	□	□	□	□
⑹ fresh/frozen/canned fish or shellfish 新鲜的/冷冻的/罐装的鱼或者贝类	□	□	□	□	□	□	□

25. How often do you …? 您多久（多经常）…?	Never 从不	Rarely 很少	Sometimes 有时	Regularly 常常	Always 总是
(1) choose low or reduced salt varieties of foods instead of the standard variety 用低盐食品替代普通食品	□	□	□	□	□
(2) add salt to your food after it has been cooked or prepared 在食物煮熟或准备好后，往您的食物中加盐	□	□	□	□	□
(3) eat meat without removing the fat 在吃肉时不去掉肥肉	□	□	□	□	□
(4) choose low or reduced fat varieties of food instead of the standard variety 用低脂食品代替普通食品	□	□	□	□	□
(5) eat leftovers which are stored in the fridge for more than two days 吃已经在冰箱里存放了超过两天的食物	□	□	□	□	□
(6) wash hands between preparing raw and cooked food 在烹饪生食和熟食之间洗手	□	□	□	□	□
(7) clean kitchen ware between preparing raw and cooked food 在烹饪生食和熟食之间清洗厨具	□	□	□	□	□

26. During your current pregnancy, how often do you …? 在您这次怀孕期间，您多久…？	Never 从不	Rarely 很少	Sometimes 有时	Regularly 常常	Always 总是
⑴ eat cold food (e.g. cooked meat and sandwiches that are stored in the fridge) 吃冷的食物（例如，在冰箱里储存的熟肉和三明治）	□	□	□	□	□
⑵ choose iodised salt when you use salt 在用盐的时候选用加碘盐	□	□	□	□	□
⑶ limit your weight gain 限制您的体重增长	□	□	□	□	□
⑷ eat as much as you want 想吃多少就吃多少	□	□	□	□	□

27. During your current pregnancy, how often do you consume/drink …? 在您这次怀孕期间，您多久（多经常）吃/服用/喝…?	Never 从不	Less than once per week 每周少于 1 次	1 - 2 times per week 每周 1- 2 次	3 - 4 times per week 每周 3 - 4 次	5 - 6 times per week 每周 5 – 6 次	7 or more times per week 每周 7 次或更多	Don't known 不知道
⑴ iron rich food 含铁多的食物	□	□	□	□	□	□	□
⑵ iron supplements 铁补充剂/铁片	□	□	□	□	□	□	□
⑶ iodine rich food 含碘多的食物	□	□	□	□	□	□	□
⑷ iodine supplements 碘补充剂/碘片	□	□	□	□	□	□	□
⑸ foods fortified with folic acid 添加了叶酸的食物	□	□	□	□	□	□	□
⑹ folic acid supplements (during the first trimester of pregnancy) 叶酸补充剂/叶酸片（在怀孕期间的头三个月）	□	□	□	□	□	□	□
⑺ blood activating (i.e. huo xue) food 活血的食物	□	□	□	□	□	□	□
⑻ yin and blood nourishing (i.e. zi yin yang xue) food 滋阴养血的食物	□	□	□	□	□	□	□
⑼ kidney nourishing (i.e. bu shen) food 补肾的食物	□	□	□	□	□	□	□
⑽ alcohol (e.g. wine, beer, and spirits) 酒（例如，葡萄酒，啤酒，烈酒）	□	□	□	□	□	□	□

Thanks you. You have already completed more than half of the questionnaire. In the next half we'll ask you about your current general ideas relating to eating and nutrition.

非常感谢。您已经完成超过一半的问卷。在接下来的一半，我们将询问您当下对于营养和饮食的总体看法。

28. Ideas 观点	Strongly disagree 完全不赞同	Disagree 不赞同	Neither agree nor disagree 既不反对也不赞同（中立）	Agree 赞同	Strongly agree 完全赞同	Don't know 不知道
(1) I seldom/never think about my eating habits. 我很少/从不考虑我的饮食习惯。	□	□	□	□	□	□
(2) I stop eating only when I cannot eat any more. 我只在吃不下更多食物时才停止吃东西。	□	□	□	□	□	□
(3) I care about the food I eat. 我在意我吃的食物。	□	□	□	□	□	□
(4) I eat what I want regardless of what is good for me. 我只吃我想吃的食物不论它是否有益于我。	□	□	□	□	□	□
(5) Knowing that a food is good for me has little influence on what I choose to eat. 知道某些食物有益于我对我在食物的选择上只有很小的影响。	□	□	□	□	□	□
(6) Eating well cannot help me prevent disease. 吃得好不能帮助我预防疾病。	□	□	□	□	□	□
(7) My current diet will help keep me healthy. 我现在的饮食可以帮助我保持健康。	□	□	□	□	□	□
(8) It is important for me to be careful with my food safety. 对我来说，在意饮食卫生是重要的。	□	□	□	□	□	□

In the following question, we will ask you about current ideas about pregnancy.

通过下面的题目，我们将询问您现在的关于怀孕的一些看法。

29. Ideas about pregnancy 与怀孕相关的观点 During pregnancy, it … 在怀孕期间，…	Strongly disagree 完全不赞同	Disagree 不赞同	Neither agree nor disagree 既不反对也不赞同（中立）	Agree 赞同	Strongly agree 完全赞同	Don't know 不知道
(1) is important for me to avoid drinking alcohol. 不喝酒对我很重要。	□	□	□	□	□	□
(2) does not matter how much weight I gain. 我不在意我的体重增加了多少。	□	□	□	□	□	□
(3) does not matter how much food I eat because I am eating for two. 我不在意我吃了多少食物因为我在为两个人吃（我和宝宝）。	□	□	□	□	□	□

Thanks for telling us about your general ideas about eating and nutrition. Next we'll investigate your current ideas relating to Western nutrition.

谢谢您告诉我们您的总体营养观念。接下来我们将询问您当下对于西方/现代营养的一些看法点。

30. Ideas 观点	Strongly disagree 完全不赞同	Disagree 不赞同	Neither agree nor disagree 既不反对也不赞同（中立）	Agree 赞同	Strongly agree 完全赞同	Don't know 不知道
(1) I am too busy to concern myself with western nutrition. 我很忙以至于没有空在意我是否遵循西方营养理论。	□	□	□	□	□	□
(2) I try hard to learn about western nutrition. 我努力尝试学习西方营养理论。	□	□	□	□	□	□
(3) I am not interested in learning about food sources of nutrients (e.g. what types of food contain calcium). 我对学习营养元素的食物来源（例如，哪些食物里含有钙质）不感兴趣。	□	□	□	□	□	□
(4) I am not interested in learning about the influence of nutrients on health. 我对学习营养元素对健康的影响不感兴趣。	□	□	□	□	□	□
(5) I try hard to keep up with the latest western nutrition information. 我努力跟进了解最新的西方营养学信息。	□	□	□	□	□	□
(6) I care about my energy/calorie intake. 我在意我的能量/卡路里摄入量。	□	□	□	□	□	□

30. Ideas 观点	Strongly disagree 完全不赞同	Disagree 不赞同	Neither agree nor disagree 既不反对也不赞同（中立）	Agree 赞同	Strongly agree 完全赞同	Don't know 不知道
⑺ I do not care about what nutrients I get from food. 我不在意我能从食物中摄取哪种营养元素。	□	□	□	□	□	□
⑻ It is important for me to eat low fibre food. 对我来说，吃低纤维的食物是重要的。	□	□	□	□	□	□
⑼ It is important for me to eat low sugar food. 对我来说，吃低糖的食物是重要的。	□	□	□	□	□	□
⑽ It is important for me to eat low salt food. 对我来说，吃低盐的食物是重要的。	□	□	□	□	□	□
⑾ It is important for me to eat food low in fat. 对我来说，吃含脂肪少的食物是重要的。	□	□	□	□	□	□
⑿ It is important for me to eat food low in saturated fat. 对我来说，吃含饱和脂肪少的食物是重要的。	□	□	□	□	□	□
⒀ It is important for me to eat food low in omega-3 fatty acids. 对我来说，吃含 ω（欧米伽）-3 脂肪酸少的食物是重要的。	□	□	□	□	□	□

31. Ideas about nutrition during pregnancy 与孕期营养相关的观点 During pregnancy, it is important for me to consume/choose... 在怀孕期间，吃/服用/选用 ... 对我来说是重要的。	Strongly disagree 完全不赞同	Disagree 不赞同	Neither agree nor disagree 既不反对也不赞同（中立）	Agree 赞同	Strongly agree 完全赞同	Don't know 不知道
(1) food fortified with folic acid 添加了叶酸的食物	□	□	□	□	□	□
(2) iron rich food 含铁多的食物	□	□	□	□	□	□
(3) low iodine food 含碘量少的食物	□	□	□	□	□	□
(4) folic acid supplements (during the first trimester of pregnancy) 叶酸补充剂/叶酸片(在怀孕期间的头三个月)	□	□	□	□	□	□
(5) iron supplements 铁补充剂/铁片	□	□	□	□	□	□
(6) iodine supplements 碘补充剂/碘片	□	□	□	□	□	□
(7) iodised salt when I use salt 加碘盐（在用盐的时候）	□	□	□	□	□	□

In addition to Western nutrition, we'd like to know about your current ideas relating to Traditional Chinese Medicine (TCM) nutrition.

