Characteristics of Western Dietary Pattern and its Association with Media Exposure in Two Generations of Hong Kong Chinese Women

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A Thesis Submitted in Partial Fulfilment
of the Requirements for the Degree of
Doctor of Philosophy
in
Public Health

The Chinese University of Hong Kong
August 2010

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Abstract (in English)

Background: Studies on the characteristics associated with the Western dietary pattern (DP) in Asia are limited. Understanding the family DP resemblance in Asia is of public health importance because of the possible beneficial effects of intergenerational transfer of traditional plant-based Asian diet. Studies about media influence on dietary behaviours in Asia are few and none studied the effects on the overall DP.

Objective: This study aims to examine the dietary and individual characteristics associated with Western DP, investigate the association between the practice of Western DP and media exposure, and qualitatively assess how media and other factors influence the dietary practices in two generations of Chinese women.

Methods: This thesis composes two studies as follows: 1)a cross-sectional study on Western DP and media exposure; 2)a qualitative study on media influences on dietary practices.

The cross-sectional study recruited 207 (103 mothers, 104 daughters) community-based women from a longitudinal study. Dietary intake was quantified by an interviewer-administered diet history questionnaire. A self-reported questionnaire assessed the media (newspapers, magazines, radio, television, and leisure-time internet use) and other exposures (demographics, leisure-time physical activities, and lifestyles). Anthropometric data are measured. Two major DPs (Western and prudent) were identified using principal component analysis. Generation-specific factors associated with DPs were identified by multiple linear regression analyses adjusted for age and energy intake.

The qualitative study enrolled 22 mothers and 13 daughters from the same study population for semi-structured in-depth interviews. Themes were identified corresponding to the environmental levels described by the Ecological Model, with quotations supported. The final themes were evaluated by participant validation.

Results: 1)Cross-sectional study: Western DP was characterised by higher intakes of meat (red, processed, poultry), fast foods, seafood, energy-dense foods (e.g. high-fat dairy, cakes and snacks), eggs, energy, fat, and dietary cholesterol. Daughters had a higher Western DP score than their mother. Western DP score was positively associated with the time spent on total media exposure and years living in Hong Kong for mothers, and with the time spent on TV viewing, mother's Western DP score, and smoking status for daughters. Western DP score was positively associated with the prevalence odds of being overweight and negatively associated with the frequency of family meals for both mothers and daughters.

2)Qualitative study: Three areas were discussed: i) Generational differences in dietary practices were apparent and it was attributable to the discrepancies in the food environment during childhood, attitudes towards family meals, and practices of regular meal schedules between generations; ii) Mothers were influential but did not recognize their influences on their adult daughters' diet. Ignorance of the importance of diet-health relationship in young adulthood was observed; iii) Effects of media food promotions were apparent in the presence of Westernized food environment and reduced family size. Health and diet information in the media induced both positive and negative effects on the dietary behaviours of Chinese women.

Conclusion: There is an intergenerational association for practicing Western DP within family. Mothers were influential in adult daughters' dietary intakes, through

modelling and family meals. A dose-response relationship exists between the practice of Western DP and media exposure in Chinese women. Public health strategies should consider promotion of family meals and empowerment of women on quick and healthy cooking skills as long-term approaches for family health promotion and obesity prevention. Policy evaluation of food or food-related advertising standards is necessary.

Keywords: mother, daughter, dietary pattern, media exposure, family meal, Western, TV viewing

Abstract (in Chinese)

摘要

背景: 在亞洲，有關西方飲食模式及其人群特徵的研究非常缺乏。了解亞洲家庭內飲食模式的相關性有助解決公共衛生問題。媒體對飲食行爲的影響之研究在亞洲很少，亦沒有研究分析媒體對整體飲食模式的影響。

目的: 本研究旨在查究西方飲食模式之膳食及其人群特徵，調查西方飲食模式的行爲與媒體接觸的關係，及以質量方法在兩代華人女性中了解媒體及其他因素對飲食行爲的影響。

方法: 本論文由兩個研究組成： 1)西方飲食模式與媒體接觸的橫斷面研究；及 2)媒體及其他因素對飲食習慣的影響之質量研究。

橫斷面研究從一項追蹤研究中成功招募 207 名 (103 位母親，104 位女兒) 在社區生活的成年女性。利用飲食歷史問卷以訪問形式評估膳食攝入量。以自我呈報方式評估媒體接觸(包括報紙、雜誌、電台、電視及餘暇互聯網使用)及其他相關因素(人口統計資料、餘暇體力活動及生活模式)。以測量方法收集人體測量數據。以主成分分析之統計方法選出兩種主要飲食模式(西方及審慎)。用多變量逐步迴歸模型及控制年齡及熱量攝入量的因素，識別每代與西方飲食模式有關的因素。

質量研究在同一研究人群中邀請 35 名 (22 位母親，13 位女兒)接受半結構性深入訪談。以生態模型所定的環境層面爲基礎，識別有語錄支持之主題思想。最終的主題思想經參加者審核及同意。

結果: 1)橫斷面研究：西方飲食模式爲進食較多肉類(紅肉、加工肉類、家禽)、快餐食品、海鮮、高熱量密度食物 (如高脂奶類、蛋糕及小食)、蛋；高熱量、脂肪及膳食膽固醇。女兒的西方飲食模式得分較其母親高。多變量迴歸分析指出母親之西方飲食模式得分與其總媒體接觸時間及其住港年期呈明顯正相關；女兒之西方飲食模式得分與其看電視時間、其母親之西方飲食模式得分及其是否吸煙者呈明顯正相關。兩代西方飲食模式得分與其出現過重機會呈正相關。兩代之西方飲食模式得分均與家庭進餐頻數呈明顯負相關。

2)質量研究：有三個討論範疇：i)兩代的飲食行爲有明顯差異。此差異可能與童年飲食環境的不同、年代對家庭膳食持不同態度及對實行定時進餐之分別有關；ii)母親沒有察覺其對成年女兒的飲食有影響力。觀察指出兩代均忽略年青成年期對健康的重要。iii)媒體對飲食推廣的影響在西化的飲食環境及縮小的家庭規模下十分明顯。健康及飲食資訊對華人女性的飲食行爲有正面及負面的作用。

結論:西方飲食模式在家庭兩代中有明顯的關係。母親對成年女兒的飲食有影響力，經飲食模式模仿及家庭膳食的影響。西方飲食模式行爲與媒體接觸時間在華人女性呈劑量反應關係。公共衛生政策應鼓勵家庭進餐頻數及強化婦女烹調快而健康的煮食技巧，作爲長遠家庭健康推廣及預防肥胖症的策略。有關食品及相關廣告的守則及指引之政策須作檢討。

關鍵字：母親，女兒，飲食模式，媒體接觸，家庭膳食，電視收看

List of Contributors

This study was designed by Professor Suzanne C HO, my supervisor, and myself. I conducted the dietary and questionnaire interviews for all daughter participants and part of interviews for mother participants in the cross-sectional study, all the qualitative interviews, all statistical data analyses, all identification of themes in the qualitative study, part of coding the dietary records, most of the result interpretation, and part of the participant recruitment. The contribution by other parties to the study is as follows.

Name of Department and Institute	Contributor	Contribution
Centre of Research and Promotion of Women's Health (CRPWH)	Research Fund	In both cross-section & qualitative studies · Financial support
World Cancer Research Fund (WCRF)	Research Grant Panel	In cross-section & qualitative studies · Financial support for the recruitment of participants and questionnaire interviews
CRPWH	Ms. Edwin So, Miss Siu-ying Yip	In the cross-sectional study · Part of dietary interviews for mother participants · Part of participant recruitment In the qualitative study · Part of interview note-taking
Studentship scheme of Chung Chi College, CUHK	Miss Kathy Leung	In the cross-sectional study · Part of the data entry · Most of dietary record coding In the qualitative study · Part of interview transcription
CRPWH	Ms. Monique Chan	In the cross-sectional study · Part of dietary interviews for mother participants · Part of participant recruitment
Studentship scheme of Chung Chi College, CUHK	Miss Florence Yeung	In the qualitative study · Part of interview note-taking · Part of interview transcription
CRPWH	Dr. Karine So	In the cross-sectional study · Medical consultation on all test results of complete blood picture (the blood test is provided as an incentive)
CRPWH	Miss Anna Tsang & Ms. Bella Lam	In the cross-sectional study · Part of the data entry In the qualitative study · Part of interview transcription

Acknowledgements

I would like to express all my gratitude to my Ph.D. supervisor, Professor Suzanne C Ho, Reader at the School of Public Health and Primary Care (SPHPC), for her inspiration, guidance, support, encouragement, and friendship; and providing me with many opportunities to develop and learn throughout my study.

Great appreciation is directed to the Centre of Research and Promotion of Women's Health and the World Cancer Research Fund (WCRF) International Research Grant for their financial support for the study. I would like to express a special thanks to WCRF for its generous support of the on-going longitudinal (MMDG) study on diet and lifestyle factors and mammographic density in Chinese women (P.I. Professor Suzanne C Ho), where the study participants were recruited.

I would like to express my gratitude to Professor Ignatius Yu, Associated Director (Research) of the SPHPC, and Professor Jean Woo, Professor of Medicine and Director of CUHK Centre of Nutritional Studies, for their valuable advice and comments in the study design and processes. A special thanks is given to Professor Zhang Xin Hua and Professor Wang Xiao Rong of the SPHPC, and Professor Chen Yu Ming of the School of Public Health of Sun Yat-sen University, for their comments on the study.

I would like to sincerely thank my colleagues, Ms. Edwin So and Ms. Monique Chan, for their support and assistance in subject recruitment and questionnaire interviews. I would also like to express my appreciation to Ms. Aprille Sham, Senior Technician (Research) of the SPHPC, for her advice on dietary record coding.

I would like to acknowledge the CRPWH teammates and the student helpers for their friendship, and I am indebted to them for their assistance and support in this study.

Last but not least, I would like to give my deepest thanks to all the study participants. The study would never be possible without their generous participation and co-operation.

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Abbreviations

Terms	Explanations
CI	Confidence interval
CUHK	The Chinese University of Hong Kong
DP	Dietary pattern
DR	Dietary record
FFQ	Food frequency questionnaire
HDL	High-density lipoprotein
HK	Hong Kong
HKSAR	Hong Kong Special Administrative Region
ICC	Intraclass correlation coefficient
PCA	Principal component analysis
MDQ	Media exposure questionnaire
MD record	Media exposure record
MMDG	The on-going longitudinal study on the dietary and lifestyle factors and the mammographic density in Hong Kong Chinese women
OR	Odds ratio
RRR	Reduced rank regression
SD	Standard deviation
TV	Television

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Chapter 1

Background, objectives, and thesis structure

1.1 Nutrition transition and the global burden of disease

Diet and nutrition are important determinants of health in both developed and developing countries. It is estimated that the annual global mortality attributable to nutrition-related risk factors is approximately 25 million people (1). Specifically, approximately 18.8 million deaths and 12.6% of the total global burden of disease are due to high blood pressure, high cholesterol, high body mass index, low fruit and vegetable consumption, and physical inactivity (1). The nutrition transition taking place in many Asian regions has been suggested to contribute to the increasing burden of colorectal cancer (2-4), breast cancer (3), cardiovascular risk factors including obesity (5-7), metabolic disorders (8;9), dislipidaemia, hypertension and type 2 diabetes (10;11) in these regions. In many Asian countries, the nutrition transition is consistently described as a "Westernization pattern" or "Western lifestyle" (12-15).

1.2 Western DP and health outcomes

The association of "Western diet" and health outcomes was first observed in ecological studies (16;17) and migrant studies (18;19). Populations living in Western countries have higher energy and fat intakes, and higher rates of chronic diseases than populations living in non-Western countries (16;20). Similar phenomena have also been observed in migrants of Asian origin living in Western countries (18;21-23). However, "Western diet" or "Western DP" is less systematically defined. Some studies considered various combinations of higher intakes of food groups such as eggs, dairy products, meat, cheese, snack foods, soft drinks, or fruits, as indicators of Western diet (15;24;25). Other studies cite higher energy and nutrient intakes such as total fat, animal fat, or

sugar, as indicators of Western diet (15;26). Not until the early 1990s was the Western dietary pattern defined using a data reduction method called principal component analysis (PCA) to assess its association with various diseases and health outcomes.

1.2.1 In adulthood

Most studies on Western DP and health outcomes have been conducted in middle-age or elderly populations. Adherence to Western DP was associated with incident colorectal cancer (27-30), colorectal cancer recurrence and mortality (31), gastric cancer (32), and cancer mortality in women (33). It has also been associated with incidences of coronary heart disease (34;35), acute myocardial infarction (36), stroke in women (37), and cardiovascular mortality in women (33). Furthermore, Western DP is linked to diabetes mellitus (38;39) and metabolic syndrome (40). On the other hand, it was less consistently associated with breast cancer (41-45) and all-cause mortality (33;46). In general, adherence to Western DP (highest vs. lowest group) increases the risk of non-communicable diseases by 16 to 86 percent. Cross-sectional analyses also indicated positive associations between Western DP and inflammatory markers (47), serum lipid and insulin (48), glucose intolerance (49), overweight (50;51), weight gain (52;53); but a negative association with serum betaine (a derivative from the oxidation of choline, which is a possible protective factor for cardiovascular diseases) (54).

1.2.2 The early years of life to adolescence

Although only few studies have related Western DP with health outcomes in children and adolescents, the findings support the negative effects of Western DP on health. Similar to the adult population, Western DP showed a positive association with obesity in children and adolescents (55). Also, Western DP was associated with poor mental health in early adolescence, such as aggressive or depressive behaviours (56).

Children or adolescents are likely to be protected by their young age from the physiological effects of Western DP on current health; however, unfavourable dietary practices developed at a young age are likely to carry forward into adulthood (57). Furthermore, exposure to Western DP during the prenatal period may have negative impacts on foetal health. Western DP during pregnancy has been associated with serious birth defects such as hare lip and/or cleft palate (58).

1.3 Intergenerational transfer of traditional or Western dietary practices?

Globalization of food environment is among the major factors contributing to the nutrition transition in many Asian countries (59;60). Migrant studies have indicated remarkable dietary changes towards Westernized patterns in populations of Asian origin soon after exposure to Western food environments (61-64). However, the migrant studies have also revealed some important factors associated with adherence to traditional diet in a Westernized food environment. Although food cost, convenience and availability of foods are most frequently mentioned, family and cultural factors such as presence of children (65), traditional food beliefs (66;67), or dietary preferences and attitudes of individuals or family members (66;68) are also salient in making food choices. Family studies have indicated resemblance of food, energy, nutrients intakes and supportive family roles in transferring cultural beliefs, food preferences and practices from generation to generation (69-71). The nutrition transition taking place in many Asian regions raises an important question about the fundamental role of family in transferring traditional dietary practices. Does the family still play a role in transferring the traditional plant-based Asian diet or does it transfer a Westernizing diet from one generation to another?

1.4 Media effects on dietary behaviours

Global food advertising and promotions are considered one of the major driving forces leading the Asian diet towards a Western pattern (59). The global soft drink and fast food companies, such as Coca-cola, McDonald's, Kentucky Fried Chicken, and Pizza Hut, continue occupying the top 10 media advertising spenders in China, India, Singapore, Vietnam, Taiwan, and Hong Kong since 1990s (72). In addition, the priming effects of such food promotions are likely further enhanced by the rapid expansion of fast food outlets in Asia over the past two decades. For example, between 1991 and 2001, the number of McDonald's outlets increased from 1 to 430 in China, from 8 to 324 in South Korea, from 54 to 351 in Taiwan, and from 38 to 237 in the Philippines (72). Other mechanisms associated with media exposure may also include distraction during eating (73), mood-induced eating (74), and cultivation effects of dietary norms (75;76) and serving sizes (77). Most studies have been conducted in women (74;78-82), supporting the thesis that women are vulnerable to media influence. In addition, images of actresses and models in the media may depict standards of body size that may influence individual's dietary behaviours (83). However, very few studies have assessed the media influence on health in the Asian regions (84-86) and none have investigated the media influence on dietary behaviours .

1.5 Limitations of existing data

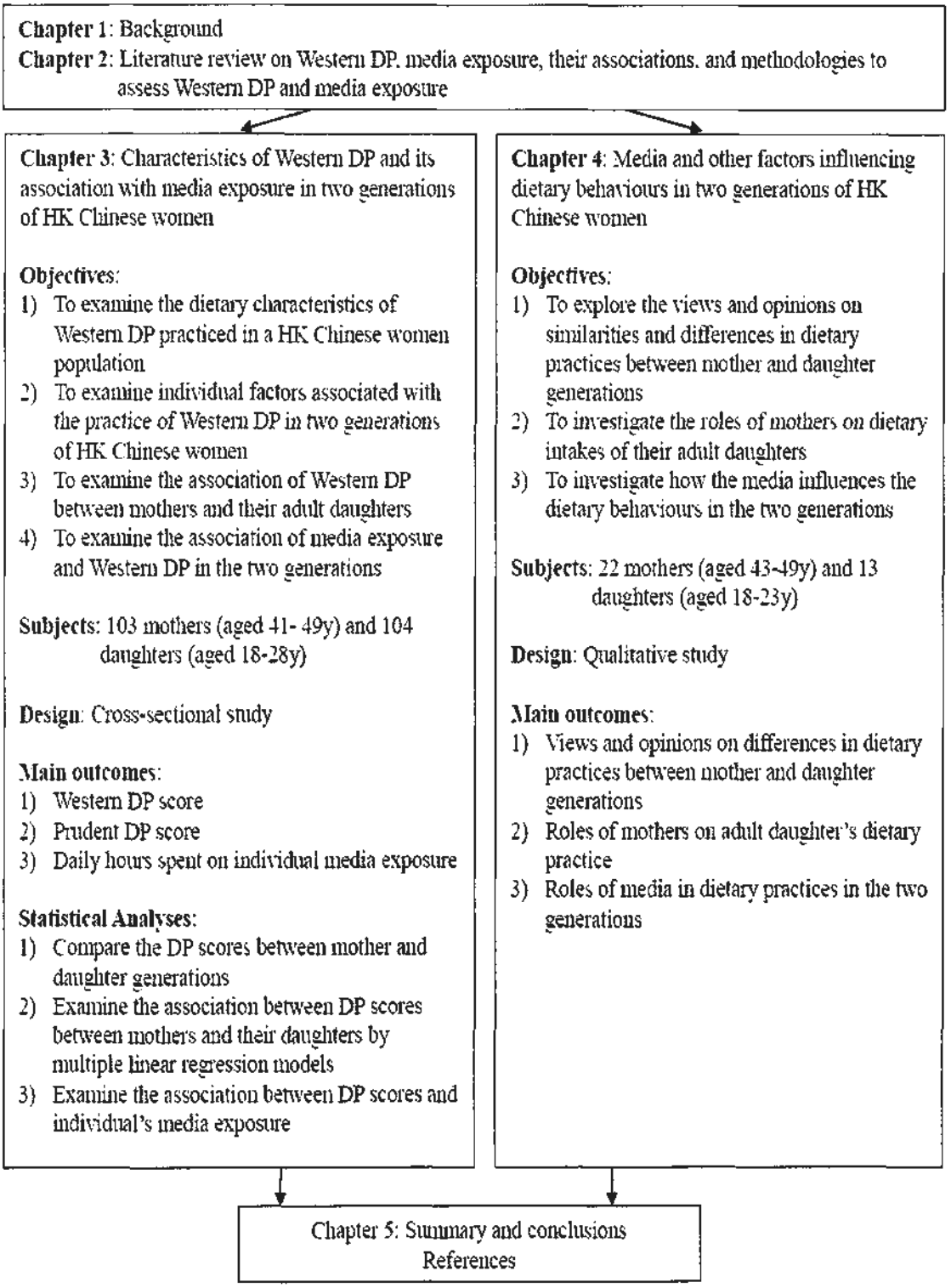
Most studies assessing the nutrition transition in the Asian population have been conducted at the population level; there is very limited research data assessing Western DP at the individual level. Assessment of Western DP would help us to understand the association of diet with noncommunicable diseases that are of increasing burden in many Asian countries. Dietary questionnaires used in previous studies in Asia may have

limited capacity to assess Western DP because some key foods contributing to Western pattern, for example, pizza and French fries, are missing (49;87-89), or the Western DP derived questions were based on the assessment of short-term (previous month) diet (29;90), which may not represent the overall DP. Exposure to food marketing and media promotion was shown to have a negative effect on dietary intake, but most studies were conducted in Caucasians only. Previous studies investigated the association of media exposure with individual foods or nutrient intakes but none examined the media influence on overall dietary pattern. Furthermore, understanding the resemblance of DP within families is of particular interest in Asia because of the possible beneficial effects of intergenerational transfer of traditional plant-based Asian diet. To date, however, no study focusing on this area has been conducted. Such findings are pertinent in planning family-level dietary interventions in Asian populations and understanding the role of family in the process of nutrition transition.

1.6 Thesis structure

The major objective in this thesis is to examine the characteristics of Western DP and its association with media exposure in two generations of Hong Kong (HK) Chinese women. The research hypotheses in this thesis are: 1) The Western DP observed in the two generations of HK Chinese women is similar to that showed in the Western populations; 2) The daughter generation has a higher Western DP score than the mother generation; 3) The Western DP score is positively associated between mothers and their daughters; and 4) Higher media exposure is associated with higher Western DP score.

1.6.1 Thesis schema



Chapter 2

Western DP, media exposure and their associations

2.1 Characteristics of Western DP (DP)

2.1.1 Food components associated with Western DP

To identify food components contributing to Western DP, a Medline search of articles published between 1980 and May 2008 was conducted using the keywords "Western dietary pattern", "Western" and ("dietary pattern" or "eating pattern" or "food pattern") and the search limited to articles in English and targeting adults aged 19 or above. Ninety three articles were identified based on the primary search and from the reference lists. In order to identify the typical Western DP practiced in the general population, studies were excluded if they included only Asian populations or pregnant/patient subjects, were non population-based, had no dietary assessment, were dietary validation or trials, or did not specify a "Western DP". Based on 24 articles from 13 distinct study populations (27;28;30;32;34;35;37-39;41-43;46-48;52;91-98), Western DP was consistently correlated with the consumptions of red meat, processed meat, refined grain (e.g. white bread, crackers, pasta, rice), eggs, French fries, potatoes, high-fat dairy products (e.g. whole milk, cheese, ice-cream, and milk shake), snacks (e.g. chips and crisps), pizza, sugar-sweetened drinks (e.g. fruit drinks, soft drinks), confectionary and pastries (e.g. chocolate, cakes, and pies), butter, margarine, and mayonnaise (27;30;32;38;40;41;46;48;52;94;96;98). The factor loadings of these foods for Western DP were mostly between 0.3 and 0.7. In a few studies, cream soup (38;43), nuts (27;38;43;94), organ meat (27;94), and coffee (27;38) were also mentioned as food components for Western DP (52;94). These 3 food items had factor loadings for

Western DP ranging from 0.22 to 0.39. The total variance explained by the Western DP was reported in 11 studies, ranging from 3.17% to 13.6% (27;32;34;46;48;91;92;94-96;98).

2.1.2 Dietary instruments used to assess Western DP

Among the 13 study populations where Western DP was assessed, all except one used food frequency questionnaires (FFQs) to collect the dietary information. The reference period using the FFQ method ranged from the preceding month (46;48), the past 6 months (41), the past year (30;34;35;42;96;98), to the past two years (27;94); or the past week for using a 3-day dietary records (DRs) (95). All studies used self-administered dietary assessments except two case-control studies (27;96). The food items collected by the FFQ ranged from 67 items to 208 items. Most studies combined food items into smaller number (15 to 40 items) of foods/food groups before DP analysis; only 2 studies used all food items for analysis (32;96). All studies identified DPs by PCA.

2.1.3 Methods to assess DPs

DP (or food intake pattern) can be described as a single dietary indicator characterizing a combination of multiple food- and nutrient-related dietary components. There are two main approaches to derive the DP. The priori or hypothesis-oriented method assigns a score to a list of foods and/or nutrients based on prior knowledge about the role of specific foods/nutrients on disease aetiology. The posterior or exploratory method assigns a weighted score to a list of foods based upon the intercorrelations or mean differences between food intakes within the study sample. In either method, a summary score is calculated and represents the extent of an individual's dietary intake compliance to a specific DP.

2.1.3.1 Prior or hypothesis-oriented method

2.1.3.1.1 Dietary indexes and scores

Based on the existing knowledge about specific dietary components on health outcomes, a list of foods or nutrients is selected and a score is assigned to each contributing food or nutrient when the dietary intake reaches a pre-set standard consumption level. A summary score or index is calculated and represents the numbers of dietary criteria an individual met for a particular dietary practice, usually a guideline for healthy eating or disease prevention. Each dietary index or score has a maximum value; and in some indexes, a range of scores between zero and a maximum value can be assigned to each contributing food or nutrient on a pro rata basis, from no intake to the standard consumption level with or without adjustment for energy intake. Examples of hypothesis-oriented derived DPs are: Healthy Eating Index, Recommended Food Score, Mediterranean Diet Score, Diet Quality Index, and Nutrient Adequacy Ratio (99;100).

2.1.3.1.2 Strengths and limitations of using dietary indexes to assess dietary pattern

Dietary indexes or scores are useful to provide quick assessment of nutrient adequacy or compliance with dietary guidelines for individuals (101;102). The dietary index or score is reproducible and relatively simple to calculate. It is good for construction of public health message and easier to interpret if the index is food-based. However, a major limitation of the dietary index or score is that it assumes the independent effects of foods or nutrients in the index and disregards the possible interactions or synergistic effects between foods and/or nutrients on health outcomes (100;101;103). Also, since intercorrelations between dietary intakes are not taken into

account, similar dietary scores that fall in the middle range may have very different dietary intake and cannot reflect the overall consumption pattern (103). Subjectivity on dietary indexes or scores is apparent in the choice of the foods or nutrients as the index components, strategies for food grouping, score to be assigned to each index component, consideration for energy adjustment, and the cut off values used for scoring and for optimal health (100). It is also limited by the current scientific evidence and may minimize the ability to generate new hypotheses on diet-disease relationship (104).

2.1.3.2 Posterior or exploratory methods

2.1.3.2.1 Principal component analysis (PCA)

PCA is a data reduction statistical technique that summarizes a large set of observed variables into fewer components based on the linear correlation between the variables (105). PCA-derived DPs are usually based on foods or food groups, although a few studies have used macro- and/or micro-nutrients for analysis (106). To identify a DP (component), the food variables obtained from FFQ or DRs are first standardized into average daily consumption in servings, grams, or percent energy intake, and the correlation coefficients between the food variables form a correlation matrix (106). Vectors (or eigenvectors, U_a) are computed by summing the correlation coefficients in each column. The elements of the eigenvectors U_a are then used for calculation of trial characteristic vectors (V_a)(105). The calculation procedures repeat until the sum of the squared differences between the pairs of elements in the current and the previous trial characteristic vectors is less than 0.00001, then the convergence is completed and the first component is extracted.

In PCA, the first component extracted explains the largest proportion of variance in the correlation matrix. The proportion of variance explained by the successive

components is lower than the previous components. All components extracted together explain all the variance in the dietary data (105). However, only components with eigenvalues exceeding 1.0 would be considered to be retained since an eigenvalue of 1.0 or lower indicates that the component is no better than the individual food variable in summarizing the association with other food variables. The factors (or components) can be made uncorrelated by orthogonal rotation method. The associations between the individual food variables with each DP are represented by factor loadings. The square of the factor loading represents the percentage of variance of the food variable explained by a particular DP.

2.1.3.2.1.1 Calculation of the factor score to represent a DP

A factor score is a summary representation of the extent to which an individual's diet can be described as a particular DP. For example, a higher score for Western DP indicates that an individual's diet presents the characteristics of Western DP to a greater extent. A factor score for each DP can be calculated by summing the standardized consumption of each input variable weighted by the corresponding factor loadings or factor score coefficients (Regression method). As such, the factor score for each DP has a mean of zero with an SD of 1. A factor loading represents the linear association or correlation of individual food variable with the DP. A factor loading for each food variable for a particular DP is calculated by multiplying the final trial characteristic vector with the square root of the eigenvalue. The factor score coefficient for each DP is the sum of multiplying the factor loadings of that DP with the corresponding inverses of the correlation matrix. As such, the factor score coefficients also take into account the relationship between pairs of variables in the original correlation matrix (107).

2.1.3.2.1.2 Strengths and limitations of PCA-derived DP

In population-based dietary data, PCA-derived DPs can reflect the eating habits within that population (104). The major foods or nutrients contributing to a DP can be identified when they have high factor loadings (>0.40) on that pattern. Individuals are ranked by the factor score based on how closely they conform to a particular DP, thus allowing a multi-pattern description of individual dietary behaviours (25). The limitations are that the patterns generated are not based on previous knowledge of healthy diet, therefore, may not represent as optimal patterns for dietary recommendation (104). Because it is a data-driven approach, PCA-derived DPs may not be reproducible in different populations. However, similar DPs have been consistently identified for "Western" and "Prudent" patterns (106). Subjectivity on the strategies for food grouping and standardizing the input variables, the number of DPs to be extracted, and the interpretability of the DP may still be dependent on prior scientific knowledge (106).

2.1.3.2.2 Cluster analysis

Cluster analysis is a data reduction statistical technique that separates a large set of variables into a few mutually exclusive clusters (108). Dietary variables based on FFQ or DRs are first standardized into daily servings or grams, energy-adjusted or unadjusted, or into percent energy. Initial cluster seeds are identified based on the mean (or median) intake of input variables, then a series of comparisons between cluster means or medians with new groupings are conducted until the differences between observations within clusters are the smallest compared to the differences between cluster means (or median)(106). Clusters derived by mean intake (by K-Means or

Ward's methods) are more commonly used than clusters derived by median intake (by partitioning around medoids method) (106).

2.1.3.2.2.1 Strengths and limitations of using cluster analysis to assess DP

The strength of cluster analysis method for DP is that each individual is assigned to a homogenous group of a distinct DP, therefore, comparisons between clusters are relatively straight forward with one cluster as the reference group (106). A major limitation of cluster analysis method is that the choice of clustering procedures may significantly affect the cluster solution (109). Similar to other analysis methods mentioned above, subjectivity on the strategies for food grouping and standardizing the input variables, the number of clusters to be reported, and naming of the clusters are major methodological consideration (106).

2.1.3.3 Mixed method

2.1.3.3.1 Reduced rank regression

Reduce rank regression (RRR) is a combined method integrating both the hypothesis-oriented and empirical approaches in data reduction. Similar to PCA, RRR derives several DPs (factors) based on food intake; however, the factors derived do not aim to explain the intercorrelations between food intakes. Rather, the RRR-derived factors aim to explain, based on prior knowledge, the variance of selected nutrients and/or biomarkers (Response variables) that are predictors for a particular disease (108). For example, a high-fat DP was derived to explain the correlations between food intakes and components (e.g. systolic/diastolic blood pressure, waist circumferences [response variables]) of metabolic syndrome (110), or a DP to explain the correlations between risk factors (e.g. BMI, fasting glucose [response variables]) that predicts type 2 diabetes

mellitus (111). In RRR, intakes of food items/groups are also standardized into daily servings or in grams based on dietary information from FFQ or DRs. A few nutrients presumed to be important for the development of the disease of interest are selected and standardized into intake per day or ratios of nutrient intakes (e.g. ratio of polyunsaturated to saturated fat intake) (108). A covariance matrix of response variables is first formed to derive response scores. Then, factors are extracted based on the linear function of input food variables in order to explain the variance of response variables. The first factor derived by RRR also explains the largest proportion of variation in the response variables than the subsequent factors.

2.1.3.3.1.1 Strengths and limitations of using RRR method to assess DP

The strength of RRR-derived DPs is that it suggests a better evaluation of the relationship between diet and diseases through the association between the DP and the predictors (response variables) and between the predictors and the disease (108). RRR is less subjective in choosing the number of factors to be extracted because it restricts the number of factors extracted to no more than the number of response variables (108). A major limitation is that the selection of response variables can be problematic when prior scientific knowledge of disease aetiology is not well established (108). Also, the information for response variables (e.g. biomarkers) may either be unavailable or if available, it may be unable to explain the pathophysiological pathway of the disease (108). Few studies have been conducted using RRR for diet-disease relationships and the usefulness of RRR in nutritional epidemiology is yet to be confirmed (110-113).