除了西方/现代营养，我们想要了解您当下的对于中国传统中医营养的看法。

32. Ideas 观点	Strongly disagree 完全不赞同	Disagree 不赞同	Neither agree nor disagree 既不反对也不赞同（中立）	Agree 赞同	Strongly agree 完全赞同	Don't know 不知道
(1) I am too busy to concern myself with Traditional Chinese Medicine (TCM) nutrition. 我很忙以至于没有空在意我是否遵循中医传统营养观念。	□	□	□	□	□	□
(2) I try hard to learn about TCM nutrition. 我努力尝试学习中医传统营养理论。	□	□	□	□	□	□
(3) I am not interested in learning about TCM food features (e.g. what types of food belong to hot/yang food). 我对喜欢学习不同食物的属性（例如，哪种食物属于热性/阳性食物）不感兴趣。	□	□	□	□	□	□
(4) I am not interested in learning the influence of TCM features (e.g. yin and yang features of food) on health. 我对喜欢学习中医传统食物属性（例如，阳性和阴性食物）对健康的影响不感兴趣。	□	□	□	□	□	□
(5) I try hard to keep up with the latest TCM nutrition information. 我努力跟进了解最新的中医传统营养信息。	□	□	□	□	□	□

32. Ideas 观点	Strongly disagree 完全不赞同	Disagree 不赞同	Neither agree nor disagree 既不反对也不赞同（中立）	Agree 赞同	Strongly agree 完全赞同	Don't know 不知道
⑹ I do not care about the balance of cold and hot (or yin and yang) food in meals. 我不在意平衡膳食中食物的寒热（或者阴阳）属性。	□	□	□	□	□	□
⑺ I care about adjusting my diet according to the seasons. 我在意根据季节变化调节我的饮食。	□	□	□	□	□	□
⑻ I care about adjusting my diet according to my body constitution. 我在意根据我的体质调节我的饮食。	□	□	□	□	□	□
⑼ It is important for me to eat greasy food. 对我来说，吃油腻的食物是重要的。	□	□	□	□	□	□
⑽ It is important for me to eat light food. 对我来说，吃清淡的食物是重要的。	□	□	□	□	□	□
⑾ It is important for me to eat spleen and stomach strengthening (i.e. jian pi wei) food. 对我来说，吃健脾胃的食物是重要的。	□	□	□	□	□	□

33. Ideas about nutrition during pregnancy 与孕期营养相关的观点 During pregnancy, it is important for me to consume... 在怀孕期间，吃 ... 对我来说是重要的。	Strongly disagree 完全不赞同	Disagree 不赞同	Neither agree nor disagree 既不反对也不赞同（中立）	Agree 赞同	Strongly agree 完全赞同	Don't know 不知道
⑴ blood activating (i.e. huo xue) food 活血的食物	□	□	□	□	□	□
⑵ yin and blood nourishing (i.e. zi yin yang xue) food 滋阴养血的食物	□	□	□	□	□	□
⑶ kidney nourishing (i.e. bu shen) food 补肾的食物	□	□	□	□	□	□

Thanks a lot for your patience. There is only one part of the study left. Please give us a couple more minutes at your time and tell us about some other personal information.

非常感谢您的耐心。这里还有一小部分问卷需要您完成。请给我们两分钟的时间来回答有关您个人信息的问题。

34. How long have you been in NZ?

您在新西兰居住了多久？

□ Less than a year 少于 1 年

□ 1 or more than 1 year, and less than 3 years 1 年或多于 1 年，并且少于 3 年

□ 3 or more than 3 years, and less than 5 years 3 年或多于 3 年， 并且少于 5 年

□ 5 or more than 5 years, and less than 7 years 5 年或多于 5 年， 并且少于 7 年

□ 7 or more than 7 years 7 年或多于 7 年

35. In general, what language(s) do you read and speak?

总体来说，您在阅读和讲话时使用哪种/哪些语言？

□ Only Chinese 只用中文

□ Chinese better than English 中文比英文多

□ Both equally 使用中英文的时候各半

□ English better than Chinese 英文比中文多

□ Only English 只用英文

36. Language and media preferences 语言和媒体喜好	Only Chinese 只是中文	More Chinese than English 更多的是中文	Both equally 中英文各半	More English than Chinese 更多的是英文	Only English 只是英文
⑴ What was the language(s) you used as a child? 在您小时候，您使用的是哪种/哪些语言？	□	□	□	□	□
⑵ What language(s) do you usually speak at home? 您在家里经常使用哪种/哪些语言？	□	□	□	□	□
⑶ In which language(s) do you usually think? 您通常用哪种/哪些语言思考？	□	□	□	□	□
⑷ What language(s) do you usually speak with your friends? 您通常用哪种/哪些语言与您的朋友讲话？	□	□	□	□	□

36. Language and media preferences 语言和媒体喜好	Only Chinese 只是中文	More Chinese than English 更多的是中文	Both equally 中英文各半	More English than Chinese 更多的是英文	Only English 只是英文
⑸ In what language(s) are the T.V. programs you usually watch? 您通常观看的是哪种/哪些语言的电视节目？	□	□	□	□	□
⑹ In what language(s) are the radio programs you usually listen to? 您通常收听的是哪种/哪些语言的广播节目？	□	□	□	□	□
⑺ In general, in what language(s) are the movies, T.V. and radio programs you *prefer* to watch and listen to? 总体上，您喜欢收听和收看的是哪种/哪些语言的电影，电视节目和广播节目？	□	□	□	□	□

37 Social relationships 社交	All Chinese (including people with Chinese cultural origins) 全部为华人	More Chinese than New Zealanders 华人比新西兰人多	Half Chinese and half New Zealanders 一半华人，一半新西兰人	More New Zealanders than Chinese 新西兰人比华人多	All New Zealanders 全部是新西兰人
⑴ Your close friends are: 您亲密的朋友们是：	□	□	□	□	□
⑵ You prefer going to social gatherings/parties at which the people are: 您喜欢参加有哪些人参加的聚会：	□	□	□	□	□
⑶ The persons you visit or who visit you are: 您拜访或者拜访您的人们是：	□	□	□	□	□
⑷ If you could choose your children's friends, you would want them to be: 如果您可以选择您孩子的朋友们，您希望他/她们是：	□	□	□	□	□

38. How many times have you been pregnant (including current pregnancy)?

您有多少次怀孕经历（包括现在正在怀孕的经历）？

□ 1 time 1 次

□ 2 times 2 次

□ 3 or more than 3 times 3 次以及以上

39. Are you currently living with any Chinese parent or parent in-law who was born in mainland of China?

现在您是否与出生于中国大陆的中国父母/岳父岳母同住?

□ Yes 是　　□ No 否

40. Do you regularly eat with other Chinese people (e.g. a Chinese flat mates, or Chinese relatives) now?
现在您是否通常与其它华人（例如，华人室友，或华人亲戚）一起吃饭？*(pregnant women only)*

□ Yes 是　　□ No 否

Thank you for your participation and patience. The survey is finished but if you provide us with your contact details we will enter you in a draw to win $50. You do not need to provide these details if you do not want to participate in the draw. If you do provide these details, they will be separated from your answers to the survey question and will only be used to contact you if you win the prize.

感谢您的耐心参与。这项调查已经结束。 如果您向我们提供您的联系方式，我们会将您加入到随机获得$50现金的抽奖中。如果您不想参与抽奖活动，您不必提供您的联系方式。如果您愿意参加抽奖，您的个人信息将与您的答卷分开保管，并且只用于联系获奖的参与者。

Please write down your contact details (You can choose any of the following to be contacted)
请填写您的联系方式（您可以选择下列任意一种联系方式）

Email 电子邮箱_____

Telephone 电话_____

Cell Phone 手机_____

The End

调查结束

Appendix B Ethical Approval

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA

30 August 2013

Jingjing Ma
Unit 11, 359 College Street
West End
PALMERSTON NORTH 4410

Dear Jingjing

Re: Eating Habits and Nutritional Attitude during Pregnancy among Chinese Women in New Zealand

Thank you for your Low Risk Notification which was received on 19 July 2013.

Your project has been recorded on the Low Risk Database which is reported in the Annual Report of the Massey University Human Ethics Committees.

The low risk notification for this project is valid for a maximum of three years.

Please notify me if situations subsequently occur which cause you to reconsider your initial ethical analysis that it is safe to proceed without approval by one of the University's Human Ethics Committees.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

A reminder to include the following statement on all public documents:

> *"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.*
>
> *If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director (Research Ethics), telephone 06 350 5249, e-mail humanethics@massey.ac.nz".*

Please note that if a sponsoring organisation, funding authority or a journal in which you wish to publish requires evidence of committee approval (with an approval number), you will have to provide a full application to one of the University's Human Ethics Committees. You should also note that such an approval can only be provided prior to the commencement of the research.

Yours sincerely

J. O'Neill

John G O'Neill (Professor)
Chair, Human Ethics Chairs' Committee and
Director (Research Ethics)

cc Dr Janet Weber
Institute of Food, Nutrition and Human Health
PN452

Prof Richard Archer, HoI
Institute of Food, Nutrition and Human Health
PN452

Massey University Human Ethics Committee
Accredited by the Health Research Council

Research Ethics Office
Massey University, Private Bag 11222, Palmerston North 4442, New Zealand T +64 6 350 5573 +64 6 350 5575 F +64 6 350 5622
E humanethics@massey.ac.nz animalethics@massey.ac.nz gtc@massey.ac.nz **www.massey.ac.nz**

Appendix C Information Sheet

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Information Sheet

You are invited to participate in this study:

Eating habits and ideas about nutrition during pregnancy among Chinese women in New Zealand.

This study aims to:

Understand your eating habits and ideas about Western and traditional Chinese medicine (TCM) nutrition relating to pregnancy.

You are invited to participate in this study, if you

- have been pregnant during the last 5 years or are currently pregnant
- are currently living in NZ
- were born in mainland of China or have at least one Chinese parent(s) who was/were born in mainland of China

In this study, you need to:

Complete one questionnaire to show your eating habits and attitudes about nutrition. (This won't take long – only about 15 minutes)

You could win a reward:

Six participants completing the questionnaire will be randomly selected and each will receive a *$50* cash reward.

There is no risk involved in participating in this study:

This study is low risk. It won't change your thinking or eating habits. It won't physically harm you.

Your private information will be protected:

The data and information collected in this study will be protected. All the questionnaires will be kept in a locked cabinet or securely password protected computers. Only the researchers will be able to access the data using a password. Others are not allowed to access to the data unless they get permission from the researchers. In order to contact to the six participants who win the $50 rewards, your contact details will be collected. These contact details will be kept separately from your answers.

Your participation in this study is voluntary.

If you do not want to attend this study:
You can withdraw from the study at anytime without penalty. If you withdraw from the study before data collection, your data will be deleted. You can skip any questions in the questionnaire that you do not willing to answer.

If you have any questions about this research, please contact to:
Email: J.Ma@massey.ac.nz Phone: +64 6 356 9099 ext 7913 Jingjing Ma
Email: J.L.Weber@massey.ac.nz Janet Weber

Return of the completed survey (questionnaire) is considered to indicate your consent to participate in this study.

Statements

This Project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethic Committees. The researcher(s) named above are responsible for the ethic conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director, Research Ethics, telephone 06 350 5249, email: humanethics@massey.ac.nz.

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

课题调查说明书

我们邀请您参加调查：

新西兰华人女性的饮食习惯以及与孕期保健相关的中西方营养观念.

此调查的目的是：

了解您对于孕期保健相关的中西方营养的看法，以及您的饮食习惯。

欢迎您参加此调查，如果您：

- 现在正怀孕或在近五年之内怀过孕
- 现在正在新西兰居住
- 出生于中国大陆或者您的中国父母中至少有一位出生在中国大陆。

在这个调查中，您需要：

完成一份问卷来反映您的饮食习惯以及您对营养的看法。

（完成问卷的过程用时较短，大约 15 分钟）

在这个调查中，您有机会获得奖励：

将有六名完成问卷的女士被随机选出，并且获得$50 奖金。

参加该调查没有任何风险：

这个研究属于低风险研究。它不会改变您的想法以及饮食习惯，并且不会对您造成任何伤害。

您的隐私将会被保护：

这个调查的相关信息和数据都将会加密保护。所有问卷都是匿名的并且会被保存在安全加锁文件柜或加密保护的电脑中。只有调查员以及指导人员可以接触问卷和数据。其余人员在没有得到调查员的允许之前没有权利接触数据和文件。为了联系到六名获得$ 50奖金的女士，我们将询问您的联系方式（例如电子邮箱，电话）。这些联系信息将与您的问卷分开保存。

您参加整个调查的过程属于自愿参加。

如果您不愿意参加这个调查：

您有权在任何时间拒绝参加调查，并且不会受到任何处罚。如果您在数据收集前放弃参加调查，我们将彻底删除您的数据。您可以跳过任何您不愿意作答的问题。

如果您对此调查有任何疑问，请联系：

电话：+64 6 356 9099 ext 7913　　电子邮箱：J.Ma@massey.ac.nz　　马晶晶

电子：J.L.Weber@massey.ac.nz　　Janet Weber

回答并反馈完成的问卷将视为您同意参与此调查。

声明

该项目已被同业审查评估并判定为低风险研究，故不需经过梅西大学人类研究伦理委员会审查。上述调查员对本研究的伦理行为负责。

如果您对本研究有任何疑问，请联系研究伦理委员会主任，John O’Neill， 电话 06 350 5249， 电子邮箱 humanethics@massey.ac.nz。

Appendix D Advertisements

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Our Study Needs Your Help

Could living in New Zealand influence your eating habits and ideas about nutrition?

After having lived in New Zealand, how do you choose food during pregnancy? Do you still choose traditional Chinese food or have you started to choose local Western food? Western food and traditional Chinese food, which one is healthier? Do you follow western eating suggestions or still follow traditional Chinese suggestions?

In our study, we invite you to help us learn about your eating habits and ideas about nutrition in pregnancy. With your help, we could have a better understanding of Chinese immigrants' pregnant eating habits and ideas about nutrition. We hope that the suggestions for the study will improve Chinese women's health during pregnancy in New Zealand.

This study will invite at least 110 women, who
- have been pregnant during the last 5 years or are currently pregnant
- are currently living in NZ
- were born in mainland of China or
  have at least one Chinese parent(s) who was/were born in mainland of China

Six participants completing the questionnaire will be randomly selected to receive a ***$50*** **cash reward**

You will need to complete an online questionnaire about your eating habits and attitudes about nutrition
Please go to: http://www.51diaocha.com/w/1053115.htm to answer the questions
(complete the questionnaire takes about 15 minutes)

If you know an individual who meets the recruitment criteria, please invite her to participate in this study.

If you have any questions, please contact to:
Phone: +64 6 356 9099 ext 7913 Email: J.Ma@massey.ac.nz Jingjing Ma or
Email: J.L.Weber@massey.ac.nz Janet Weber
the Institute of Food, Nutrition and Human Health, Massey University

Thanks a lot for your cooperation and help

This Project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethic Committees. The researcher(s) named above are responsible for the ethic conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director, Research Ethics, telephone 06 350 5249, email: humanethics@massey.ac.nz.

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

我们的研究需要您的帮助

新西兰的生活能够影响您对饮食和营养的看法吗？

生活在新西兰后，您在怀孕的时候怎样选择食物？是选择中国传统食物还是开始选择当地的西方食物？中国传统食物和当地西方食物，哪种食物更健康？是遵循西方饮食建议还是仍旧遵循中国传统建议？

在我们的研究中，我们邀请您帮助我们了解您的一些有关于孕期营养相关的想法以及饮食习惯。在您的帮助之下，我们将更好了解中国移民的孕期饮食习惯和营养意识。我们希望此次调查将有助于提高新西兰华人女性的孕期健康状况。

此调查将邀请至少 110 名女性：
- 现在正怀孕或在近五年之内怀过孕
- 现在正在新西兰居住
- 出生于中国大陆或者您父母中至少有一位出生在中国大陆

在完成问卷的女士中，将有六名女士被随机选出并且获得**$50 奖金**

您需要完成一份在线调查问卷来体现您的饮食习惯以及您对营养的看法
请前往以下链接作答：http://www.51diaocha.com/w/1053115.htm
（完成问卷大约需要 15 分钟）

如果您认识符合上述条件的女士，请邀请她参加此调查

如果您有任何疑问，请联系：
电话：+64 6 356 9099 ext 7913　电子邮箱：J.Ma@massey.ac.nz　马晶晶
电子邮箱：J.L.Weber@massey.ac.nz　Janet Weber
食品营养健康学院，梅西大学

非常感谢您的合作和帮助

该项目已被同业审查评估并判定为低风险研究，故不需经过梅西大学人类研究伦理委员会审查。上述调查员对本研究的伦理行为负责。

如果您对本研究有任何疑问，请联系研究伦理委员会主任，John O’Neill， 电话 06 350 5249， 电子邮箱 humanethics@massey.ac.nz。