2.1.4 Reproducibility and validity of DP assessment

In most studies assessing DP, the reproducibility and validity of the dietary instrument (e.g. FFQ) on food and nutrient intakes rather than on DP were measured. In

general, studies using FFQ as the primary dietary instrument examined the reproducibility by repeated administrations of FFQ and examined the validity by comparing the dietary information with multiple 24-hr recalls or 3-day DRs.

2.1.4.1 Assessment of DP reproducibility

Very few studies examined the reproducibility of the DP measures (114;115). The reproducibility of DPs derived by factor analysis was satisfactory for short-term (e.g. 1-year reproducibility: Pearson's r=0.67 for Western pattern, 0.70 for prudent pattern) (114) and long-term assessments (e.g. 9-year reproducibility: Pearson's r=0.30 – 0.52; p<0.0001) (115).

2.1.4.2 Assessment of DP validity

2.1.4.2.1 DP derived by PCA

The validity of FFQ for PCA-derived DPs has been examined in two studies using one or two 1-week diet records (114;116). A major difference in the methodology for the DP validation from the general validation of FFQ is that the foods and food groups for the DP derivation have to be kept as individual items for evaluation. This may result in a greater attenuation of the correlation coefficients with the reference method (DRs) due to the greater day-to-day variation for individual food items (e.g. tofu) than broad food groups (e.g. all soy products). However, both validation studies have suggested fair to good correlations of food, nutrients, and DP assessed. Hu and colleagues (114) assessed the FFQ validity in a group of male health professionals and showed that the Pearson's correlation coefficients were 0.07 – 0.90 for food items/groups, 0.51 – 0.74 for Western DP and 0.34 – 0.52 for prudent DP. Togo and colleagues (116) assessed the validity for DPs ("green", "sweet", and "Traditional")

other than Western or prudent DPs, and using two data reduction methods, the exploratory and confirmatory factor analyses. They found that the correlation coefficients were similar for males (Spearman r=0.10 -0.68) and females (r=0.14 – 0.66) for food items/groups. They also found similar correlation coefficient for DPs using either methods for men (Pearson's r=0.34 – 0.61 and r=0.37 – 0.57 respectively) and women (r=0.57-0.61 and r=0.56 – 0.64 respectively) (116).

2.1.4.2.2 DP derived by cluster analysis

There is one study validating FFQ for DP derived by cluster analysis (117). Each of the nutrient intakes estimated by 3-day DRs was first ranked from healthy (lower rank) to unhealthy (higher rank) intake levels and an overall mean rank was computed for each individual. Then, the mean ranks of individuals were compared across DP clusters and the DP clusters were ranked to represent the dietary risk for heart disease (lower rank has lower dietary risk). The study indicated that the "heart healthy" cluster had the lowest overall mean rank of nutrient intakes and the "empty calorie" cluster had the highest overall rank of nutrient intakes, suggesting that the FFQ-derived clusters could separate individuals with distinct nutrient intakes into nonoverlapping groups (117). In addition, the cluster ranking was consistent with the prior knowledge of dietary risk for heart diseases (117). However, such validation method depends on the prior knowledge of the diet-disease relationship, which may be controversial and thus may under- or over-estimate the validity of the dietary instrument.

2.1.5 Individual characteristics associated with Western DP

2.1.5.1 Demographic characteristics associated with Western DP

Individuals practicing Western DP were observed to share similar demographic characteristics. Adherence to Western DP was associated with younger age (27;30;36;38;42;43;47-49;92), being male (36;48;92), lower education level (27;41;41;48;94), and lower income (27;48) in Western populations. In Asian populations, practice of Western DP also tended to be associated with younger age (25;29;118;119), However, as opposed to Western populations, the practice of Western DP in Asian populations tended to be positively associated with higher education (29;118) or socio-economic status (120).

2.1.5.2 Lifestyle characteristics associated with Western DP

Adherence to Western DP was associated with the unhealthy lifestyle characteristics. Individuals who practiced Western DP were more likely to be smokers (27;36;38;42;47;92;94), have higher BMI (27;38;38;41;41;47;47;48;50;50;121), (36;42;47;94)and be less physically active (38;47;94). Some studies also indicated Western DP was positively associated with alcohol consumption (34;48;92), but inversely associated with supplement use (34;37;37;39). In Asian populations, Western DP was associated with smoking and alcohol use (29), but the association was less consistent for physical activity levels and obesity status (29;51;120).

2.2 Family resemblance in dietary characteristics

There is a consensus in the public health arena that family is among the key environments for promotion of healthy eating (122). Transfer of nutrition habits within family can be examined by the assessment of dietary resemblance between parents and their children. Family studies have demonstrated associations of food and nutrient

intakes within families (123-125). Such family aggregation is suggested to be contributed by a combination effect of genetic heritability and shared environment (126-131). Some studies have presented evidence that shared family environment, rather than the genetic factors, accounted for most of the family resemblance in the intakes of energy(126;127;129), total fat (126;127), carbohydrates (126), protein (126), and cholesterol (127). Despite cohabitation status, duration of living together and frequency of meals shared together may affect the degree of family resemblance (127-129). Furthermore, the effects of shared family environment on dietary behaviours may persist in children after they lived apart from their parents (130;131).

2.2.1 Parent-child resemblance in dietary intakes

Most studies on family resemblance of dietary intakes were conducted in families with young children or adolescents. Food frequency questionnaires or 3-day DRs were used to assess the correlations of dietary intake between family members. The parent-child dietary correlations ranged 0.13–0.30 for energy (123-128;130;132), 0.10–0.33 for protein (126;128;130), 0.05–0.31 for carbohydrates (123;126;128;130), 0.09–0.34 for total fat (124-128;130), 0.02–0.38 for saturated fat(124;125;127;130;132), 0.19–0.45 for monounsaturated fat (124;125;127), 0.13–0.38 for polyunsaturated fat (123-125;127), and 0.00–0.55 for cholesterol (123-125;127;130;132). Compared with fathers, mothers generally had a higher correlation with their daughters for fat intake (124;128;132). Three studies also examined the familial correlations of food intakes (125;127;132). The parent-child correlations ranged 0.12–0.46 for fruits and vegetables , 0.16–0.53 for meat (125;127), 0.10–0.49 for dairy products, and 0.13–0.52 for cakes, pizza and confectionaries. Two studies specifically reported the dietary correlations between parents and adult children (124;127). One study examined the associations of

food and nutrient intakes between adult daughters and their middle-age mothers living apart (127). The correlations ranged from 0.13 for polyunsaturated fat intake to 0.27 for energy intake, and ranged from 0.12 for fruit and vegetable intake to 0.32 for cakes and pastry intake (127). Another study reported an correlation of total fat intake at home and outside home between parents and their adult children living together (124). The correlations of total fat intake were stronger for mother-child than father-child pairs for both intakes at home and outside home (124). Although the two studies may not be directly comparable, the correlation of total fat intake was higher if the parent and adult children were living together than if they lived apart. Because foods and nutrients are not consumed in isolation, examining the resemblance of overall dietary pattern would provide a more relevant picture of the transfer of dietary habits within family. Only one study examining the association of dietary pattern between parents and children (132). In that study, the Healthy Eating Index score was used to examine the overall dietary quality and the parent-child correlations for the dietary score ranged 0.18–0.28 for mother-child pairs and 0.28–0.29 for father-child pairs (132).

2.2.2 Family resemblance in dietary beliefs, attitudes, and food preferences

The family similarities in dietary behaviours are likely to be associated with the beliefs and attitudes held within family. The correlations in food preference between parents and children ranged from 0 to 0.3 (133;134). Despite modest associations, family and twin studies indicated that family resemblance of food preferences is largely due to common food environments, rather than genetic factors (135;136). Family environments primarily determine what foods can be experienced and involved in the transmission of nutritional beliefs, values, food likings, food preparation methods and

children, intergenerational transfer of eating attitudes and behaviours takes place (70). Furthermore, some studies supported a greater resemblance of food preferences between mothers and daughters (136;137), but some found no sex difference in food preference between parents and children (133;138). Nevertheless, family similarities in dietary preference likely persist after family members live apart. Stafleu and colleagues (69) showed significant associations between mothers and their adult daughters (aged 20-30y) in dietary beliefs for processed meat, whole milk products, and cake and biscuits, but no association for healthy foods such as fish and low-fat dairy products. Mothers and daughters also held similar liking, nutrition attitudes, and "intention to consume" for pork, chicken, egg, custard, and cakes and biscuits (69). The greater similarities among females in the family may also reveal the sex-difference in susceptibility to environmental influences. Logue and colleagues (136) suggested that females might be more likely to imitate and influence each other and more likely to be influenced by TV commercials. One study also argued that mothers had a greater influence on their daughters for restrictive eating behaviours such as disinhibition and hunger responses to food stimuli (71).

2.3 Characteristics of media exposure

2.3.1 Types of media exposure

The major types of media communication include newspapers, magazine, television, radio, films, and the internet (139). However, health studies referred the term "media" or "(mass) media use" differently, varying from TV viewing and video/computer game use (140-143), to a combination of TV viewing with reading (142), talking on the phone (142), internet surfing (142), radio listening (144), and/or magazine reading (144;145).

Local surveys in adults assessed similar types of media exposure presented in the literature. Recent findings indicated that the most commonly use media is television (95.5 - 98.2% reported exposure), followed by newspaper (76.7–88.4%), radio (44.8–61.2%), internet (53.1–56.9%), and films (51.1–54.8%) (146). The surveys also indicated that reading magazines, viewing videos, reading books (excluding electronic books or textbooks), and listening audio recordings are more commonly exposed than reading comics or playing computer games (146). Likewise, the average time spent on different media was highest for TV viewing (2.2–2.6 hours per day), followed by radio listening (1.0–1.3 hours per day), newspaper reading (0.6–0.7 hour per day), and going to the theatre (4 times per year) (146).

2.3.2 Methods to assess the media exposure

A Medline search was conducted using the keywords "Television watching", "Television viewing", "Leisure time computer use", "magazine reading", "radio listening" between 1980 and April 2008. The search was limited to English or Chinese, and for adults aged 19 or above. The Medline database was chosen in order to focus the exposure assessment related to health outcomes or health behaviours. The search initially located 192 papers. Excluding those without media exposure assessment, studies on children, patients or pregnant subjects, qualitative or experimental studies, or studies specifically focusing on particular news events, 59 papers were retrieved. With an additional 22 papers located from the reference lists, 81 papers were reviewed to identify methods of media exposure assessment.

2.3.2.1 Media exposure measurements

2.3.2.1.1 Frequency and duration of exposure

Almost all previous studies measured media exposure by self-reported and most often reported the frequency of TV viewing and computer use. Participants were asked to report how much time they usually spent per day (83;141;147-165), or the average time spent per week on TV viewing and/or computer use (145;166-175). The frequency responses were open-ended (145;147;150-154;158;161;165;167;171;176-178), closed-ended (e.g. less than or equal to 1 hour per day, 2 to 4 hours per day, 5 or more hours per day)(141;148;149;155;156;159;160;163;168-170;172;173;179;180), or by frequency categories (e.g. never, sometimes, often, very often) (181-183). A few studies measured TV viewing and/or computer use separately for weekdays and weekends (147;149;150;159-161;172;184), or specified a reference period for reporting exposure (e.g. previous day (154), previous week (161;176;178), past 30 days (158), past 4 weeks/month (141;175;183), and past 12 months (149;152;171)). Two studies on TV exposure also inquired the number of days per week for TV viewing (178;185).

Studies on exposure to magazines, newspapers, books, or listening to music/radio were similar to those for TV viewing or computer use, but their exposure were not often assessed in health research (83;145;152;184;185). Salmon *et al* (185) assessed the time spent per day on reading (including magazines and books) and listening to music/audio recordings/radio on the previous weekdays and weekends. Field and colleagues (145) assessed the exposure to magazines by asking participants their average number of times per week or per month reading magazines and by inquiring about the type of magazines they most often read. Bertrais *et al* (152) and

Utter *et al* (184) did not assess the exposure specific to magazine/newspaper reading but inquired into the time spent on reading in general.

2.3.2.1.2 Assessment of media content being exposed

Very few observational studies assessed the media content and its association with dietary behaviours. None of these studies assessed the overall DP but assessed specific dietary behaviours (e.g. alcohol consumption, supplement use) (145;186-188) or specific factors that claimed to affect particular dietary behaviours (e.g. the influence of thin ideal media images on disordered eating) (189-191). Most of these studies examined media content on one or two types of media only, mainly TV, magazines, and/or movies (145;187-191). For the assessment of magazine content, a list of magazine titles or types (e.g. health and fitness, beauty and fashion) was presented and the number of magazines read and the time spent on magazine reading were assessed (145;189;190). For TV content exposure assessment, the time spent on particular TV programs (e.g. soap operas, music videos) assumed to contain content influencing dietary behaviours was assessed (145;189-191). In two studies that examined the influence of alcohol content in movies on teenage drinking, a list of contemporary films was selected and timed for on-screen alcohol use and the total time of exposure to content related to alcohol for those movies that were seen by the respondent (188;192). Another study assessed the exposure to content related to alcohol in individual media by examining the number of advertisements for alcohol, moderation messages, and alcohol portrayals recalled by the respondents (186). Most studies were limited to the assessment of media content seen in the past week (190), past month (145;189;190), or with no specific timeframe (186;187;191).

Compared to the assessment using the overall time spent on individual media, further assessment on media content did not provide additional findings for the association between media influence and diet-related outcomes. Connolly and colleagues (186) found that for females, the hours spent on TV watching at age 13y and 15y significantly predicted the frequency and the average amount of alcoholic beverages consumed at age 18y but none of the recall variables (e.g. number of alcohol commercials or portrayals of alcohol in entertainment recalled) was identified as a significant predictor. Tiggemann (190) indicated that both the time spent on overall TV watching and the time spent specifically on soap operas and music videos showed similar associations with BMI (Pearson r: 0.18 and 0.23 respectively; $p<0.05$) and disordered eating (0.09 and 0.06 respectively; not significant) in undergraduate female students. These findings support that the assessment of media exposure using the time spent on individual media alone is sufficient to examine the media influence on dietary behaviours.

2.3.2.2 Reliability and validity of media exposure measurements

2.3.2.2.1 Reliability of media exposure measurements

Eight studies reported the reliability of media exposure in adults (147;149;151;153;160;167;172;185). All these studies used open-ended questions to measure media exposure. The test-retest Pearson's correlations coefficients for television/video viewing ranged 0.68–0.93 (147;149;151;160;167;185), computer use 0.62–0.87 (167;185), reading books/magazines 0.78 (185), and listening to music/audio recordings/radio 0.37 (185). Three studies reported intra-class correlation coefficients (ICC) for TV viewing (0.32–0.81) (151;172), leisure-time computer use (0.69) (172), and TV viewing/leisure-time computer use combined (0.88) (172). The reliability was

quite good (>0.60) for all media exposure except for listening to radio/music/audio recordings. The reliability was generally better when the media exposure were measured separately for weekdays and weekends. The test-retest intervals for repeated measures were relatively short-term, ranging from 1 week to no more than 3 months. No study was found to assess the reliability or reproducibility of the media exposure assessment for longer test-retest intervals (e.g. one-year interval). The response rate for reliability study of media exposure varied and was reported in two of the studies, ranged from 24% (185) to 73% (149).

2.3.2.2.2 Validity of media exposure measurements

Only three studies reported the validity of media exposure measurements (149;160;185). Wareham *et al* (149) used heart rate monitors to assess the daytime energy expenditure to correlate with TV viewing hours and found a negative correlation between energy expenditure and TV viewing (Partial correlation coefficient adjusted for age and sex, $r=-0.19$, $p<0.05$). Salmon *et al* (185) compared the self-reported measures against a 3-d behavioural log and found that the correlations are good for computer use (Spearman's rank-order correlation, $r= 0.6$), moderate for listening to music/radio and reading books/magazines ($r=0.4$, $p<0.01$) and fair for TV viewing ($r=0.3$, $p<0.01$). Matton *et al* (160) used tri-axial accelerometer parallel with a 7-day activity log to estimate the time spent on each activity and compared the self-report measures from the questionnaire. The validity for TV viewing was high for men (Pearson correlation 0.69–0.78 and for women (0.80–0.83) (160). The response rate for the validity study of media exposure was reported in two studies and was higher for using 3-d activity log (90%) (185) than using heart rate monitors (67%) (149).