Appendix E Participants' Answers of the Acculturation Questions

Questions	Options	n (%)
35. In general, what language(s) do you read and speak?	Only Chinese	7 (8.8)
	Chinese better than English	41 (51.3)
	Both equally	26 (32.5)
	English better than Chinese	6 (7.5)
	Only English	____
36 (1). What was the language(s) you used as a child?	Only Chinese	78 (92.9)
	More Chinese than English	6 (7.1)
	Both equally	____
	More English than Chinese	____
	Only English	____
36 (2). What language(s) do you usually speak at home?	Only Chinese	61 (72.6)
	More Chinese than English	16 (19.0)
	Both equally	2 (2.4)
	More English than Chinese	3 (3.6)
	Only English	2 (2.4)
36 (3). In which language(s) do you usually think?	Only Chinese	53 (63.1)
	More Chinese than English	21 (25.0)
	Both equally	8 (9.5)
	More English than Chinese	2 (2.4)
	Only English	____

Questions	Options	n (%)
36 (4). What language(s) do you usually speak with your friends?	Only Chinese	35 (41.7)
	More Chinese than English	26 (31.0)
	Both equally	19 (22.6)
	More English than Chinese	4 (4.8)
	Only English	____
36 (5). In what language(s) are the T.V. programs you usually watch?	Only Chinese	23 (27.4)
	More Chinese than English	25 (29.8)
	Both equally	28 (33.3)
	More English than Chinese	7 (8.3)
	Only English	1 (1.2)
36 (6). In what language(s) are the radio programs you usually listen to?	Only Chinese	22 (26.2)
	More Chinese than English	26 (31.0)
	Both equally	21 (25.0)
	More English than Chinese	11 (13.1)
	Only English	4 (4.8)
36 (7). In general, in what language(s) are the movies, T.V. and radio programs you prefer to watch and listen to?	Only Chinese	18 (21.4)
	More Chinese than English	27 (32.1)
	Both equally	30 (35.7)
	More English than Chinese	7 (8.3)
	Only English	2 (2.4)

Questions	Options	n (%)
37 (1). Your close friends are:	All Chinese (including people with Chinese cultural origins)	41 (48.8)
	More Chinese than New Zealanders	32 (38.1)
	Half Chinese and half New Zealanders	9 (10.7)
	More New Zealanders than Chinese	2 (2.4)
	All New Zealanders	____
37 (2). You prefer going to social gatherings/parties at which the people are:	All Chinese (including people with Chinese cultural origins)	25 (29.8)
	More Chinese than New Zealanders	32 (38.1)
	Half Chinese and half New Zealanders	20 (23.8)
	More New Zealanders than Chinese	6 (7.1)
	All New Zealanders	1 (1.2)
37 (3). The persons you visit or who visit you are:	All Chinese (including people with Chinese cultural origins)	25 (29.8)
	More Chinese than New Zealanders	41 (48.8)
	Half Chinese and half New Zealanders	15 (17.9)
	More New Zealanders than Chinese	3 (3.6)
	All New Zealanders	____

Questions	Options	n (%)
37 (4). If you could choose your children's friends, you would want them to be:	All Chinese (including people with Chinese cultural origins)	5 (6.0)
	More Chinese than New Zealanders	6 (7.1)
	Half Chinese and half New Zealanders	65 (77.4)
	More New Zealanders than Chinese	6 (7.1)
	All New Zealanders	2 (2.4)

Appendix F Possible Relationship between the Participants' Acculturation Score and Basic Information

1. Mean acculturation scores by education levels

Education levels						Total		P value *(ANOVA)*
High school (n = 5)		Undergraduate and college (n = 67)		Postgraduate (n = 11)				
Mean	SD	Mean	SD	Mean	SD	Mean	SD	
1.55[a]	0.43	1.97[a, b]	0.52	2.38[b]	0.87	1.99	0.59	0.03

Note.
Means marked by the same superscript means the means are similar, and marked with the different superscripts are significantly different by Tukey HSD test.

2. Mean acculturation scores by the duration of living in New Zealand

Duration of living in New Zealand										Total		P value *(ANOVA)*
< 1 year (n = 3)		≥ 1 year & < 3 years (n = 11)		≥ 3 years & < 5 years (n = 11)		≥ 5 years & < 7 years (n = 12)		≥ 7 years (n = 44)				
Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
1.42	0.22	1.77	0.56	1.88	0.56	1.95	0.51	2.12	0.62	1.99	0.59	0.15

3. Mean acculturation scores by the number of pregnancies

Number of pregnancies						Total		P value *(ANOVA)*
1 time (n = 37)		2 times (n = 37)		≥ 3 times (n = 9)				
Mean	SD	Mean	SD	Mean	SD	Mean	SD	
2.01	0.58	1.99	0.59	1.87	0.69	1.99	0.59	0.83

4. Independent t-test by living with any Chinese parent / parent in-law

Group variables	Groups	Mean	Standard deviation	Standard error	95% CI of difference	t	f	Sig. (one-tailed)
Whether live with any Chinese parent/parent in-law	Yes (n = 37)	1.90	0.47	0.08	-0.44 to 0.09	-1.34	7	0.10
	No (n = 46)	2.07	0.66	0.10				

5. Independent t-test by whether regular eating with other Chinese

Group variables	Groups	Mean	Standard deviation	Standard error	95% CI of difference	t	f	Sig. (one-tailed)
Whether regularly eat with other Chinese	Yes (n = 54)	1.90	0.52	0.07	-0.56 to 0.00	-1.99	6	0.03
	No (n = 28)	2.18	0.71	0.14				

6. Linear regression analysis of acculturation scores

Predictor variables	R^2	F	Constant	β_1	t	p (t)
Age (n = 84)	0.002	0.124	1.792	0.007	0.352	0.73

Appendix G Eating Habits Scores of Different Acculturation Groups

Theoretical score range	Minimum	Maximum	Median	95% CI		Acculturation group					
						Lower (n = 28)			Medium (n = 25)		
						Median	95% CI		Median	95% CI	
				Lower	Upper		Lower	Upper		Lower	Upper
1) Whether met the New Zealand recommended servings of food groups for pregnancy											
5 - 10	6.0	10.0	8.0	8.2	8.6	8.00[a,b]	8.2	8.8	8.0[a*]	7.8	8.5
2) Healthy eating for adults											
3 - 24	14.5	23.0	19.5	19.2	20.0	19.5	18.6	19.9	19.3	18.6	20.4
3) Consumption of supplements and food relating to Western nutrition recommendations for pregnancy											
1 - 41	9.0	41.0	25.0	23.0	26.4	23.00	19.6	25.6	29.00	23.8	30.1
4) Consumption of food with specific TCM features relating to TCM nutrition recommendations for pregnancy											
0 - 18	0.0	13.0	9.0	7.2	8.7	8.5	5.9	9.0	9.0	8.0	9.9
5) Maintaining food safety											
4 - 20	11.0	20.0	17.0	16.0	17.1	16.4	15.3	17.3	18.0	16.0	18.3

Note:

Medians marked by the same superscript mean the distribution are similar, and marked with the different superscripts are significantly different b

** The difference is significant at the 0.05 level (adjust sig = 0.033).*

Theoretical score range	Minimum	Maximum	Median	95% CI		Acculturation group					
						Lower (n = 28)			Medium (n = 25)		
						Median	95% CI		Median	95% CI	
				Lower	Upper		Lower	Upper		Lower	Upper
6) Controlling weight gain											
2 - 10	2.0	10.0	6.0	5.3	6.3	7.0	4.6	6.6	5.5	4.3	5.9
7) Avoiding drinking alcohol											
0 - 6	3.0	6.0	6.0	5.9	6.0	6.0	5.6	6.1	6.0	5.9	6.0

Appendix H Nutrition Attitudes Scores of Different Acculturation Groups

1. Attitudes relevant to both Western and TCM nutrition

Theoretical score range	Minimum	Maximum	Median	95% CI		Acculturation group					
						Lower (n = 28)			Medium (n = 25)		
						Median	95% CI		Median	95% CI	
				Lower	Upper		Lower	Upper		Lower	Upper
⑴ General caring about eating habits											
0-35	19.0	35.0	25.0	24.6	26.2	26.0	24.1	26.9	26.0	24.5	27.3
⑵ Attitudes towards maintaining food safety											
0 - 5	0.0	5.0	5.0	4.1	4.6	4.5	3.9	4.6	5.0	4.0	4.8
⑶ Attitudes towards avoiding drinking alcohol											
0 - 5	1.0	5.0	5.0	4.5	4.8	5.0	4.2	4.9	5.0	4.3	5.1
⑷ Attitudes towards controlling weight gain											
0 - 5	2.0	10.0	10.0	8.0	8.9	10.0	7.2	9.0	10.0	7.4	9.3

2 Western nutrition attitudes scores of different acculturation groups

Theoretical score range	Minimum	Maximum	Median	95% CI		Acculturation group					
						Lower (n = 28)			Medium (n = 25)		
						Median	95% CI		Median	95% CI	
				Lower	Upper		Lower	Upper		Lower	Upper
⑴ Caring & learning about Western nutrition											
0 - 25	10.0	25.0	19.0	17.7	19.1	17.5	16.6	19.1	19.0	17.0	19.7
⑵ Attitudes towards overall Western nutrition											
0 - 10	4.0	10.0	7.0	6.9	7.5	7.0	6.4	7.4	7.0	6.4	7.6
⑶ Attitudes towards Western nutrition recommendation of healthy eating for adults											
0 - 25	11.0	25.0	18.0	17.4	18.7	18.0	16.7	18.7	18.0	16.7	19.0
⑷ Attitudes towards Western nutrition recommendation for pregnant period only											
0 - 35	10.0	34.0	26.0	25.3	27.3	25.0[a*]	23.7	27.0	25.0[a*]	23.2	27.1

Note.

Medians marked by the same superscript mean the distribution are similar, and marked with the different superscripts are significantly different b

** The difference is significant at the 0.05 level (adjust sig between low and higher acculturation groups = 0.033; adjust sig between medium and*

3 TCM nutrition attitudes scores of different acculturation groups

Theoretical score range	Minimum	Maximum	Median	95% CI		Acculturation group					
						Lower (n = 28)			Medium (n = 25)		
						Median	95% CI		Median	95% CI	
				Lower	Upper		Lower	Upper		Lower	Upper
⑴ Caring & learning about TCM nutrition											
0 - 25	6.0	24.0	16.5	16.1	17.3	16.0	15.2	17.3	17.0	16.0	18.0
⑵ Attitudes towards overall TCM nutrition											
0 - 15	4.0	15.0	11.0	10.1	11.1	10.0	9.5	10.9	11.0	9.7	11.5
⑶ Attitudes towards TCM nutrition recommendation of healthy eating for adults											
0 - 15	6.0	15.0	12.0	11.1	11.9	11.5[a*]	10.4	11.7	11.0[a,b]	10.4	12.3
⑷ Attitudes towards TCM nutrition recommendation for pregnant period only											
0 - 15	0.0	14.0	10.0	8.3	9.7	9.5	7.6	10.0	9.0	7.5	10.1

Note.

Medians marked by the same superscript mean the distribution are similar, and marked with the different superscripts are significantly different b

** The difference is significant at the 0.05 level (adjust sig = 0.041)*

Appendix I Relationships between Confounding Factors and Scores for Eating Habits and Nutrition Attitudes

1. Relationship between eating habits and education

Eating habits	Education groups						P value *(Kruskal-Wallis test)*
	High school (*n* = 5)		Undergraduate and college (*n* = 67)		Postgraduate (*n* = 11)		
	Median	95% CI	Median	95% CI	Median	95% CI	
(1) Consumption of different food groups – whether meet guidelines	9.0	7.9 - 9.3	8.0	8.2 - 8.6	9.0	7.9 - 9.3	0.519
(2) Recommended supplements & food for pregnant women by Western nutrition	29.0	14.8 - 35.6	25.0	23.2 - 26.9	25.0	16.9 - 28.6	0.748
(3) Recommended supplements & food for pregnant women by TCM nutrition	8.0	2.0 - 11.6	9.0	7.3 - 8.9	9.0	6.0 - 10.2	0.392
(4) Food safety	17.0	11.7 - 19.9	17.0	15.9 - 17.2	17.0	15.7 - 18.5	0.779
(5) Weight control	6.0	3.0 - 7.8	6.0	5.2 - 6.3	7.0	4.5 - 8.0	0.671
(6) Avoiding drinking alcohol	constant = 6.0		6.0	5.8 - 6.0	6.0	5.7 - 6.1	0.561
(7) Special eating habits (controlling sugar, fat, and salt intake)	19.0	17.1 - 20.9	19.5	19.0 - 20.0	20.5	19.0 - 21.6	0.286

2. Relationship between nutrition attitudes and education

	Education groups						P value *(Kruskal-Wallis test)*
	High school (n = 5)		Undergraduate and college (n = 67)		Postgraduate (n = 11)		
	Median	95% CI	Median	95% CI	Median	95% CI	
1. General nutrition attitudes							
⑴ Caring about nutrition	25.0	22.5 - 28.3	25.0	24.2 - 25.9	28.0	24.1 - 30.5	0.270
⑵ Food safety	4.0	1.7 - 5.5	5.0	4.1 - 4.6	5.0	4.5 - 5.1	0.049*
⑶ Avoiding alcohol	constant = 5.0		5.0	4.5 - 4.9	5.0	4.3 - 5.2	0.494
⑷ Weight control	10.0	8.5 - 10.7	10.0	7.8 - 8.9	10.0	6.8 - 10.4	0.430
2. Western nutrition attitudes							
⑴ Caring & learning about Western nutrition	19.0	15.8 - 21.8	19.0	17.4 - 19.0	19.0	17.1 - 21.5	0.698
⑵ Overall Western nutrition attitudes	6.0	5.7 - 7.1	7.0	6.8 - 7.5	8.0	6.6 - 8.8	0.186
⑶ Western nutrition attitudes for adults	18.0	16.1 - 20.7	18.0	17.2 - 18.6	18.0	16.0 - 20.7	0.881
⑷ Western attitudes for pregnant period only	26.0	21.1 - 31.4	26.0	25.5 - 27.7	25.5	21.6 - 27.4	0.383
* There was no significant difference when comparing each of the two groups.							

	Education groups						P value *(Kruskal-Wallis test)*
	High school (*n* = 5)		Undergraduate and college (*n* = 67)		Postgraduate (*n* = 11)		
	Median	95% CI	Median	95% CI	Median	95% CI	
3. TCM nutrition attitudes							
⑴ Caring & learning about TCM nutrition	18.0	12.7 - 20.9	17.0	16.2 - 17.6	15.0	14.4 - 17.0	0.299
⑵ Overall TCM nutrition attitudes	10.0	7.6 - 13.6	11.0	10.2 - 11.2	11.0	8.3 - 12.0	0.928
⑶ TCM nutrition attitudes for adults	11.0	9.4 - 13.0	12.0	11.1 - 12.1	12.0	9.4 - 12.6	0.807
⑷ TCM attitudes for pregnant period only	10.0	8.5 - 12.3	10.0	8.5 - 9.8	9.0	4.1 - 10.8	0.524

3. Relationship between eating habits and whether regularly eat with other Chinese

	Whether regularly eat with other Chinese				P value *(Mann-Whitney U test)*
	Yes (n = 54)		No (n = 28)		
	Median	95% CI	Median	95% CI	
(1) Consumption of different food groups – whether meet guidelines	8.0	8.3 - 8.8	8.0	7.9 - 8.6	0.146
(2) Recommended supplements & food for pregnant women by Western nutrition	24.0	22.2 - 26.2	28.0	22.7 - 29.7	0.224
(3) Recommended supplements & food for pregnant women by TCM nutrition	9.0	7.2 - 8.9	10.0	6.4 - 9.5	0.191
(4) Food safety	17.0	15.8 - 17.2	17.0	15.6 - 17.7	0.768
(5) Weight control	6.0	4.8 - 6.1	7.0	5.7 - 7.4	0.075
(6) Avoiding drinking alcohol	6.0	5.9 - 6.0	6.0	5.8 - 6.1	1.000
(7) Special eating habits (controlling sugar, fat, and salt intake)	19.5	19.1 - 20.1	20.0	18.7 - 20.4	0.722

4. Relationship between nutrition attitudes and whether regularly eat with other Chinese

	Whether regularly eat with other Chinese				P value *(Mann-Whitney U test)*
	Yes (n = 54)		No (n = 28)		
	Median	95% CI	Median	95% CI	
1. General nutrition attitudes					
⑴ Caring about nutrition	25.0	24.6 - 26.2	26.0	23.9 - 27.5	0.812
⑵ Food safety	5.0	4.3 - 4.7	4.0	3.6 - 4.6	0.087
⑶ Avoiding alcohol	5.0	4.5 - 4.9	5.0	4.4 - 5.0	0.623
⑷ Weight control	10.0	7.8 - 9.1	10.0	7.8 - 9.4	0.951
2. Western nutrition attitudes					
⑴ Caring & learning about Western nutrition	19.0	17.8 - 19.4	19.0	17.0 - 19.6	0.751
⑵ Overall Western nutrition attitudes	7.0	6.7 - 7.5	8.0	6.8 - 0.8	0.393
⑶ Western nutrition attitudes for adults	18.0	17.3 - 18.8	18.0	16.7 - 19.4	0.835
⑷ Western attitudes for pregnant period only	26.0	24.7 - 27.2	26.5	25.4 - 28.9	0.269