2.4 Associations between media exposure and Western DP

2.4.1 Media consumption and energy expenditure

Media consumption, in most circumstances, is a sedentary behaviour. Increase in media exposure may indicate a lower energy expenditure and an increased risk of overweight or obesity. Television (TV) viewing, in particular, has drawn most attention in health research. Research consistently indicates a positive association between TV viewing and obesity (154;156;170;193-196), waist circumference (161;195), and skinfold thickness (197). In general, TV viewing for 4 hours or more per day is two times more likely to be overweight/obese, compared to TV viewing for 1 hour or less per day (193;194). Also, TV viewing during childhood, adolescence, and early adulthood (age 21y) was a positive predictor of BMI at later life (196). TV viewing also has a lower metabolic rate compared to other sedentary activities such as sewing, playing board games, reading, writing, or driving a car (198), therefore results in lower energy expenditure than other sedentary activities (170).

2.4.2 Media exposure and dietary intakes

Association of media exposure with dietary intake is more extensively studied for TV viewing than other media exposure. Most studies assessed the association of media exposure with food and nutrient intakes and only one study assessed the association between media exposure with the DP. In a study of male health professionals, TV viewing was positively associated with the Western DP but there was no association with the prudent DP (199). Observational studies in adults also supported the association of media exposure with Western dietary practices and indicated that TV viewing was associated with higher intakes of food characterising Western DP, such as red meat (170), refined grain (170), snacks and sweets (170), fast foods (166), and

sugar-sweetened carbonated drinks (180). Effects of TV viewing on food consumption were also associated with an increased frequency of eating or snacking during the day (200), and frequency (156;201) and amount of energy-dense food consumed while TV viewing (79;150;161;202;203). Besides, TV viewing was associated with higher total energy intake (154;166;204). Bowman (154) showed that TV viewing of more than 2 hours per day was associated with an additional daily intake of 137 kcal compared to those watched less than 1 hour per day. Jeffery and French (204) found that a 1-hour increase in TV viewing was associated with an increase of 50-136 calories intake in women but not in men. Attention to or memory for advertisements on TV was also positively associated with energy intake (205).

Only a few studies were conducted to investigate the effects of other media exposure, such as magazine reading, radio listening or internet use, on dietary intake in adults. In one experimental study, audio listening that induced distraction during meal increased energy intake in young women, but audio listening that induced attention to the food characteristics did not (206). In another experiment, audio listening while eating showed a similar stimulation effect to that of TV viewing on increasing energy intake in young women (79), but showed a significantly lower energy intake than eating while watching TV in a mixed sample of young undergraduates (202). A longitudinal study in adolescent and young women indicated that more than one hour per day spent on listening to radio programmes significantly increased the risk of developing eating disorders compared to those who spent less time on radio listening (83). Based on experimental studies, reading per se during mealtime did not show any impact on energy intake in adults (205). However, frequent reading of girls magazine (once a week or more) was associated with a 42% increase of the risk of developing eating

disorders in adolescent or young adult women (83). It was suggested that the culture presented in the radio programmes, magazines, and music videos targeting young women exerted a pressure to be thin (83;207). Frequent reading of dieting and weight loss advice in magazines also predicted subsequent unhealthy weight control behaviours, such as fasting and skipping meals, in young adulthood (208).

2.4.3 Possible mechanisms of media exposure on dietary behaviours

The effects of media exposure on dietary behaviours can be grouped into non food-related and food-related environmental stimuli. Several experimental studies have been conducted to investigate the mechanisms of media exposure on adults' dietary intake during and after media exposure.

2.4.3.1 Non-food related environmental effects on dietary intakes

2.4.3.1.1 Distraction effect of media exposure

A major mechanism affecting dietary intake is the distractive effect of media exposure. As such, internal sensation of hunger and satiety and/or self-monitoring are impaired, leading to a higher energy intake during mealtime (202;203;206). Exposure to media may also disturb the memory of recent eating and result in overeating in the subsequent consumption (80). Distraction by TV during eating has also been shown to alter the rate of food intake during meals and lengthen the mealtime duration, leading to increase energy intake (202). Attention to or memory for advertisements, which may serve as one of the indicators of distraction, was shown to increase the energy intake when eating while watching TV (205). It is also suggested that either visual or auditory stimuli can exert distracting effects on individual control of dietary intake and induce over-eating regardless of the individual's satiety state and the palatability of food

consumed (79). Furthermore, TV viewing was shown to exhibit a stronger distracting power compared to music stimuli (202), probably because it performs both visual and auditory stimuli at the same time.

2.4.3.1.2 Mood-induced eating associated with media exposure

Another effect of media exposure on dietary intake relates to the emotional arousal induced by the media information, which subsequently promotes or suppresses eating (209). Exposure to frightening scenes in the media, such as horror movies, might increase negative moods such as anxiety, sadness, and/or anger, and triggered overeating in individuals with dietary restraints (210) but lower dietary intake in low-restraint eaters (74;78). Media exposure to scenes that induce positive mood, for example, comedies, might also promote food consumption but to a lesser extent than scenes inducing negative mood (211). One mechanism relating mood and overeating is that overconsumption of foods may act as a means of comfort or as a "displacement activity" to the negative feelings (74;209). Another mechanism refers to physiological response to emotions whereby the intense fear or stress may activate autonomic responses and suppress motivation to eat or delay glucose absorption and gastro-intestinal transit (209). Macht (209) also summarized that emotional arousal may simply distract the cognitive control on dietary intake, and alter the perception of food pleasantness and motivation to eat.

2.4.3.1.3 Effects of thin ideal body image portrayed in the media on eating behaviours

Most studies on the media effects of thin ideal body image on dietary behaviours were focused on disordered eating in women. Several experimental studies indicated interesting results that exposure to TV commercials featuring thin models may induce

higher consumption of snack foods in high restraint eaters but lower consumption in low restraint eaters, compared to exposure to TV commercials featuring less thin models (82;212). Similarly, exposure to TV commercials about dieting or weight loss may disinhibit the dietary restraint in high restraint eaters and resulted in higher consumption of snack food (213;214); but may decrease consumption in low restraint eaters (213).

Several pathways have been suggested to explain the influence of the media on dietary restriction or binge eating (189;215). First, media exposure, particularly to the thin ideal, heightens body dissatisfaction through thin ideal-body stereotype internalization or gender-role endorsement of femininity, which results in disordered eating (189). The susceptibility to thin ideal presented in the media may induce a stronger response for external eating (eating regardless of the individual's satiety state in the presence of external food cues) than restrained or emotional eating (216). Second, besides the direct effects, media influences may interact with the family's negative perceptions or comments on the individual's physical appearance, and increase body comparison and dissatisfaction resulting in dietary restriction or over-eating (215). Third, the peer pressure for dieting or thinness influenced by the media may increase individual's dietary restrictive behaviours (215). In addition, over-emphasis on dieting and weight loss in the media may promote unrealistic dietary restraint which may link to binge eating (189). It is suggested that all women are vulnerable to the media effects of exposure to the thin ideal stereotype (212;214), but the effects may vary across BMI status (190).

2.4.3.2 Food related environmental stimuli

Exposure to food-related scenes in the media is ubiquitous. Advertisements for food and beverages alone may contribute approximately one-fourth of all advertisements aired on TV (217). High penetration and intensity of food-related promotion presented in the media are potentially powerful stimuli to consumption of unhealthy foods since it is likely that more than half of food products advertised are sweets, beverages, or energy-dense snacks (76;217;218). Furthermore, media portrayals of consuming mostly energy-dense foods or alcohol in social events and celebrations, such as in soap operas or prime time shows, may shape individual dietary preferences or beliefs, or model particular eating behaviours as socially desirable (75;76).

2.4.3.2.1 Priming effects of food cues

A direct effect of exposure to food cues such as food advertisements or display of food or eating scenes in the media is it increases individuals' motivation to eat. Higher attentiveness was shown for food or food-related stimuli compared to non-food stimuli (81). Psychological studies indicated that an instant display of food photographs could enhance desire to eat regardless of individuals' satiety state (219;220). In addition, exposure to snack commercials, in particular, could significantly increase the amount of food consumed compared to exposure to nutrition-related or non-food commercials (220). On the other hand, exposure to advertisements conveying nutrition messages showed no obvious effects on the consumption of healthy foods (220). However, palatable foods that claimed to be healthy (e.g. low-fat cookies or chocolates) could induce over-consumption of such foods (221;222). One mechanism of priming effects is based on the cognitive-transactional model of psychology whereby the exposure to food cues activates individuals' memory of related concepts of food consumptions or

increases the accessibility of food-related concepts from memory (223). If the activation is recent and the intensity of the activations ('primes') exceeds its threshold, it triggers the performance of 'primed' eating behaviours (220;223). The cognitive process activated by the primes is assumed to be short-term and unconscious to the audience, and is an effortless, automatic mental process (224). Also, the effects of priming are stronger for hedonic or palatable foods than utilitarian foods, and in individuals with dietary restraints than those without (225;226).

2.4.3.2.2 Media cultivation of dietary behaviours

The mechanism behind the effects of media cultivation is that through consistent and repeated depictions of similar content across media channels, the media frames or models the norm of dietary behaviours (224). For example, in most content analyses of prime time shows or soap operas, snacking and alcohol consumption at mealtime were most frequently presented, which may be viewed as a representation of how most people eat in the real world(75;76). Furthermore, the food portion size presented in the advertisements or other food-related scenes may also serve as an indicator or a norm of appropriateness for how much an individual should eat (227). The oversized portions presented by many fast food restaurants are well documented (77). The media content is central to the cultivation effects and selective exposure by the audience is assumed not possible due to the pervasiveness of similar messages across media channels. The effects are subtle and subconscious.

2.5 Method to assess the Western DP in this study

2.5.1 Development of FFQ

The FFQ used in this study was initially developed from the FFQ used in an on-going longitudinal (MMDG) study on dietary and lifestyle factors and mammographic density in Chinese women. The FFQ was originally based on a semi-quantitative 73-item FFQ assessing the overall diet (228) and a 47-item FFQ assessing the dietary soy intake (229). Both FFQs were used to assess the diet and health in the local Chinese women (228;230;231). The FFQ asked the habitual frequency intake of specific foods or food groups on daily, weekly, or monthly basis for the past 12 months and the usual intake of serving sizes (e.g. bowls and table/tea spoons) commonly used in the local population. The FFQ also employed an open-ended section for unlisted foods. The original FFQs had good reproducibility for energy intake (r=0.625-0.663) (230), protein (r=0.533-0.561) (230), calcium (r=0.522-0.553), fruits (r=0.605) (232), and vegetables (r=0.471) (232); and good reproducibility and validity for soy isoflavones (r=0.68 and r=0.53 respectively) (229). Twenty two duplicated soy food items shared between the two FFQs were identified, 23 soy food items from the soy-food FFQ were combined into 9 soy food groups based on their similarity in nutrient content and culinary use (e.g. low fat soymilk, low sugar soymilk, soymilk without added sugar) were combined into single items. In total, 11 new soy food items were added and an 84-item FFQ was compiled.

Food components that contributed to the Western DP indicated in the literature were compared to the food listed in the 84-item FFQ and 18 new food items were added. They included 2 staple items (spaghetti/macaroni, pancake/waffle), 3 dairy items (milkshake, cream/sour cream, yogurt), 3 beverage items (sugar-sweetened carbonated

drink, fruit drink, cream soup), 2 nuts items (peanut butter, nuts other than peanuts), 3 snack items (chocolate, potato chips, other chips), 2 whole grains items (oats, whole wheat bread), pizza (1 item), French fries (1 item), and mayonnaise (1 item).

2.5.2 Pretesting of FFQ

The additional food items in the FFQ were pretested to identify the appropriate portion size and to test the ease of understanding and recall of frequency consumption for food items being asked. Nine female volunteers of similar age range as the study subjects were recruited from the visitors at the Centre of Research and Promotion of Women's Health and the administrative staff working at the CUHK School of Public Health. Food pictures and cooking utensils were presented to volunteers to identify their usual portion consumption. We adjusted the wording in the question for "fruit drinks" to "fruit flavoured drink excluding 100% fruit juice" and adding one more example (i.e. sour cream in baked potato) for the food item "cream/sour cream". The revised questions were then added to the existing FFQ.

2.5.3 DP identification

A posterior approach using PCA was used to identify key DPs using food consumption data from the FFQ since it was the only method that presented Western DP specifically in the literature (106). Frequency consumption of 102 food items in the FFQ were standardized into grams per day consumed and summed into 36 food groups/items. The grouping of food items aimed to minimize the within-person variation in consumption of individual foods and was based on the similarity of nutrient composition and culinary use. Some individual food items were preserved as single food items if they constituted distinct DPs (e.g. pizza, French fries, coffee, Chinese salted fish, Chinese sausages, Chinese pickles etc). To facilitate comparability, the

grouping of food items was also made closely approximate the food grouping strategies that were used previously in the literature. The components obtained were rotated by an orthogonal transformation, which allows the identified components to be uncorrelated and therefore achieves a simpler structure. The simpler structure indicates that the factor loadings on variables are high in one component but low or zero for other components (105). Components with the simpler structure are replicable and have better interpretability (105). To determine the number of components to be retained, the criterion of an eigenvalue larger than 1, the scree test, and the interpretability of the components were considered. The eigenvalue is the sum of squared factor loadings of a component (105). The eigenvalue of a component divided the number of variables in the correlation matrix represents the percentage of variance explained by that component. A good component should have at least an eigenvalue larger than 1 since an eigenvalue of 1 or less indicates that the component is no better than the individual variable (has a variance of 1) to summarize the correlation matrix (233). A distinct break on the scree plot where the slope of the eigenvalues starts to form a flat, horizontal line indicates the number of components suggested to be retained (233). The score for each DP (component) was constructed by summing the observed intake of the component food items weighed by factor loadings using the regression method (233).

2.6 Method to assess the media exposure in this study

2.6.1 Development of media exposure questionnaire (MDQ)

The MDQ was developed based on the methodology with reliability and validity reported (149;160;185). The primary MDQ asked exposure to TV (including video viewing), radio, newspapers, leisure-time internet, going to the theatre, and magazines in the past 12 months, which are major media in Hong Kong (146). For media (TV,

radio, newspapers, leisure-time internet use) that are likely to be exposed on a daily or weekly basis, one question was asked about how many days per week the medium is exposed. For media (magazine, going to theatre) that are likely to be exposed on a weekly or monthly basis, the question was modified to ask about how many days per month (magazine) or per year (going to the theatre) the medium is exposed. One question asked the average hours spent on the medium on the days that the respondents use the medium. For TV viewing and leisure-time internet use, the question on the time spent on individual media was asked separately for weekdays and weekends. For ease of reporting, all responses were closed-ended. Due to the frequency exposure varies between media (146), the responses ranged from no exposure, less than once a week to every day for TV, radio, newspapers, and the leisure-time internet use; from no exposure, less than once a month, one to three times a month, to at least once a week for magazine reading; and from not at all, one to three times per year, to once per month or more for going to the theatre. The responses for the amount of time exposure ranged from less than an hour, one to two hours, to eight hours or more per day for TV, radio, newspapers, and leisure-time internet use; and ranged from less than an hour per week, one to three hours per week, to eight hours or more per week for magazines. MDQ For magazine, an extra question was asked to identify the two major topics in the magazines the respondent most often read. Since very little is known about the specific media content associated with the DP in Chinese women, the media content was not assessed in the study MDQ, but was assessed by exploratory methods (Chapter 4) using semi-structured qualitative interviews.