	Whether regularly eat with other Chinese				P value *(Mann-Whitney U test)*
	Yes (*n* = 54)		No (*n* = 28)		
	Median	95% CI	Median	95% CI	
3. TCM nutrition attitudes					
⑴ Caring & learning about TCM nutrition	17.0	16.1 - 17.6	16.0	15.5 - 17.6	0.463
⑵ Overall TCM nutrition attitudes	11.0	9.9 - 11.1	10.0	10.1 - 11.6	0.876
⑶ TCM nutrition attitudes for adults	12.0	11.2 - 12.2	11.0	10.4 - 12.1	0.305
⑷ TCM attitudes for pregnant period only	10.0	8.7 - 10.0	9.5	6.7 - 9.8	0.773

Appendix J Participants' Eating Habits

1) Participants' consumption of food groups

	Servings of food per day					
Food groups	Never	Less than one serving per day	1 serving per day	2 servings per day	3 servings per day	4 or more servings per day
Fruits	----	3 (3.6)	20 (24.1)	28 (33.7)	22 (26.5)	10 (12.0)
Vegetables	----	4 (4.8)	17 (20.2)	32 (38.1)	26 (31.0)	5 (6.0)
Bread	2 (2.5)	24 (30.4)	41 (51.9)	9 (11.4)	3 (3.8)	----
Other cereals as main food	----	11 (13.1)	39 (46.4)	25 (29.8)	9 (10.7)	----
Other cereals (such as biscuits, crackers, muesli, and cornflakes)	6 (7.4)	38 (46.9)	26 (32.1)	11 (13.1)	----	----
Dairy food	1 (1.2)	17 (20.5)	29 (34.9)	30 (36.1)	6 (7.2)	----
Meat, egg, and seafood	1 (1.2)	9 (10.8)	18 (21.7)	34 (41.0)	21 (25.3)	----

2) Whether participants' food consumption meet the nutrition recommendation

Whether meet nutrition recommendation	Fruits ≥ 2 servings/d	Vegetables ≥ 4 servings/d	Cereals ≥ 6 servings/d	Dairy food ≥ 3 servings/d	Meat, egg, and seafood ≥ 2 servings/d
Yes	60 (72.3%)	5 (6.0%)	2 (2.4%)	6 (7.2%)	55 (66.3)
No	23 (27.7%)	79 (94.0%)	82 (97.6%)	77 (92.8%)	28 (33.7)

3) Consumption of food and supplements relating to Western nutrition recommendations for pregnant women

Questions	Options						
	Never	Less than once per week	1 - 2 times per week	3 - 4 times per week	5 - 6 times per week	7 or more times per week	Don't know
Iron rich food	4 (4.8)	10 (11.9)	28 (33.3)	22 (26.2)	9 (10.7)	4 (4.8)	7 (8.3)
Iron supplements	27 (32.5)	5 (6.0)	1 (1.2)	11 (13.3)	8 (9.6)	27 (32.5)	4 (4.8)
Iodine rich food	7 (8.3)	17 (20.2)	29 (34.5)	10 (11.9)	6 (7.1)	8 (9.5)	7 (8.3)
Iodine supplements	25 (30.1)	6 (7.2)	7 (8.4)	8 (9.6)	7 (8.4)	27 (32.5)	3 (3.6)
Foods fortified with folic acid	14 (17.1)	9 (11.0)	15 (18.3)	13 (15.9)	8 (9.8)	13 (15.9)	10 (12.2)
Folic acid supplements (during the first trimester of pregnancy)	7 (8.3)	2 (2.4)	1 (1.2)	6 (7.1)	8 (9.5)	57 (67.9)	3 (3.6)

How often do you …?	Options				
	Never	Rarely	Sometimes	Regularly	Always
choose iodised salt when you use salt during pregnancy	14 (16.7)	14 (16.7)	8 (9.5)	16 (19.0)	32 (38.1)

4) Consumption of food and supplements relating to TCM nutrition recommendations for pregnant women

Questions	Options						
	Never	Less than once per week	1 - 2 times per week	3 - 4 times per week	5 - 6 times per week	7 or more times per week	Don't know
Blood activating (i.e. huo xue) food	34 (40.5)	18 (21.4)	14 (16.7)	5 (6.0)	----	1 (1.2)	12 (14.3)
Yin and blood nourishing (i.e. zi yin yang xue) food	22 (26.2)	17 (20.2)	21 (25.5)	7 (8.3)	3 (3.6)	1 (1.2)	13 (15.5)
Kidney nourishing (i.e. bu shen) food	28 (34.1)	25 (30.5)	10 (12.2)	4 (4.9)	----	1 (1.2)	14 (17.1)

5) Food safety and weight control

Questions	Options				
How often do you …?	Never	Rarely	Sometimes	Regularly	Always
(1) Food safety					
Eat leftovers which are stored in the fridge for more than two days	22 (26.8)	25 (30.5)	23 (28.0)	11 (13.4)	1 (1.2)
Wash hands between preparing raw and cooked food	5 (6.0)	6 (7.1)	6 (7.1)	17 (20.2)	50 (59.5)
Clean kitchenware between preparing raw and cooked food	2 (2.4)	4 (4.8)	6 (7.1)	14 (16.7)	58 (69.0)
Eat cold food (e.g. cooked meat and sandwiches that are stored in the fridge) during pregnancy	41 (48.8)	27 (32.1)	11 (13.1)	4 (4.8)	1 (1.2)
(2) Weight control					
Limit your weight gain	18 (21.7)	11 (13.3)	28 (33.7)	16 (19.3)	10 (12.0)
Eat as much as you want	9 (10.8)	22 (26.5)	22 (26.5)	16 (19.3)	14 (16.9)

6) Alcohol

Question	Options						
How often do you drink alcohol (e.g. wine, beer, and spirits) during pregnancy?	Never	Less than once per week	1 - 2 times per week	3 - 4 times per week	5 - 6 times per week	7 or more times per week	Don't know
	81 (96.4)	2 (2.4)	----	1 (1.2)	----	----	----

7) Selection on oil, bread, rice, and milk

Questions	Options	n (%)
What type of fat or oil do you use most often when cooking?	Butter blend	1 (1.2)
	Oil	82 (98.8)
What type of oil do you use most often when cooking?	Canola oil	14 (17.9)
	Olive oil	25 (32.1)
	Salad & cooking oil	9 (11.5)
	Soya oil	18 (23.1)
	Sunflower oil	4 (5.1)
	Peanut oil	3 (3.8)
	Rice oil	1 (1.3)
	Grape seeds oil	2 (2.6)
	Vegetable oil	2 (2.6)
What type of butter or margarine spread do you use the most?	None, I don't use butter or margarine as a spread	40 (47.6)
	Butter (including semi soft)	19 (22.6)
	Butter and margarine blend	6 (7.1)
	Margarine - full fat	2 (2.4)
	Light or reduced fat margarine and low fat varieties	12 (14.3)
	Other (not mention in question 18)	2 (2.4)
	Don't know	3 (3.6)

Questions	Options	n (%)
What type of milk do you use the most?	None, I don't use milk	4 (4.8)
	Whole or standard milk	42 (50.0)
	Reduced fat	17 (20.2)
	Skim or trim	14 (16.7)
	Soymilk	7 (8.3)
	Other	----
What type of bread, rolls or toast do you eat the most?	None, I don't eat them	3 (3.7)
	White	22 (26.8)
	High fibre white	10 (12.2)
	Light grain bread or wholemeal bread	24 (29.3)
	Heavy grain bread	23 (28.0)
What type(s) of rice do you usually eat?	None, I don't eat rice	1 (1.2)
	White rice only	30 (35.7)
	White rice more often	35 (41.7)
	Half white rice and half brown	13 (15.5)
	Brown rice more often	5 (6.0)
	Brown rice only	----

8) Consumption of food high in fat, salt, and sugar

Questions: How often do you eat/drink…?	Options						
	Never	Less than once per week	1 - 2 times per week	3 - 4 times per week	5 - 6 times per week	7 or more times per week	Don't know
Hot chips, French fries, wedges, or kumara chips	14 (16.7)	48 (57.1)	21 (25.0)	----	----	----	1 (1.2)
Lollies, sweets, chocolate and confectionary	5 (6.0)	31 (36.9)	24 (28.6)	18 (21.4)	4 (4.8)	2 (2.4)	----
Fruit juices and drinks	14 (17.1)	30 (36.6)	19 (23.2)	12 (14.6)	3 (3.7)	4 (4.9)	----
Soft drinks and energy drinks	37 (45.1)	29 (35.4)	7 (8.5)	6 (7.3)	2 (2.4)	1 (1.2)	----
Fresh/frozen/canned fish or shellfish	17 (20.5)	25 (30.1)	29 (34.9)	9 (10.8)	3 (3.6)	----	----
Battered/fried fish or shellfish	36 (43.4)	41 (49.4)	5 (6.0)	----	----	----	1 (1.2)

9) Eating habits relating to reducing salt and fat intake

How often do you …?	Options				
	Never	Rarely	Sometimes	Regularly	Always
choose low or reduced salt varieties of foods instead of the standard variety	23 (27.4)	36 (42.9)	19 (22.6)	3 (3.6)	3 (3.6)
add salt to your food after it has been cooked or prepared	27 (32.1)	18 (21.4)	15 (17.9)	12 (14.3)	12 (14.3)
eat meat without removing the fat	22 (26.5)	20 (24.1)	17 (20.5)	13 (15.7)	11 (13.3)
choose low or reduced fat varieties of food instead of the standard variety	18 (21.7)	26 (31.3)	18 (21.7)	16 (19.3)	5 (6.0)
choose iodised salt when you use salt during pregnancy	14 (16.7)	14 (16.7)	8 (9.5)	16 (19.0)	32 (38.1)

Appendix K Participants' Attitudes towards Nutrition

1) Overall nutrition attitudes

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
(1) General care about nutrition						
I seldom/never think about my eating habits.	23 (27.4)	43 (51.2)	13 (15.5)	3 (3.6)	1 (1.2)	1 (1.2)
I stop eating only when I cannot eat any more.	25 (30.5)	32 (39.0)	14 (17.1)	10 (12.2)	1 (1.2)	----
I care about the food I eat.	6 (7.1)	1 (1.2)	9 (10.7)	41 (48.8)	27 (32.1)	----
I eat what I want regardless of what is good for me.	11 (13.1)	33 (39.3)	21 (25.0)	17 (20.2)	2 (2.4)	----
Knowing that a food is good for me has little influence on what I choose to eat.	8 (9.6)	21 (25.3)	28 (33.7)	24 (28.9)	1 (1.2)	1 (1.2)
Eating well cannot help me prevent disease.	19 (22.6)	34 (40.5)	17 (20.2)	12 (14.3)	2 (2.4)	----
My current diet will help keep me healthy.	1 (1.2)	5 (6.0)	21 (25.0)	45 (53.6)	9 (10.7)	3 (3.6)
(2) Food safety						
It is important for me to be careful with my food safety.	2 (2.4)	2 (2.4)	3 (3.6)	29 (34.5)	47 (56.0)	1 (1.2)
(3) Avoid drinking alcohol						
It is important for me to avoid drinking alcohol during pregnancy.	3 (3.6)	----	3 (3.6)	12 (14.3)	66 (78.6)	----

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
(4) Weight control						
It does not matter how much weight I gain during pregnancy.	27 (32.1)	37 (44.0)	8 (9.5)	9 (10.7)	3 (3.6)	----
It does not matter how much food I eat because I am eating for two during pregnancy.	22 (26.2)	32 (38.1)	19 (22.6)	7 (8.3)	4 (4.8)	----

2. Western nutrition attitudes

⑴ Care and learning about Western nutrition

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
I am too busy to concern myself with western nutrition.	14 (16.7)	36 (42.9)	25 (29.8)	7 (8.3)	2 (2.4)	----
I try hard to learn about western nutrition.	3 (3.6)	9 (10.8)	30 (36.1)	32 (38.6)	8 (9.6)	1 (1.2)
I am not interested in learning about food sources of nutrients (e.g. what types of food contain calcium).	16 (19.0)	46 (54.8)	15 (17.9)	7 (8.3)	----	----
I am not interested in learning about the influence of nutrients on health.	19 (22.6)	48 (57.1)	13 (15.5)	4 (4.8)	----	----
I try hard to keep up with the latest western nutrition information.	1 (1.2)	7 (8.3)	30 (35.7)	37 (44.0)	9 (10.7)	----

2) General Western nutrition attitudes

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
I care about my energy/calorie intake.	1 (1.2)	11 (13.3)	34 (41.0)	28 (33.7)	9 (10.8)	----
I do not care about what nutrients I get from food.	18 (21.4)	38 (45.2)	21 (25.0)	7 (8.3)	----	----

3) Healthy eating for adults

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
It is important for me to eat low fibre food.	5 (6.0)	25 (29.8)	23 (27.4)	25 (29.8)	6 (7.1)	----
It is important for me to eat low sugar food.	----	9 (10.7)	16 (19.0)	41 (48.8)	18 (21.4)	----
It is important for me to eat low salt food.	----	6 (7.1)	20 (23.8)	43 (51.2)	15 (17.9)	----
It is important for me to eat food low in fat.	----	9 (10.7)	16 (19.0)	41 (48.8)	18 (21.4)	----
It is important for me to eat food low in saturated fat.	1 (1.2)	8 (9.5)	21 (25.0)	40 (47.6)	13 (15.5)	1 (1.2)
It is important for me to eat food low in omega-3 fatty acids.	5 (6.0)	16 (19.0)	21 (25.0)	28 (33.3)	14 (16.7)	----

4) Western attitudes for pregnant period only

Ideas *(During pregnancy, it is important for me to consume/choose...)*	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
Food fortified with folic acid	----	3 (3.6)	17 (20.2)	44 (52.4)	20 (23.8)	----
Iron rich food	----	----	13 (15.5)	45 (53.6)	25 (29.8)	1 (1.2)
Low iodine food	3 (3.6)	16 (19.0)	32 (38.1)	24 (28.6)	4 (4.8)	5 (6.0)
Folic acid supplements (during the first trimester of pregnancy)	----	1 (1.2)	4 (4.8)	36 (42.9)	43 (51.2)	----
Iron supplements	1 (1.2)	3 (3.6)	24 (28.6)	32 (38.1)	23 (27.4)	1 (1.2)
Iodine supplements	1 (1.2)	3 (3.7)	26 (31.7)	30 (36.6)	19 (23.2)	3 (3.7)
Iodised salt when I use salt	1 (1.2)	4 (4.8)	24 (28.9)	29 (34.9)	21 (25.3)	4 (4.8)

3. TCM nutrition attitudes

1) Caring and learning about TCM nutrition

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
I am too busy to concern myself with Traditional Chinese Medicine (TCM) nutrition.	10 (11.9)	25 (29.8)	35 (41.7)	11 (13.1)	1 (1.2)	2 (2.4)
I try hard to learn about TCM nutrition.	2 (2.4)	9 (10.7)	42 (50.0)	28 (33.3)	2 (2.4)	1 (1.2)
I am not interested in learning about TCM food features (e.g. what types of food belong to hot/yang food).	6 (7.1)	36 (42.9)	27 (32.1)	13 (15.5)	2 (2.4)	----
I am not interested in learning the influence of TCM features (e.g. yin and yang features of food) on health.	7 (8.3)	42 (50.0)	24 (28.6)	10 (11.9)	----	1 (1.2)
I try hard to keep up with the latest TCM nutrition information.	1 (1.2)	7 (8.3)	44 (52.4)	29 (34.5)	3 (3.6)	----

2) General TCM nutrition attitudes

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
I do not care about the balance of cold and hot (or yin and yang) food in meals.	6 (7.2)	39 (47.0)	24 (28.9)	12 (14.5)	1 (1.2)	1 (1.2)
I care about adjusting my diet according to the seasons.	----	8 (9.6)	30 (36.1)	36 (43.4)	7 (8.4)	2 (2.4)
I care about adjusting my diet according to my body constitution.	----	3 (3.6)	22 (26.2)	47 (56.0)	12 (14.3)	----

3) Healthy eating for adults

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
It is important for me to eat greasy food.	28 (33.3)	41 (48.8)	9 (10.7)	5 (6.0)	1 (1.2)	----
It is important for me to eat light food.	----	3 (3.6)	21 (25.3)	46 (55.4)	13 (15.7)	----
It is important for me to eat spleen and stomach strengthening (i.e. jian pi wei) foods.	----	4 (4.8)	25 (29.8)	38 (45.2)	13 (15.5)	4 (4.8)

4) TCM attitudes for pregnant period only

Ideas (*During pregnancy, it is important for me to consume/choose...)*	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
⑴ blood activating (i.e. huo xue) food	11 (13.1)	19 (22.6)	32 (38.1)	12 (14.3)	3 (3.6)	7 (8.3)
⑵ yin and blood nourishing (i.e. zi yin yang xue) food	1 (1.2)	5 (6.0)	29 (34.5)	36 (42.9)	5 (6.0)	8 (9.5)
⑶ kidney nourishing (i.e. bu shen) food	2 (2.4)	8 (9.6)	38 (45.8)	19 (22.9)	5 (6.0)	11 (13.3)

Appendix L Codes of the Scales for Eating Habits, Attitudes towards Nutrition, and Acculturation

1. Eating habits Scales

1) Whether meet the New Zealand recommended servings of food groups for pregnancy

Food groups	Servings	Code	Servings	Code
Fruits	< 2 servings/d	1	≥ 2 servings/d	2
Vegetables	< 4 servings/d	1	≥ 4 servings/d	2
Cereals	< 6 servings/d	1	≥ 6 servings/d	2
Dairy food	< 3 servings/d	1	≥ 3 servings/d	2
Meat, eggs, and seafood	< 2 servings/d	1	≥ 2 servings/d	2

2) Consumption of supplements and food for pregnancy relating to Western nutrition