2.6.2 Pretesting of the MDQ

The primary MDQ was pretested to identify the appropriate closed-end responses and to test the ease of understanding and recall of frequency and consumption for the media exposure. Twenty-one female volunteers of similar age range to the study subjects were recruited from the visitors at the Centre of Research and Promotion of Women's Health and the administrative staff working at the CUHK School of Public Health. Respondents were asked about the clarity of the questions, how they chose among the response options, and whether the categories in the options could accurately reflect their frequency exposure and consumption. Several modifications were made. Except for going to the theatre, the response options for the amount of time exposure were modified into an open-ended format (i.e. the number of hours and minutes spent in individual media), since almost all respondents indicated that reporting the number of hours or minutes of media exposure was easier than choosing among the closed-ended options. For TV and leisure-time internet use, the total amount of time exposure was asked for weekend since the respondents indicated that the exposure in the weekend varied greatly and could not easily be averaged out. The revised questionnaire was pretested in another group of volunteers from the same population. No further modification was suggested and the revised questionnaire was used in the study.

Chapter 3

A cross-sectional study to assess Western DP and its association with media exposure in two generations of Hong Kong Chinese women

Abstract

Objective: To examine the characteristics of Western DP, its association with media exposure, and the within-family association of Western DP in two generations of Chinese women. **Methods**: 103 mothers (aged 41 – 49y) and 104 daughters (aged 18 – 28y) were enrolled for this community-based cross-sectional study. Dietary intake was assessed by questionnaire interviews. Media and other exposures were assessed using self-reported questionnaires. Two major DPs (Western and prudent) were identified via principal component analysis. Generation-specific factors associated with each DP were identified by multiple linear regression analyses adjusted for age and energy intake. **Results**: Western DP was characterised by higher intakes of meat (red, processed, poultry), fast foods (sugar-sweetened drinks, French fries, pizza), processed seafood, cakes and snacks, high-fat dairy, cooking oil, mayonnaise, and eggs. The Western DP score was positively associated with the intakes of energy, total and saturated fat, and dietary cholesterol; but was negatively associated with the intakes of carbohydrates, dietary fibre, calcium, iron, magnesium, phosphorus, thiamine, riboflavin, folate, and vitamin C (p for trend <0.05). Younger age, smoking, obesity (mothers only), and central obesity was associated with higher Western DP score. Age- and energy-adjusted multivariate analyses indicated that the Western DP score was positively associated with the daily hours spent on total media exposure (beta=0.37; p<0.001) and years living in Hong Kong (beta=0.20; p=0.009) for mothers. For daughters, the Western DP score was positively associated with the daily hour spent on TV viewing (beta=0.121;

p=0.01), mother's Western DP score (beta=0.11; p=0.019), and smoker's status (beta=0.14; p=0.004). The Western DP score was negatively associated with the hours spent on radio listening[$\log_e$-transformed] (beta=-0.22; p=0.019) for mothers, and with the frequency of family meals for both mothers and daughters (beta=-0.21; p=0.005 and beta=-0.17; p=0.001 respectively). An inverse association was shown for the prudent DP score with leisure-time internet use (beta=-0.23; p=0.006), and a positive association with the frequency of family meals in daughters (beta=0.20; p=0.019). **Conclusion**: An intergenerational association of Western DP was showed within Chinese families. A dose-response relationship existed between the practice of Western DP and media exposure. Family meals had a protective effect against practicing Western DP in Chinese women.

Keywords: mother, daughter, family meal, dietary pattern, media exposure, TV viewing

3.1 Introduction

Dietary Westernization is suggested as one of the risk factors contributing to the epidemiological transition towards increasing burden of diet-related noncommunicable diseases in many Asian populations (12;15;24;26). However, the characteristics of Western DP in Asia are not well defined. Previous studies in Asia populations have limited capacity to assess the Western DP because some key food items, for example, pizza and French fries, contributing to Western diet are missing in the dietary questionnaires (49;87). The role of family in the nutrition transition in Asia is noteworthy since family is the primary locus of intergenerational transfer of traditional Asian diet, namely plant-based diet, takes place. Furthermore, there is evidence that media influences health (168) (170;171;173;182;234)and dietary behaviours (78-80;202;205;206;220). Previous studies have shown women are vulnerable to various media effects (79;80;182;205;206). However, few studies have been conducted in Asian populations.

This study examines the dietary characteristics of Western DP, identifies the individual characteristics associated with Western DP, and assesses the within-family relationship of Western DP in two generations of Chinese women. Furthermore, this study reports the relationship of the practice of Western DP with media exposure, including newspaper reading, magazine reading, radio listening, TV viewing, and leisure-time internet use.

3.2 Methodology

3.2.1 Subject recruitment

Mother participants in this study were recruited from an on-going population-based longitudinal (MMGD) study that investigated the associations between the dietary

and lifestyle factors and mammographic density in Hong Kong Chinese women. The MMGD study was funded by the World Cancer Research Fund (WCRF Reference no. 2003/81). Participants were recruited through door-to-door invitations or by sending invitation letters to households of randomly selected housing blocks identified by stratified cluster sampling of three major housing types (public, private and government-subsidized) in the Shatin District, advertisements in the Shatin district newsletters and in a free newspaper in Hong Kong between May 2004 and February 2006. There were 894 women aged 35 to 45 years at baseline. Based on the age of first full-term pregnancy reported by the study participants, it was estimated that 375 study participants would have children aged 16.5y or above at the time of the follow-up.

Mother subjects who had adult daughters were identified during their follow-up visits for the MMGD study or by mailing invitation letters with study introduction pamphlets to potential participants between May 2008 and July 2009. At least 3 follow-up telephone calls were made to the potential participants within two weeks of the invitation letters being sent. At least 2 invitation letters were sent to each potential subject, three to six months apart. When mother subjects had two or more eligible daughters who were interested in participation, the next birthday method was used to determine which daughter would be invited to the study. That is, the daughter who had her birthday soon after the study invitation was invited to participate. An incentive of free blood test for fasting serum lipids (for mother subjects) or complete blood picture (for daughter subjects), or a HK$50 cash coupon from a local supermarket or department store were provided.

A screening procedure was conducted with the potential participants at their convenience by telephone. Inclusion criteria for study participation were Cantonese-

speaking Chinese females, age 18y or above, had no history of cancer, chronic kidney or liver diseases, and were residing in Hong Kong in the past twelve months. Women were excluded if they were pregnant, institutionalized, had a history of any cancer, heart diseases, liver or renal diseases, surgical removal of stomach or intestine, or were on restricted diet or had a history of malabsorption. To control for the effects due to food choice modifications adopted when living outside Hong Kong, women were excluded if they had ever lived outside Hong Kong or China for two consecutive years or more, or were outside Hong Kong for more than six months in the preceding 12 months.

3.2.2 Sample size planning

The only study comparing the Western DP between the two generations was in a group of second and third generation, Japanese Americans (age 40-70y) (25). We hypothesize that the study sample had similar mean Western food factor scores and standard deviations (SDs) as in that study (-0.18±0.63 in the older generation and 0.19±0.61 in the younger generation) (25). Using the sample size equation for two-sample t-test, $n = \frac{2\sigma^2 [z_{1-\alpha} + z_{1-\beta}]^2}{[\mu_1 - \mu_2]^2}$, with Type I error ($\alpha$) of 0.05 and 80% power ($1-\beta$) (235), and $\sigma^2=[(0.61)^2 + (0.63)^2]/2 = 0.385$; the sample size estimated was, $n= 2(0.385)(1.96+0.842)^2 / [0.19-(-0.18)]^2=44.2$. Therefore, at least 45 mother-daughter pairs should be recruited. In addition, the sample size required for conducting PCA using 36 food variables for identification of DPs should be at least 180 subjects (107). Therefore, at least 90 mother-daughter pairs were required.

The DP scores (see Figures 3.2 and 3.3) from 103 mother and 104 daughter participants were examined to assess whether the sample size was sufficient to test the study hypotheses with Type I error (α) of 0.05 and 80% power ($1-\beta$), using the

statistical and power analysis software PASS 2005 (236). For the hypothesis that the daughter generation had a higher Western DP score than the mother generation, two-sample t-test power analysis indicated that the study's sample size had a statistical power of 1.00 to detect the difference in Western DP score shown between mother and daughter generations in this study. The one-sample t-test power analysis indicated that the study's sample size had the statistical power of 0.92 to detect the difference in Western DP within mother-daughter pairs shown in this study. For the hypothesis that the Western DP score (dependent variable) was associated with the time spent on individual media exposure (independent variable), linear regression power analyses were conducted separately for mother and daughter participants. For mothers, the power analyses indicated that study's sample size was sufficient to detect a regression slope of as low as 0.04 for total media exposure, 0.05 for radio listening, 0.07 for TV viewing, 0.15 for leisure-time internet use, 0.25 for newspaper reading, and 0.51 for magazine reading. For daughters, power analyses indicated that the study's sample size was sufficient to detect a regression slope of as low as 0.04 for total media exposure, 0.07 for leisure-time internet use, 0.08 for TV viewing, 0.10 for radio listening, 0.40 for newspaper reading, and 0.60 for magazine reading.

3.2.3 Study design

A cross-sectional design was used to compare the DP between mothers and daughters, and the association between DP scores and media exposure. To assess the relationship between mothers' and daughters' DP scores, and the relationship between DP scores and media exposure, dependent variables were individual's DP scores; independent variables were the daughter's or mother's DP scores, daily hours spent on newspaper reading, magazine reading, radio listening, television viewing, and leisure-

time internet use; and co-variables were age, energy intake, years living in Hong Kong, frequency of family meals, education level, income level, employment status, smoking status, and leisure-time physical activity level.

3.2.4 Data collection

Each participant was invited to a face-to-face interview conducted at the School of Public Health of the Chinese University of Hong Kong (CUHK) between May 2008 and August 2009. To facilitate study participation, the face-to-face interviews were arranged on weekdays, weekends, evenings, or public holidays. Interviews were conducted separately for mothers and daughters to avoid reporting bias of joint interviews. Anthropometric and blood pressure measurements were taken during the visit. The whole visit lasted for 60 to 90 minutes.

For mothers who attended the follow-up visit for the MMDG study, their information on dietary intakes, demographic and lifestyle characteristics, and anthropometric measurements was retrieved from the MMDG study with the written consent of the subjects and with the permission by the MMDG study investigator. In addition, 15 extra food items (spaghetti/macaroni, whole wheat bread, pancake/waffle, mutton, pizza, milk shake, yogurt, cream/sour cream, mayonnaise, cream soup, peanut butter, other nuts (except peanuts), fruit-flavoured drinks, potato chips, and other chips) and media exposure were examined for this study. To assess the additional food items, a descriptive photo set of these food items and cooking utensils used in the face-to-face dietary interview were mailed to the mother participants and the dietary information was then obtained by telephone interviews. For the media exposure assessment, a self-administered MDQ was sent to the mother participants by mail and the participants returned the completed questionnaire by a paid returned envelope included in the

original mail. Ethics approval was obtained from the CUHK Behavioural and Survey Research Ethics Committee.

3.2.4.1 Questionnaire interview

Information was collected by trained interviewers using a structured questionnaire. At the face-to-face interview, the interviewer briefly explained the purpose of the study, procedures of the visit, and the information on the consent form. The participants were given as much time as they needed to ask any questions about the study and the information on the consent form. The participants signed the consent form before data collection process began. The complete questionnaire was double-checked at the end of the interview for any missing information.

3.2.4.1.1 Food frequency questionnaire

A 102-item interviewer-administered semi-quantitative FFQ was developed for the study (see Chapter 2 section 2.5 for details). Frequency of breakfast, meals-away-from-home (breakfast, lunch, afternoon tea, and dinner), fried food consumption, and supplement use were also asked. To account for the possible effects of shared meals on correlations between mothers' and daughters' DP, mothers were asked their frequency of meals (breakfast, lunch, dinner) with any of their children, and daughters were asked their frequency of meals with their mothers in the past 12 months. Mothers were also asked their frequency (usually, sometimes, rarely, or not at all) of cooking family meals and food shopping. Common cooking utensils and food pictures were presented to facilitate the recall of food consumptions and for estimation of amount consumed. The dietary interview lasted approximately 35 to 50 minutes.

3.2.4.1.2 Media exposure

A self-administered MDQ was developed for the study (see Chapter 2 section 2.6 for details) with questions on media exposure to TV, radio, newspapers, magazines, leisure-time internet use, and going to the theatre. Participants were accommodated in a quiet, comfortable, air-conditioned room alone and were informed that they had as much time as they wanted to complete the questionnaire. The interviewer gave and explained the instructions for completing the questionnaire and told the participant that she could find the interviewer outside the room if she had any questions. Mothers who received the MDQ by mail were given a friendly reminder by telephone if the questionnaire was not returned two weeks after the questionnaire had been mailed out. The MDQ took about 7 to 15 minutes to complete.

3.2.4.1.3 Demographics and lifestyle factors

The information for demographic information was obtained using a structured questionnaire previously validated for the local population (228;237). Information included place of birth, place of origin, medical history or medication (doctor diagnosis or prescription for hypertension, diabetes, or hypercholesterolemia), self-reported health (better than others of same age, similar, worse than others), household and individual income (11 categories from less than HK$4,000 per month to HK$50,000 or above per month), education level (no formal education, primary school, some secondary school, completed secondary school, sub-degree post-secondary level, university degree or above), occupation (occupation categories according to the Hong Kong Population Census 2001 and full-time/part-time) , marital status (never married, currently married, divorce/separated, or widowed), places and lifetime duration of residing outside Hong Kong, presence of children younger than 18y in the household. Cohabitation status and

duration of living together between mother and daughter were asked to account for the cohabitation effects on DP. Each participant's date of birth was recorded from her Hong Kong identity card.

Smoking status was assessed by three questions. One question asked about the history of smoking (never, past, or current). Another question asked if the participant had ever smoked at least one cigarette per day (i.e. at least 7 cigarettes per week). If yes, the duration (years or months) of the stated smoking habit was also asked. Also, each participant was asked one question about current drinking status (non-drinker, non-frequent drinker, or drink at least once a week). For those who consumed alcohol at least once a week, further questions were asked about the frequency of consumption per week (1-2 times, 3-4 times, or 5 times or above), duration of the stated drinking habit, the most frequently consumed alcoholic beverages and the amount consumed (glasses per occasion).

For levels of physical activity, participants indicated two physical activities most frequently performed in the past 12 months. For each activity, participants indicated the number of months the activity they performed and the average duration of activity per week or per month. Physical activities were classified into moderate or vigorous if their metabolic equivalent (MET) intensity levels were 3.0 or above based on the Compendium of Physical Activities (198). Each moderate or vigorous activity was expressed in MET hour spent per week (MET-hr/wk) by multiplying the average number of hours spent per week on that activity by its MET value. The leisure-time physical activity level was the sum of the reported moderate or vigorous activities in MET-hr/wk.

3.2.4.2 Anthropometric and blood pressure measurements

Systolic (Phase 1 Korotkoff sound) and diastolic (Phase 5 Korotkoff sound) blood pressures were measured following a standard protocol (238) using a mercury sphygmomanometer (Baumanometer, W.A.BAUM Co., Inc, New York), Participants were asked to sit down and rest for at least 10 minutes before blood pressure measurements were taken. Three blood pressure readings were taken (within at least a 1-minute interval between two measurements) at the right arm with unrestricted clothing, with the arm positioned at the heart level, the legs uncrossed and the back supported. If the mid-arm circumference of the right arm was less than 26cm, the "small adult" cuff (11 x 26cm) was used, otherwise, the "adult" cuff was used (14 x 34cm). The mean of the second and the third measurements was used to estimate the blood pressure level. All interviewers (3 research staff) attended a 3-hr training session on clinical blood pressure measurement. The intra-class correlations for blood pressure measurements made by the three interviewers with the "gold standard" measurements made by an experienced nurse on 11 women volunteers (aged 24–50y) were 0.86–0.92 for systolic and 0.78-0.87 for diastolic blood pressures.