How often do you consume…	Frequency (times/week)						
	Never	< 1	1 - 2	3 - 4	5 - 6	≥ 7	Don't known
Iron rich food	1	2	3	4	5	6	0
Iron supplements	1	2	3	4	5	6	0
Iodine rich food	1	2	3	4	5	6	0
Iodine supplements	1	2	3	4	5	6	0
Foods fortified with folic acid	1	2	3	4	5	6	0
Folic acid supplements (during the first trimester of pregnancy)	1	2	3	4	5	6	0

How often do you choose iodised salt when you use salt?	Never	Rarely	Sometimes	Regularly	Always
	1	2	3	4	5

3) Consumption of food with specific TCM features during pregnancy

How often do you eat…	Frequency (times/week)						
	Never	< 1	1 - 2	3 - 4	5 - 6	≥ 7	Don't known
Blood activating (i.e. huo xue) food	6	5	4	3	2	1	0
Yin and blood nourishing (i.e. zi yin yang xue) food	1	2	3	4	5	6	0
Kidney nourishing (i.e. bu shen) food	1	2	3	4	5	6	0

4) Food safety

How often do you …	Never	Rarely	Sometimes	Regularly	Always
Eat leftovers which are stored in the fridge for more than two days	5	4	3	2	1
Wash hands between preparing raw and cooked food	1	2	3	4	5
Clean kitchen ware between preparing raw and cooked food	1	2	3	4	5
Eat cold food (e.g. cooked meat and sandwiches that are stored in the fridge)	5	4	3	2	1

5) Weight control

How often do you …	Never	Rarely	Sometimes	Regularly	Always
Limit your weight gain	1	2	3	4	5
Eat as much as you want	5	4	3	2	1

6) Avoiding alcohol

	Frequency (times/week)						
	Never	< 1	1 - 2	3 - 4	5 - 6	≥ 7	Don't known
How often do you drink alcohol (e.g. wine, beer, and spirits)?	6	5	4	3	2	1	0

7) Healthy eating for adults

① The selections of bread

Question	Bread	Score
What type of bread, rolls or toast do you eat the most?	Don't Know	0
	None, I don't eat them	0
	Other	0
	White	1
	High fibre white	2
	Light grain bread or wholemeal bread	2
	Heavy grain bread	2

② The selection of rice

Question	Rice	Score
What type(s) of rice do you usually eat?	Don't Know	0
	None, I don't eat rice	0
	White rice only	1
	White rice more often	2
	Half white rice and half brown	2
	Brown rice more often	2
	Brown rice only	2

③ The selection of milk

Question	Milk	Score
What type of milk do you use the most?	Don't know	0
	None, I don't use milk	0
	Soymilk	0
	Other (e.g. rice and goat's milk)	0
	Whole or standard milk	1
	Reduced fat	2
	Skim or trim	2

④ Limiting consuming food high in fat, sugar, and salt

How often do you eat/drink…?	Frequency (times/week)						
	Never	< 1	1 - 2	3 - 4	5 - 6	≥ 7	Don't known
Hot chips, French fries, wedges, or kumara chips	6	5	4	3	2	1	0
Lollies, sweets, chocolate and confectionary	6	5	4	3	2	1	0
Fruit juices and drinks	6	5	4	3	2	1	0
Soft drinks and energy drinks and energy drinks	6	5	4	3	2	1	0
Battered/fried fish or shellfish	6	5	4	3	2	1	0

⑤ Limiting fat, sugar, and salt intake

How often do you …	Never	Rarely	Sometimes	Regularly	Always
Choose low or reduced salt varieties of foods instead of the standard variety	1	2	3	4	5
Add salt to your food after it has been cooked or prepared	5	4	3	2	1
Eat meat without removing the fat	5	4	3	2	1
Choose low or reduced fat varieties of food instead of the standard variety	1	2	3	4	5

2. Nutrition attitudes scales

1) Overall nutrition attitudes

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
① Caring about nutrition						
I seldom/never think about my eating habits.	5	4	3	2	1	0
I stop eating only when I cannot eat any more.	5	4	3	2	1	0
I care about the food I eat.	1	2	3	4	5	0
I eat what I want regardless of what is good for me.	5	4	3	2	1	0
Knowing that a food is good for me has little influence on what I choose to eat.	5	4	3	2	1	0
Eating well cannot help me prevent disease.	5	4	3	2	1	0
My current diet will help keep me healthy.	1	2	3	4	5	0
② Food safety						
It is important for me to be careful with my food safety.	1	2	3	4	5	0
③ Weight control (during pregnancy)						
It does not matter how much weight I gain.	5	4	3	2	1	0
It does not matter how much food I eat because I am eating for two.	5	4	3	2	1	0
④ Avoiding alcohol						
It is important for me to avoid drinking alcohol.	1	2	3	4	5	0

2) Western nutrition attitudes

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
① Caring and learning about Western nutrition						
I am too busy to concern myself with western nutrition.	5	4	3	2	1	0
I try hard to learn about western nutrition.	1	2	3	4	5	0
I am not interested in learning about food sources of nutrients.	5	4	3	2	1	0
I am not interested in learning about the influence of nutrients on health.	5	4	3	2	1	0
I try hard to keep up with the latest western nutrition information.	1	2	3	4	5	0
② Overall Western nutrition attitudes						
I care about my energy/calorie intake.	1	2	3	4	5	0
I do not care about what nutrients I get from food.	5	4	3	2	1	0
③ Healthy eating for adults						
It is important for me to eat low fibre food.	5	4	3	2	1	0
It is important for me to eat low sugar food.	1	2	3	4	5	0
It is important for me to eat low salt food.	1	2	3	4	5	0
It is important for me to eat food low in fat.	1	2	3	4	5	0
It is important for me to eat food low in saturated fat.	1	2	3	4	5	0

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
④ Healthy eating for pregnant period only (During pregnancy, it is important for me to consume/choose...)						
Food fortified with folic acid	1	2	3	4	5	0
Iron rich food	1	2	3	4	5	0
Low iodine food	5	4	3	2	1	0
Folic acid supplements (during the first trimester of pregnancy)	1	2	3	4	5	0
Iron supplements	1	2	3	4	5	0
Iodine supplements	1	2	3	4	5	0
Iodised salt when I use salt	1	2	3	4	5	0

3) TCM nutrition attitudes

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
① Caring and learning about TCM nutrition						
I am too busy to concern myself with Traditional Chinese Medicine (TCM) nutrition.	5	4	3	2	1	0
I try hard to learn about TCM nutrition.	1	2	3	4	5	0
I am not interested in learning about TCM food features (e.g. what types of food belong to hot/yang food).	5	4	3	2	1	0
I am not interested in learning the influence of TCM features (e.g. yin and yang features of food) on health.	5	4	3	2	1	0
I try hard to keep up with the latest TCM nutrition information.	1	2	3	4	5	0

Ideas	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
② Overall TCM nutrition attitudes						
I do not care about the balance of cold and hot (or yin and yang) food in meals.	5	4	3	2	1	0
I care about adjusting my diet according to the seasons.	1	2	3	4	5	0
I care about adjusting my diet according to my body constitution.	1	2	3	4	5	0
③ Healthy eating for adults						
It is important for me to eat greasy food.	5	4	3	2	1	0
It is important for me to eat light food.	1	2	3	4	5	0
It is important for me to eat spleen and stomach strengthening (i.e. jian pi wei) food.	1	2	3	4	5	0
④ Healthy eating for pregnant period only (During pregnancy, it is important for me to consume...)						
Blood activating (i.e. huo xue) food	5	4	3	2	1	0
Yin and blood nourishing (i.e. zi yin yang xue) food	1	2	3	4	5	0
Kidney nourishing (i.e. bu shen) food	1	2	3	4	5	0

4) Acculturation scale

	Only Chinese	Chinese better than English	Both equally	English better than Chinese	Only English
① In general, what language(s) do you read and speak?	1	2	3	4	5

② Language and media preferences	Only Chinese	More Chinese than English	Both equally	More English than Chinese	Only English
What was the language(s) you used as a child?	1	2	3	4	5
What language(s) do you usually speak at home?	1	2	3	4	5
In which language(s) do you usually think?	1	2	3	4	5
What language(s) do you usually speak with your friends?	1	2	3	4	5
In what language(s) are the T.V. programs you usually watch?	1	2	3	4	5
In what language(s) are the radio programs you usually listen to?	1	2	3	4	5
In general, in what language(s) are the movies, T.V. and radio programs you *prefer* to watch and listen to?	1	2	3	4	5

③ Social relationships	All Chinese (including people with Chinese cultural origins)	More Chinese than New Zealanders	Half Chinese and half New Zealanders	More New Zealanders than Chinese	All New Zealanders
Your close friends are:	1	2	3	4	5
You prefer going to social gatherings/parties at which the people are:	1	2	3	4	5
The persons you visit or who visit you are:	1	2	3	4	5
If you could choose your children's friends, you would want them to be:	1	2	3	4	5