All anthropometric measurements were done twice following standard protocols (239). All interviewers attended demonstrations and practical sessions on how to use the instruments for every anthropometric measurement. Interviewers practiced the measurements until they could correctly conduct the protocols without assistance. Instructions and graphical presentations for the anthropometric measurements were also printed on the record sheets for the interviewers to follow. Weight was measured (to the nearest 0.1 kg) in light clothing and without shoes using a mechanical column scale with beam reading (Detecto, model 3P704, Webb City, Missouri, USA). Height was

measured (to the nearest 0.1 cm) without shoes using a stadiometer (SECA Leicester Height Measure, model SE001, UK). Waist circumference was measured at the mid-point between the lowest rib and the uppermost lateral border of the ileum (240). Hip circumference was measured at a horizontal level along the pelvis at the point with the maximum protrusion of the buttocks (240). For all participants, the anthropometric measurements were conducted using the same instruments. The two repeated measurements for each anthropometric index should differ no more than 0.5 units of measurement; if not, a third or repeated measurement was conducted until the within-0.5 unit criterion was met. The mean of the two measurements was used for anthropometric assessments.

BMI was calculated by weight (kg) / height $(m)^2$ (240). BMI below 18.5kgm^{-2} was classified as underweight, between 18.5 kgm^{-2} and 22.9 kgm^{-2} as normal weight, and 23 kgm^{-2} or above as overweight (240). Waist circumference of 80cm or above was classified as central obesity (240). Women were classified as hypertensive if they were on hypertensive medication or if their systolic blood pressure was 140mmHg or above and/or diastolic blood pressure was 90mmHg or above (241).

3.2.5 Validation of study instruments

Because the two main study variables, dietary intakes and frequency of media exposure, measured in this study were self-reported, additional information on dietary intake and media exposure were collected using other reference methods in a subgroup of the study participants to assess the validity of the instruments used. All participants were informed of the possibility that they might be selected to complete either three DRs or three MD records in the following 12 months, and that their participation was voluntary but highly appreciated. At the end of the interviews, all study participants

were also briefly instructed on how to complete the dietary or MD records. They were informed that all food consumed had to be reported in detail in the DRs, including brand, methods of preparation, and time and location; and to use the same measuring utensils used in the FFQ interview to quantify the amount consumed. Participants were informed to report all media uses and time spent on each media during the reporting dates. A paid returned envelope and a souvenir pen were included with the record forms mailed to the subjects to facilitate participation. Returned records were checked and further contacts by telephone were made for clarification with the participants if necessary.

3.2.5.1 Administration of DRs

Between May 2008 and Jan 2010, three 3-day DRs were mailed (three to four months apart) to randomly selected study participants based on a random number table of 1 (selected) and 0 (not selected). Each DR required reporting of dietary intake for two weekdays and one weekend; and the weeks and the days for the DRs were selected based on a random number table of 1 to 7. The DR form was adapted from a standard method (242) and included two covering pages and three DR sheets. The covering pages included a list of dates for dietary reporting, guidelines and instructions for reporting the food intakes, a contact telephone and fax number for enquiries, a sample completed DR, and a photo of cooking utensils including bowls, spoons, and a water glass (the same as those used for FFQ interview). Each DR sheet stated the date for dietary reporting on the top of the page, and the time, location, and descriptions for food and serving size in a table format below for reporting. The DR form was pretested in 15 females of similar age to the study participants for the ease of understanding and reporting food intake. The participants indicated that the sample DR was very useful but they preferred that

the foods and the servings consumed be combined into one column. Corresponding changes were made in the DR form and no further pretesting was conducted.

3.2.5.2 Administration of MD records

Between May 2008 and October 2009, three 3-day MD records were mailed (three to four months apart) to randomly selected study participants based on a random number table of 1 (selected) and 0 (not selected). Each MD record included two weekdays and one weekend, and the weeks and the days were randomly selected based on a random number table of 1 to 7. Each record included a covering instruction page and three media exposure logs. The covering page included a list of the dates for media exposure reporting, instructions and acronyms for various types of media exposure to facilitate reporting, and an example of a completed media exposure log. Each media exposure log listed 30-minute time intervals from 6 o'clock in the morning to 6 o'clock the following morning. Participants were instructed to indicate time intervals when they exposed to any media. Participants were also asked to indicate the minutes spent on a particular medium if the exposure was less than the 30-minute time interval. The MD record was pretested in 14 females of similar age to the study participants for ease of understanding and reporting media exposure. The participants indicated that the sample media exposure log was very useful and no modification was suggested. Furthermore, between May 2009 and October 2009, a subgroup of study participants, including those who completed at least one MD record, were mailed a second questionnaire about one year after the completion of the first MDQ to assess the reproducibility.

3.3 Data analyses

3.3.1 Dietary assessment

The dietary information was standardized into average intakes (in grams) per day separately for FFQ and DRs. Foods consumed on weekly or monthly basis reported in FFQ were averaged into per day intake by dividing the consumption frequency by 7 or by 28 respectively, and then multiplied by the reported intake portion and the corresponding weight (in grams) of the reference portion. Energy and nutrient intakes provided by individual food items were calculated primarily using the National Nutrient Database for Standard reference (Release 21, September 2008) provided by the US Department of Agriculture (243). Because a few local foods such as Chinese dim sums could not be found in the primary nutrient database, the China Food Composition 2002 (244) and the Nutrient Information Inquiry System provided by the HKSAR Centre for Food Safety (245) were used as supplementary databases. The nutrient values for food groups were established by averaging the corresponding nutrient values of contributing food items.

3.3.2 DP identification

The average daily intakes (in grams) of 102 food items in the FFQ were summed into 36 foods/food groups based on the similarity in nutrient characteristics and culinary use (Table 3.1). Individual foods that represented distinctive DPs (e.g. coffee, French fries, and pizza) were left as individual categories. PCA was conducted based on these 36 foods/food groups to derive DPs. The components identified were rotated by orthogonal rotation procedure to present uncorrelated components with simpler structure for interpretation. The number of components to be retained was determined by the eigenvalues greater than 1.0, the distinct break on the scree plot, and the

interpretability of the components. For each individual, factor scores were calculated for all DPs identified by summing the standardized intakes of 36 food groups weighted by their factor score coefficients for the responding components (Regression method). Each DP score had a mean of zero and a SD of 1.

3.3.3 Data analyses for validity and reproducibility of the study instruments

3.3.3.1 Comparison of dietary intakes from DRs and from FFQ

The validity of FFQ was assessed by calculating the correlations of food and nutrient intakes between FFQ and DRs, with and without adjustment for total energy (by residual method), and were adjusted for the number of DRs completed. Pearson's correlation coefficients were also used to assess the relationship of DP scores with food and nutrient intakes derived from the average of DRs and from the FFQ. Percentage agreements by quartile distributions of food and nutrient intakes were also assessed. The median food and nutrient intakes were compared between the FFQ and the DRs using Wilcoxon's signed rank test. Bland-Altman plots were examined to assess whether systematic bias was present in the reporting of nutrient intake. Food and nutrient intakes were $\log_e$-transformed to improve normality before correlation analyses. For correlations with DP scores, the untransformed food and nutrient intakes were used since DP scores were derived based on untransformed data.

3.3.3.2 Comparison between MD records and MDQs

Media exposure information was standardized into average hours spent per day. The median daily hours spent on each medium were compared between MD records and MDQs using Wilcoxon's signed rank test. Because most media exposure measures were positively skewed, they were $\log_e$-transformed to improve normality for correlation

analyses. Before taking logarithms, 1.5 was added to each value to account for the zero value. The MDQ reproducibility was assessed using single measure ICCs and 95% confidence intervals (CIs). Relative validity of the questionnaire was assessed using Pearson's product-moment correlation coefficients.

3.3.4 Statistical analyses

Comparisons between mother and daughter generations were assessed by independent Student's t-test for continuous variables and by Chi-square test for categorical variables. Subjects were divided into 4 categories according to quartiles of DP scores among the whole study sample. Because the daughter generation differed significantly from the mother generation in the distribution of DP quartiles, comparisons across quartiles of the Western and prudent DP scores were performed separately for mothers and daughters. Test for linear trend was conducted by bivariate linear regression for continuous variables and by Chi-square test for linear-by-linear association for categorical variables. Subgroup analyses within generations were performed using Mann-Whitney or Kruskal-Wallis test for continuous variables and Chi-square test for categorical variables. The associations between mother's and daughter's DP scores, and individual's DP score and the frequency of media exposure were analyzed using multiple linear regression models (forward method). The criterion for each variable entering into the regression model is set at p-value of 0.05 for the F statistics of the Analysis of Variance test. Except for total media exposure, most media exposure measures were right-skewed and were $\log_e$-transformed to improve the normality of the distribution before regression analyses. Since DP scores were strongly associated with energy intake, all models were adjusted for age and energy. Co-variates included years living in Hong Kong, years of mothers and daughters living together

between mothers and daughters, frequency of family meals, frequency of meals-away-from-home, level of leisure-time physical activity, education level, smoking status, and employment status. Binary logistic regressions were used to examine the associations between quartiles of DP scores and BMI status, adjusted for age, energy intake, education level, leisure-time physical activity level, and total daily hours spent on media. Data were verified by double-data entry. Data were presented as mean ± SD for continuous variables and as percentage for categorical variables. All tests of statistical significance were 2-sided and p value of 0.05 or less was denoted as statistically significant. The Statistical Package for the Social Sciences (SPSS) for Windows (Release 16.0, 2008; SPSS Inc, Chicago, IL) was used for all analyses.

3.4 Results

3.4.1 Subject participation

Between September 2007 and May 2009, 678 women were screened during their follow-up visits for the MMDG study, 5 women were diagnosed with cancer and were excluded. One hundred and sixty six women were identified to have one or more adult daughters aged 18y or above. Among 216 women who were not screened, 93 women were identified from their baseline information to have had their first full term pregnancy at least 16.5 years prior to this study. These 93 women were also sent invitation letters to identify whether they had daughters aged 18y or above. In total, 259 women were sent invitations. Eighteen women were unable to be contacted by mail or by telephone, 27 had no adult daughters. Thirty three women were excluded since their daughters had lived/studied overseas for more than 2 years (10 subjects) or were currently living/studying overseas (14 subjects). The remaining 9 women excluded daughters that were not in Hong Kong for 6 months or more in the past 12 months (5

subjects); daughters with long-term illness (3 subjects); and one pregnant daughter. Among 181 eligible mother-daughter pairs, 104 mother-daughter pairs agreed to join the study. One mother later refused to participate; therefore, the final sample included 103 mothers and 104 daughters from 104 households. The response rate is 56.9 percent.

Among 78 refused mother-daughter pairs, half (52.6 percent) indicated that they had no time for participation and half indicated that they were not interested. Demographic information of participants and non-participants is shown in Table 3.2. Mothers' information was based on their reports at the baseline of the MMDG study. Information on age, working status (currently working or studying), and cohabitation status (living with mother or not) was obtained from 58 (74.4%) daughter non-participants. Mother participants and nonparticipants were similar for age, full-time employment, family history of breast cancer, and self-reported health, but participants were more likely to have completed secondary school (39.8 % vs. 26.9%; p=0.071) and had a longer duration in HK (34.5 ± 12.0y vs. 31.6 ± 13.2y; p=0.129). Mother participants were significantly less likely to be current smokers or have central obesity, tended to consume alcohol less frequently and had lower BMI. Daughter participants and nonparticipants were similar for age, full-time employment/study, or cohabitation with their mother.

3.4.2 Characteristics of study participants

Table 3.3 shows the characteristics of mother and daughter participants. Mother participants were between age 41 and 49 years and had a mean age of 46.1 ± 1.9y. Daughter participants were between age 18 and 28 years and had a mean age of 20.8 ± 2.6y. About 60 percent of mothers and most (91.3 percent) daughters were born in Hong Kong. Two-fifths (39.8 percent) of mothers and most (90.4 percent) daughters had

completed secondary education. About half (48.5 percent) of mothers and almost all (96.2 percent) daughters were in full-time employment or study. Most (85.4 percent) mothers were married and almost all (98.1 percent) daughters were never married. More than half (53.4 percent) of mother participants and about one-fifth (19.2 percent) of daughter participants were overweight. Likewise, more mothers (42.7 percent) had central obesity than daughters (8.7 percent); however, 27.9 percent daughters were underweight. No mother reported 'ever diagnosed' or 'on medication for dislipidemia or diabetes', but 14.6 percent of mothers were hypertensive. Mothers were more likely to be supplement users (30.1% vs. 11.5%, p=0.001), consumed alcohol at least once a week (6.8% vs. 1.9%; p=0.023), but less likely to be current smokers than daughters (1.9% vs. 5.8%; p=0.224).

3.4.3 Validity of FFQ

3.4.3.1 Subject characteristics

One hundred and ten subjects (49 mothers and 61 daughters) were randomly selected from the cross-sectional study to report 3-day DR(s) over a year to assess the validity of the FFQ. Sixty eight subjects (31 mothers and 37 daughters) returned at least one completed DR and the overall response rate is 61.8 percent. The mean age of participants was 46.5 ± 1.7y for mothers and 21.5 ± 2.4y for daughters (Tables 3.4a and 3.4b respectively). They were similar for age, duration in Hong Kong, marital status, obesity status, energy intake, and DP scores with the overall sample. They had a higher income level, but were less likely to be employed or study full-time or to have ever smoked than the overall sample. Among 68 study participants, the majority (75%) had completed at least two and 54% had completed all three DRs. There were 471 DRs in total, representing 5,920 food entries and 389 unique food items.

Participants and non-participants for the FFQ validation study were similar in age, years living in Hong Kong, BMI status, and energy intake (data not shown). However, non-participants in general were more likely to be ever smokers, alcohol drinkers, have a higher Western DP score, and a lower prudent DP score. In contrast, participants were more likely to be high school graduates or at a higher income level.

3.4.3.2 Comparison of food intakes reported from FFQ and DRs

Table 3.5 presents the median comparisons for food intakes reported from FFQ and DRs. Most food intakes reported in the FFQ were higher than those reported in the DRs. However, the intakes of processed meat, fish and seafood, processed seafood, cakes and snacks, refined bread, and sugar-sweetened drinks reported in the DRs were higher than those reported in the FFQ. Table 3.6 presents the partial correlations for food intakes between FFQ and DRs, adjusted for the number of DRs completed. The correlations ranged from 0.02 for Chinese sausage to 0.79 for coffee. About 60% of the correlations were significantly different from zero. Close to half (47%) of the correlation coefficients were 0.3 or above. For Western DP, with the exception of cream soup and fish and seafood, the correlation coefficients of major food intakes (factor loading $\geq$0.30) ranged from 0.21 for egg and pizza to 0.56 for processed meat. For prudent DP, with the exception of Chinese sausages, legumes, and other vegetables, the correlation coefficient of major food intakes ranged from 0.12 for soy condiment to 0.45 for refined bread. After energy adjustment, the correlation coefficients for major food intakes were attenuated and ranged 0.11–0.38 for Western DP (except for cream soup and French fries) and 0.11–0.42 for prudent DP (except for legumes and Chinese sausage).

For Western DP, the percentage agreement on classifying food intakes into the same quartiles ranged from 22% for French fries to 71% for Pizza (Table 3.7). For prudent DP, the percentage agreement on classifying food intakes into the same quartiles ranged from 21% for soy products and soy condiments to 77% for Chinese sausage. The agreement rates for classifying food intakes into the same or adjacent quartiles were 69–82% for Western DP and 56–87% for prudent DP. With the exception of fish and seafood, the rate of intake misclassification into extreme quartiles ranged from 2–10% for Western DP and 2–13% for prudent DP.

3.4.3.2.1 Pearson's correlations for food intakes from FFQ and DRs with DP scores

The DP scores showed similar correlations for most food reported by FFQ and by DRs (Table 3.8). Consistent for FFQ and DRs, the Western DP score showed positive associations with the intake of red meat, poultry, processed meat, processed seafood, high-fat dairy, pizza, French fries, sugar-sweetened drinks, and cakes and snacks; and negative or null associations with the intake of leafy vegetables, fruits, legumes, and whole grains. Likewise, the prudent DP score showed positive associations with the intake of leafy and other vegetables, corn and potatoes, fruits, tofu, soymilk, and nuts; and negative or null associations with the intake of red meat, organ meat, poultry, and sugar-sweetened drinks.

3.4.3.3 Comparison of nutrient intakes reported from FFQ and DRs

Table 3.9 presents the median comparisons for nutrient intakes reported from the FFQ and DRs. All nutrient intakes reported in FFQ were significantly higher than in DRs, but the Bland-Altman plots indicated no systematic bias across the intake levels for all nutrients (Figures 3.4 and 3.5 for illustration). The mean percentage differences

between FFQ and DRs compared to the average of the two instruments ranged from 15% for energy to 63% for folate.

Table 3.10 presents the partial correlations for nutrient intakes between FFQ and DRs, adjusted for the number of DRs completed. Except for the intake of iron and vitamin E, the correlations of nutrient intake between FFQ and DRs were significant and ranged from 0.31 for magnesium to 0.61 for saturated fat. The percentage agreement on classifying nutrient intakes into the same quartiles ranged from 24% for dietary fibre to 46% for saturated fat (Table 3.11). The agreement rates on classifying nutrient intakes into the same or adjacent quartiles were 63–87%. Misclassifications of nutrient intakes into extreme quartiles were low (3–12%).

3.4.3.3.1 Pearson's correlations for nutrient intakes from FFQ and DRs with DP scores

The associations of nutrients from FFQ with DP scores moved in similar directions to those of the nutrients from DRs (Table 3.12). For both FFQ and DRs, the Western DP score was positively associated with the intake of energy, protein, total and saturated fat, calcium, phosphorus, zinc, thiamine, riboflavin, niacin, retinol, and dietary cholesterol; but negatively associated or had no association with the intake of dietary vitamin C. Similarly, the prudent DP score was positively associated with the intake of dietary fibre, calcium, magnesium, folate, and vitamin C; but negatively associated or had no association with the intake of cholesterol in both FFQ and DRs.

3.4.4 MDQ reproducibility and validity

3.4.4.1 Subject characteristics

3.4.4.1.1 MDQ reproducibility

For the reproducibility study, 114 subjects (60 mothers and 54 daughters) were mailed a second MDQ approximately one year after the first administration of the same questionnaire. Ninety four subjects (50 mothers and 44 daughters) returned completed questionnaires, with an overall response rate of 82.5 percent. The mean age was 46.0 ± 1.9y for mother and 20.8 ± 2.4y for daughters (Tables 3.13a and 3.13b respectively). Fifty-six percent of mothers and 26 percent of daughters were overweight or obese. They were not different from the whole study sample for age, education level, marital status, income, duration living in Hong Kong, employment status, BMI, and central obesity status, except that they tended to have a higher exposure to TV and were less likely to be ever smokers or alcohol users.

3.4.4.1.2 MDQ validity

For the validation study, 72 subjects (39 mothers, 33 daughters) were randomly selected from the main study for participation. Forty-two subjects (24 mothers, 18 daughters) returned at least one completed 3-day MD record and one MDQ. Data from these subjects were used to assess the MDQ validity and the overall response rate was 58 percent. Among 42 subjects, 88% had completed at least two 3-day MD records and 57 percent had completed all three records. The mean age was 45.8 ± 2.1y for mothers and 20.4 ± 2.6y for daughters (Tables 3.14a and 3.14b respectively). Thirty-nine percent of mothers and 22% of daughters were overweight or obese. They were similar to the whole study sample for age, duration in Hong Kong, marital status, and BMI. However,

participants were more likely to be high school graduates, non-smokers, non alcohol users, being more physically active, and had a lower income.

Compared to those who refused to participate in the validation study, mother participants had a longer duration in Hong Kong (39.6 ± 10.8y vs. 31.8 ± 12.3y; p=0.038) and daughter participants had a higher exposure to newspapers (0.5 ± 0.4hr/d vs. 0.2 ± 0.1hr/d; p=0.033) than nonparticipants. Participants were also more likely to be high school graduates, be more physically active, and have a lower BMI.

3.4.4.2 MDQ reproducibility

Table 3.15 presents the one-year reproducibility for media exposure measures. Landis and Koch (246) defined ICCs of 0.4 or below as poor agreement, 0.4–0.75 as fair to good agreement, and 0.75 or above as excellent agreement. The time spent on various medium was reported fairly similarly in the 1st and 2nd MDQs, except that the time spent on TV viewing was higher in the 1st MDQ than in the 2nd MDQ (p=0.049). The ICCs ranged from 0.36 for TV viewing to 0.85 for leisure-time internet use. Total media exposure had fair to good agreement (ICC 0.57). All correlations were significantly different from zero.

3.4.4.3 MDQ Validity

Table 3.16 presents the Pearson's correlations for media exposure between the two MDQs and the MD records. Both MDQs reported more time spent on every medium than MD records except for magazine reading. Both MDQs, with the exception of baseline magazine reading, were significantly correlated with MD records. The correlation coefficients were ranged from 0.48 to 0.80 (except for baseline magazine

reading, r=0.07). Except for magazine reading, the 1st MDQ showed a better agreement with the MD records.

3.4.5 Meal characteristics and nutrient intakes of study participants in the cross-sectional study

Table 3.17 shows the meal characteristics and dietary intakes of mother and daughter participants in the cross-sectional study. Daughters were more likely than mothers to skip breakfast, consume fried foods, and eat meals outside the home. The mean frequency of meals eaten together between mothers and daughters was 6.2 ± 3.5 times per week. The meal that mothers and daughters consumed together most frequently was dinner and the mean frequency was 4.1 ± 2.2 times per week.

For nutrient intakes, mothers reported significantly lower energy intake than daughters (1578 ± 609kcal vs. 2139 ± 676kcal respectively; p<0.001). For nutrient intakes (per 1000kcal), daughters consumed significantly more protein, total fat, saturated fat, cholesterol, zinc, and niacin, but less carbohydrates, dietary fibre, calcium, iron, magnesium, folate, and vitamin C.

3.4.6 Media exposure and leisure-time physical activity of study participants in the cross-sectional study

Table 3.18 presents the frequency of media exposure and leisure-time physical activity for mother and daughter participants. Mothers spent an average of 4.6 ± 2.5 hours per day and daughters spent 5.7 ± 2.9 hours per day. Mothers spent significantly more time on newspaper reading (0.5 ± 0.4 hrs/d vs. 0.3 ± 0.3 hrs/d; p=0.007) and radio listening (1.1 ± 2.0 hrs/d vs. 0.5 ± 1.2 hrs/d; p=0.004) but spent less time on leisure-time internet use than daughters (0.3 ± 0.7 hrs/d vs. 2.3 ± 1.7 hrs/d; p<0.001). TV viewing was the most frequent media use for both mothers (2.6 ± 1.5 hrs/d) and daughters (2.4 ±

1.5 hrs/d). There was no difference for the time spent on TV viewing or magazine reading between the two generations. Among those who read magazines, topics about celebrity or entertainment were most frequently read by both mothers (50%) and daughters (62.5%). Health topics were also frequently read by mothers (38.5%) but topics on women or fashion (64.1%) and travel (20.3%) were more frequently read by daughters.

The leisure-time physical activity level was comparably higher in daughters (7.1 ± 10.6 MET-hr/wk) than in mothers (5.2 ± 10.3 MET-hr/wk) but the difference did not reach statistical significance.

3.4.7 Pearson's correlations between foods/food groups

Table 3.19 shows the correlations between the 36 foods/food groups for PCA. Foods that were high in fats, sugar or energy, correlated significantly with each others. Intakes of red meat, poultry, processed meat, sugar-sweetened drinks, French fries, high-fat dairy products, and cakes and snacks were significantly correlated and the correlation coefficients ranged from 0.186 to 0.479. Cream soup, egg, processed seafood, and cooking oil were also significantly correlated with the intakes of above food items but the correlation coefficients were slightly lower (r = 0.156–0.400). Pizza and mayonnaise were significantly correlated with intakes of poultry, processed meat, French fries, cakes and snacks, cooking oil, and cream soup (r = 0.146–0.355). The intake of pickles was significantly correlated with intakes of red meat, poultry, processed meat, high-fat dairy, cooking oil, and pizza (r = 0.139–0.229).

Likewise, low-fat or high-fibre foods were correlated with each other. Leafy vegetables, legumes, tofu, and fruits correlated significantly with each other (r = 0.242–0.410). The intake of whole grains was significantly correlated with intake of legumes,

tofu, and fruit (r= 0.180–0.211). Other non-leafy vegetables was significantly correlated with intake of leafy vegetables, legumes and tofu (r = 0.143–0.350). However, intakes of meat or energy-dense foods such as sugar-sweetened drinks, French fries, or high-fat dairy, had either null or significant negative associations with intakes of vegetables, fruits, legumes and tofu.

3.4.8 DPs identified by PCA

The daily intakes in grams of 36 foods/food groups were aggregated by PCA. The analysis identified 13 components with eigenvalues exceeding 1.0, including 5 components with eigenvalues exceeding 1.5. The scree plot showed a distinct break at the third component (Figure 3.1). This suggested that the first three components to be retained and the variances explained by the subsequent components were comparably small and similar. These three components explained 28.4 percent of the variance of the correlation matrix of 36 foods/food groups. However, the third component shared many characteristics of the first and second components and could not be identified as a distinct DP. A second analysis allowing a two-component model identified two major components with eigenvalues exceeding 3.0, explaining 22.4 percent of total variance. These two components were retained and rotated by orthogonal transformation to minimize the correlations.

3.4.9 Characteristics of DPs

3.4.9.1 Foods characterizing the DPs

Table 3.20 shows the key foods/food groups for the two major DPs. The factor loadings of foods/food groups indicate the correlations between the foods/food groups with the DP and the square of the factor loading indicates the variance of the food item/

group explained by that component. The first component was positively associated with intakes of red meat, poultry, sugar-sweetened drinks, French fries, processed seafood, cakes and snacks, processed meat, high-fat dairy, cooking oil, cream soup, mayonnaise, and pizza. These foods were typical items characterizing Western DP and therefore the first component was termed "Western". The Western DP was also negatively correlated with intakes of leafy vegetables, fruits and whole grain. The second component was positively associated with intakes of tofu and soy products, vegetables (leafy and non-leafy), legumes, fruits, whole grains, and nuts. These foods were items typically characterizing healthy or "prudent" DP. Therefore, the second component was named "prudent" (106). The Western DP component explained 13.5% whereas the prudent DP component explained 8.9% of variance in the correlation matrix.

A few food items/groups correlated positively with both Western and prudent DPs. However, intakes of egg, processed seafood, cakes and snacks were more strongly correlated with the Western DP than the prudent DP (r=0.40–0.61 vs. 0.16–0.31 respectively); whereas corn and potatoes, rice and noodles, refined bread, and soy condiments were more strongly correlated with the prudent DP than the Western DP (r=0.29–0.43 vs. 0.16–0.28 respectively). The intake of fish and seafood was correlated to a similar extent with the Western and prudent DPs.

The energy-adjusted daily food intakes by quartiles of Western and prudent DPs are showed in tables 3.21 and 3.22 respectively. Higher quartile of western DP score was associated significantly with increasing intakes of red meat, processed meat, poultry, processed seafood, high-fat dairy, sugar-sweetened drinks, French fries, pizza, cream soup, cakes and snacks, cooking oil, and mayonnaise, but with decreasing intakes of rice and noodles, whole grains, fruits, leafy vegetables, legumes, tofu, and soymilk.

On the other hand, adherence to prudent DP was associated significantly with increasing intakes of rice and noodles, wholegrain, fruits, leafy and non-leafy vegetables, corn and potatoes, legumes, tofu, other soy products, soy condiments, soymilk, nuts, refined bread, and Chinese sausages, but with decreasing intakes of poultry, red meat, processed meat, high-fat dairy, sugar-sweetened drinks, French fries, cakes and snacks, and cooking oil.

3.4.9.2 Nutrient characteristics of DPs

Energy adjusted nutrient intakes for the Western and prudent DPs are shown in tables 3.23 and 3.24 respectively.

3.4.9.2.1 Western DP

Consistent with the food intakes associated with Western DP, subjects in the higher quartiles of Western DP score had significantly higher intakes of total energy, total fat, saturated fat, and cholesterol; but lower intakes of carbohydrates, dietary fibre, calcium, iron, magnesium, phosphorus, thiamine, riboflavin, folate, and vitamin C. The mean energy intake in the highest quartile of Western DP score was higher than that of prudent DP score (2686 ± 667kcal vs. 2265 ± 798 kcal).

3.4.9.2.2 Prudent DP

Although subjects in the higher quartiles of prudent DP score also had a significantly higher intake of energy, the increased energy intake across quartiles was paralleled with an increase in the carbohydrate intake but a decrease in total or saturated fat intake. Higher quartiles of prudent DP also had significantly higher intakes of dietary fibre, calcium, iron, magnesium, phosphorus, thiamine, riboflavin, folate, vitamin C,

and vitamin E; but lower intake of total and saturated fat, niacin, and cholesterol. There was no difference in protein intake across quartiles of Western or prudent DP scores.

3.4.10 Comparison of DP scores between mother and daughter generations

Figures 3.2 and 3.3 show the distributions of Western and prudent DP scores for mothers and daughters. Tables 3.21 and table 3.22 present the distribution of mother and daughter participants across quartiles of DP scores.

For Western DP score, mothers had a significantly lower score than daughters (-0.62 ± 0.51 vs. 0.61 ± 0.99; $p<0.001$) and had a lower score within mother-daughter pairs (mean difference: -1.23 ± 1.0; $p<0.001$). The majority (83.5%) of mothers were classified into the lower two quartiles while the majority (83.7%) of daughters were classified into the upper two quartiles.

On the other hand, mothers had a significantly higher prudent DP score than daughters (0.22 ±1.15 vs. -0.21 ± 0.78; $p=0.001$) and had a higher score within mother-daughter pairs (mean difference: 0.42 ± 1.28; $p=0.002$). Two-thirds (61.2%) of mothers were classified into the higher two quartiles while two-thirds (60.6%) of daughters were classified into the lower two quartiles.

3.4.11 Associations of DP scores with demographics and lifestyle characteristics

Due to the generational difference in DP scores, the demographic and lifestyle characteristics across quartiles of Western and prudent DP scores were presented separately for mothers and daughters. For Western DP quartiles, since there were very few mother participants in quartile 4 and very few daughter participants in quartile 1, quartile 3 and quartile 4 were combined for mothers whereas quartile 1 and quartile 2 were combined for daughters. The demographic and lifestyle characteristics across

Western and prudent DP score quartiles are presented in tables 3.25 and 3.26 for mothers, and in tables 3.27 and 3.28 for daughters.

3.4.11.1 Western DP

Mother participants in the highest quartile had a longer duration living in Hong Kong and were more likely to be born in Hong Kong (both p for trend 0.002) (Table 3.25). They were also more likely to have higher BMI (p for trend 0.046), central obesity (p for trend 0.065), and had their body weight increased or fluctuating by at least five pounds in the past 12 months (p for trend 0.040). There were no differences across quartiles of Western DP score for age, household income, full-time employment status, and self-perceived health. However, there was a non-significant trend that mothers with a higher Western DP score were less likely to be high school graduate (highest vs. lowest quartile: 29.4% vs. 46.8%), more likely to be ever smoker (17.6% vs. 8.5%), and spend less time on leisure-time physical activities (2.9 ± 4.6 MET-hr/wk vs. 6.2 ± 12.4 MET-hr/wk).

For daughter participants, there were no significant differences for all demographic and lifestyle characteristics, but daughters in the higher quartiles were more likely to be ever smokers or have central obesity (highest vs. lowest quartiles for both variables: 10.4% vs. 5.9%) (Table 3.27). Daughters in the highest quartile also were more likely to consume alcohol regularly (≥1 week).

3.4.11.2 Prudent DP

In contrast with the Western pattern, there were no significant differences in the demographic or lifestyle characteristics across prudent DP quartiles for mothers (Table 3.26). However, there were non-significant trends that mothers in the higher quartiles tended to be high school graduates (highest vs. lowest quartile: 43.8% vs. 36.8%), never

smokers (96.9% vs. 84.2%), working full-time (56.3% vs. 36.8%), have a healthy waistline (% with central obesity: 43.8% vs. 52.6%), and be more physically active (5.7 ± 11.9 MET-hrs/wk vs. 3.2 ± 10.2 MET-hrs/wk).

Daughters in the higher prudent DP quartiles were less likely to be ever smokers and perceived better self-rated health (p for trend 0.017 and 0.005 respectively) (Table 3.28). There was a non-significant trend that daughters in the higher quartiles were more likely to have central obesity (highest vs. lowest quartile: 20.0% vs. 6.3%); however, they also tended to report a reduction of or maintaining body weight in the past 12 months (65.0% vs. 50%).

3.4.12 Associations of DPs with media exposure

Tables 3.29 and 3.30 present the frequency of media exposure for mothers and daughters across quartiles of Western and prudent DP scores respectively.

3.4.12.1 Western DP

In general, daughters had a higher total media exposure at all levels of Western DP score than mothers. Mothers in the higher quartiles were associated with higher daily hours spent on total media exposure (highest vs. lowest quartile: 5.8 ± 3.7 hrs/d vs. 4.7 ± 2.5 hrs/d; p for trend 0.035) and TV viewing (3.2 ± 2.1 hrs/d vs. 2.6 ± 1.3 hrs/d; p for trend 0.038). Similarly, daughters in the higher quartiles were associated with higher daily hours spent on total media exposure (6.1 ± 3.0 hrs/d vs. 5.3 ± 2.9 hrs/d; p for trend 0.026). Particularly, time spent on magazine reading and leisure-time internet use were significantly higher among daughters with higher Western DP score (p for trend 0.007 and 0.021; respectively).

3.4.12.2 Prudent DP

Overall, there was no significant difference for all types of media exposure for both mothers and daughters across quartiles of prudent DP score. However, mothers in the higher quartiles tended to spend less time on total media exposure (highest vs. lowest quartile: 4.6 ± 2.8 hrs/d vs. 5.5 ± 2.4 hrs/d) and on TV viewing (2.5 ± 1.9 hrs/d vs. 3.7 ± 1.9 hrs/d). Daughters in the higher quartiles tended to spend less time on total media exposure (4.7 ± 2.4 hrs/d vs. 5.6 ± 2.7 hrs/d), TV viewing (1.9 ± 1.2 hr/d vs. 2.4 ± 1.3 hrs/d), and leisure-time internet use (1.9 ± 1.5 hr/d vs. 2.6 ± 2.0 hrs/d). However, daughters in the highest quartile spent twice the time on radio listening (0.4 ± 0.7 hrs/d vs. 0.2 ± 0.7hrs/d).

3.4.13 Associations between media exposure and BMI status

Table 3.31 shows the frequency of media exposure according to the BMI status. Overweight mothers spent slightly less time on total media exposure than normal weight mothers (4.5 ± 2.3 hrs/d vs. 5.0 ± 3.0 hrs/d; p=0.394). However, overweight mothers spent more time on TV viewing (2.8 ± 1.7 hrs/d vs. 2.6 ± 1.7 hrs/d; p=0.535) and leisure-time internet use (0.4 ± 0.8 hrs/d vs. 0.2 ± 0.3 hrs/d; p=0.073) but less time on radio listening (0.8 ± 1.2 hrs/d vs. 1.5 ± 2.6 hrs/d; p=0.105) or newspaper reading (0.4 ± 0.4 hrs/d vs. 0.6 ± 0.4 hrs/d; p=0.024). There were very few underweight mothers (n=2) and they tended to spend less time on all forms of media compared to normal weight or overweight mothers.

Both overweight and underweight daughters spent more time on total media exposure than normal weight daughters (6.2 ± 2.6 hrs/d and 6.4 ± 3.6 hrs/d vs. 5.1 ± 2.5hrs/d; $p_{t\text{-}test}$=0.028). In particular, overweight or underweight daughters spent more time on TV viewing (2.6 ± 1.7 hrs/d and 2.5 ± 1.4 hrs/d vs. 2.3 ± 1.4 hrs/d; $p_{t\text{-}test}$=0.388)

and leisure-time internet use (2.7 ± 1.7 hrs/d and 2.4 ± 2.1 hrs/d vs. 2.1 ± 1.5 hrs/d; $p_{t\text{-}test}$=0.208). Also, overweight or underweight daughters spent more time on radio listening than normal weight daughters (0.4 ± 0.8 hrs/d and 1.0 ± 1.8 hrs/d vs. 0.2 ± 0.6 hrs/d; $p_{t\text{-}test}$=0.038).

3.4.14 Associations of DPs with meal pattern characteristics

Tables 3.32 and 3.33 present the meal pattern characteristics for mothers across quartiles of Western and prudent DP scores respectively. For daughters, their meal pattern characteristics across quartiles of Western and prudent DP scores are presented in tables 3.34 and 3.35 respectively.

3.4.14.1 Western DP

Compared to the lowest quartile, mothers in the higher quartiles consumed fried foods (highest vs. lowest quartile: 1.9 ± 2.0 times/wk vs. 1.0 ± 1.2 times/wk; p for trend 0.001), and had breakfast eaten away from the home (%total breakfast consumed per week: 45.7 ± 40.3% vs. 31.5 ± 35.5%; p for trend 0.059) more frequently (Table 3.32). There was a non-significant trend that mothers in the higher quartiles tended to skip breakfast more often (1.5 ± 2.5 times/wk vs. 1.1 ± 2.2 times/wk) and had fewer meals with their children (5.5 ± 4.5 times/wk vs. 8.1 ± 4.7 times/wk). Mothers in the higher quartiles tended to cook meals or shop for food less frequently, and were less likely to be supplement users.

Similarly, daughters in the higher quartiles also consumed fried foods more frequently (highest vs. lowest quartile: 3.1 ± 2.7 times/wk vs. 0.8 ± 0.6 time/wk; p for trend <0.001) (Table 3.34). In addition, daughters in the higher quartiles were more likely to skip breakfast (2.5 ± 2.1 times/wk vs. 1.8 ± 2.2 times/wk; p for trend 0.037),

consumed meals prepared away from home more frequently (9.5 ± 4.3 times/wk vs. 5.9 ± 3.2 times/wk; p for trend 0.004), particularly at dinner time or for afternoon tea. Also, they were less likely to have meals with their mothers (5.1 ± 3.1 times/wk vs. 8.0 ± 4.1 times/wk; p for trend 0.010). Daughters in the higher quartiles also tended to be supplement users.

3.4.14.2 Prudent DP

There was no significant difference in meal patterns across quartiles for mothers (Table 3.33). However, compared to the lowest quartile, mothers in the higher quartiles were more likely to be supplement users (highest vs. lowest quartile: 31.3% vs. 15.8%; p for trend 0.418), had meals with their children more frequently (7.5 ± 4.1 times/wk vs. 6.4 ± 4.3 times/wk; p for trend 0.286), and ate meals prepared away from home less frequently (5.6 ± 3.8 times/wk vs. 7.9 ± 5.2 times/wk). Mothers in the higher quartiles tended to cook meal and shop for food more frequently.

Contrary to Western DP, daughters in the higher quartiles of prudent DP were less likely to skip breakfast (highest vs. lowest quartile: 1.7 ± 2.0 times/wk vs. 3.0 ± 2.1 times/wk; p for trend 0.011) (Table 3.35). They were also more likely to be supplement users (25.0% vs. 6.3%; p for trend 0.033) and had meals eaten with mother, particularly breakfast (1.4 ± 1.6 times/wk vs. 0.5 ± 0.7 times/wk; p for trend 0.023) and dinner (4.2 ± 1.8 times/wk vs. 3.3 ± 2.3 times/wk; p for trend 0.278).

3.4.15 Determinants of DPs

3.4.15.1 Pearson's correlations

Table 3.36 shows the Pearson's correlation coefficients between mothers' and daughters' DP scores, and between DP scores and media exposure, age, years living in

Hong Kong, years living together between mothers and daughters, energy intake, frequency of meals-away-from-home, frequency of family meals, and leisure-time physical activity levels. Energy intake was positively associated with Western and prudent DPs for both mothers and daughters. Frequency of family meals was negatively correlated with both mothers' and the daughters' Western DP scores but positively correlated with prudent DP scores. In general, media exposure was positively associated with Western DP score but negatively associated or had no significant associations with prudent DP score for both mothers and daughters. Specifically for Western DP score, time spent on TV viewing and total media exposure were significantly correlated with mothers' DP scores while time spent on magazine reading, leisure-time internet use, and total media exposure were significantly correlated with daughters' DP scores. Frequency of meals-away-from-home was positively correlated with the Western DP score for daughters but had no correlation with mothers' Western DP score or with prudent DP scores. Age, leisure-time physical activity level, or years living together between mothers and daughters were not associated with Western or prudent DP scores.

Within mother-daughter pairs, mothers were positively correlated with daughters for Western DP score (Pearson r: 0.22, p=0.027) but not for prudent DP score (0.16, p=0.102) in the bivariate associations. Further stratification by cohabitation status and adjustment for age, energy intake, and frequency of family meals indicated that the Western and prudent DP scores were significantly correlated for mothers and daughters who were living together in the past 12 months (Partial r=0.24, p=0.027 and r=0.28, p=0.007 respectively) (Table not shown). Since only few daughters lived apart from their mothers (n=10), the mother-daughter DP score correlations for this group cannot be determined as further adjustment of other variables was not possible.

3.4.15.2 Multiple linear regressions

In order to assess any possible independent correlations of DPs between mothers and daughters, multiple linear regression analyses were conducted. The analyses were conducted separately for Western and prudent DP scores. To control for the effects of age and energy intake on individual DP scores, these two variables were included in the model by the "enter" method. The corresponding mother's or daughter's DP score was included in the model by the "forward" method. The criterion for each variable entering into the regression model is set at p-value of 0.05 for the F statistics of the Analysis of Variance test. Co-variables included the daily time spent on individual media exposure, years living in Hong Kong, frequency of family meals, and frequency of meals-away-from-home, and years residing in HK. These were entered into the model by the "forward" method. Because descriptive statistics suggested possible associations of DP scores with smoking status and full-time employment status, dummy variables were created for these two variables and were entered as co-variates. Except for mothers' Western DP score, the results using the untransformed data were presented, since the untransformed and transformed data yielded similar results.

3.4.15.2.1 Determinants of Western DP score

As shown in Table 3.37, after adjustment for age and energy intake, mothers' Western DP scores were positively and significantly associated with the time spent on total media exposure ($p<0.001$) and years living in Hong Kong ($p=0.009$). Per 1-hour increase in total media exposure per day was associated with a 14%SD increase in mothers' Western DP scores. Per 5-y increase in duration residing in Hong Kong was associated with an 8%SD increase in mothers' Western DP scores. In contrast, frequency of family meals and the time spent on radio listening were negatively

associated with mothers' DP scores (p=0.005 and 0.019 respectively). Mothers who had at least one meal per day with their children were 33%SD lower in Western DP score than mothers who did not have any meal with their children. Per 2-hour increase on radio listening per day was associated with a 41%SD decrease in Western DP score. Such effect of radio listening was independent of total media exposure. These 4 variables together with age and energy intake explained 48.2% of the variance of mothers' Western DP scores. Daughters' Western DP scores did not predict mothers' Western DP scores.

Daughters' Western DP scores were significantly predicted by their mothers' Western DP scores (p=0.019). Per one unit increase in mothers' Western DP scores was associated with a 21% SD increase in daughters' Western DP scores. In addition, the time spent on TV viewing was positively associated with daughters' Western DP scores (p=0.01). Per hour increase in TV viewing per day was associated with an 8%SD increase in daughters' Western DP scores. Furthermore, smoking status strongly predicted the adherence to Western DP in daughters. Daughters who were ever smokers were 51%SD higher in the Western DP score than never smokers. In contrast, frequency of family meals was negatively associated with the daughter's DP score (p<0.001). Daughters who had at least one meal with their mothers per day were 34%SD lower in Western DP score than those who did not have any meal with their mothers. These 4 variables together with age and energy intake explained 81.2% of the variance of daughters' Western DP scores.

3.4.15.2.2 Determinants of prudent DP score

Contrary to Western DP, duration living in Hong Kong or media exposure of any kind was not associated with the mothers' prudent DP scores (Table 3.38). The only predictor was full-time employment status. Mothers who worked full-time were 57%SD lower in prudent DP score than mothers who were not working full-time. Daughters' prudent DP scores did not predict mothers' prudent DP scores.

For daughters, although mother's prudent DP score was not a predictor of daughters' prudent DP scores, frequency of meals eaten by mothers and daughters together was significantly associated with daughters' prudent DP scores. Daughters who had at least one meal per day with their mothers were 32%SD higher in prudent DP score than daughters who did not have any meal with their mother. On the other hand, time spent on leisure-time internet use was negatively associated with daughters' prudent DP scores. Per hour increase in leisure-time internet use per day was associated with 11%SD decrease in daughters' prudent DP scores.

3.4.16 Associations of mothers' employment status with individuals' DP scores, meal pattern characteristics, and media exposure

The positive association between Western DP score and the frequency of family meals presented in mothers and daughters is likely modified by the mothers' employment status because mothers who were employed full-time were less likely to report cooking family meals "usually" (62.0% vs. 79.2%, p=0.054) and frequent food shopping (≥3d/week) (76.0% vs. 94.3%, p=0.008) (Table 3.39). As such, stratified descriptive analyses were performed to assess the association of mothers' employment status with the DP scores, meal pattern characteristics, and media exposure for mothers and for their daughters who were living with them.

3.4.16.1 Comparisons of mothers' dietary characteristics and media exposure by their employment status

Mothers who were employed full-time had a slightly higher Western DP score but lower prudent DP score than those who were employed part-time or were full-time home makers (Table 3.39). Mothers who worked full-time had a lower frequency of meals with their children (6.0 ± 4.3 times/week vs. 8.2 ± 4.5 times/week; p=0.046) and a higher frequency of fried food consumption (1.4 ± 1.6 times/week vs. 0.9 ± 0.8 times/week; p=0.034). However, they skipped breakfast less frequently (0.9 ± 1.9 times/week vs. 1.3 ± 2.2 times/week; p=0.306) and their frequency of meals-away-from-home (6.9 ± 4.6 times/week vs. 6.8 ± 5.1 times/week; p=0.879) was similar to mothers who were not employed full-time. They also spent less time on total media exposure, particularly on TV viewing (2.4 ± 1.6 hrs/d vs. 3.0 ± 1.7 hrs/d; p=0.053).

3.4.16.2 Comparisons of daughters' dietary characteristics and media exposure by mothers' employment status

Similar to their mothers, daughters whose mothers worked full-time had a higher Western DP score and a lower prudent DP score than daughters whose mothers worked part-time or were full-time home makers (Table 3.40). Also, daughters whose mothers worked full-time had less meals with their mothers (5.8 ± 3.4 times/week vs. 7.2 ± 3.6 times/week; p=0.046). However, they were similar to their counterparts in the frequency of meals-away-from-home (8.5 ± 4.2 times/week vs. 8.4 ± 4.1 times/week; p=0.917) and had a lower frequency of fried food consumption (1.7 ± 1.5 times/week vs. 2.6 ± 2.8 times/week; p=0.046). They were also similar to their counterparts in the frequency of breakfast skipping (2.0 ± 2.0 times /week vs. 1.8 ± 1.8 times/week; p=0.483), but they had a higher frequency of breakfast outside the home (31.4 ± 31.5%times/week vs. 26.4 ± 31.9%times/week; p=0.446). Daughters whose mothers worked full-time spent

more time on media exposure, particularly leisure-time internet use (2.7 ± 1.6 hrs/d vs. 2.1 ± 1.6 hrs/d; p=0.058).

3.4.17 Associations of mothers' place of birth with individuals' characteristics

The association of DP scores between mothers and their daughters or the association between DP scores and media exposure may be influenced by mothers' place of birth because mothers who were born in China may present different social and lifestyle practices compared to those who were born in HK. As such, stratified descriptive analyses were conducted to assess the characteristics on demographics, DP scores, meal pattern, lifestyles, and media exposure for mothers and daughters according to maternal place of birth.

3.4.17.1 Comparisons between mothers who were born in China and those who were born in HK

3.4.17.1.1 Demographic and lifestyle characteristics

Mothers who were born in China spent only half the number of years in HK compared to those who were born in HK and were less likely to be high school graduate (23.1% vs. 49.2%; p=0.009); however, they were similar in full-time employment status, BMI and prevalence of central obesity (Table 3.41). Mothers who were born in China were less likely to be ever smokers (0.0% vs. 3.2%; p=0.261); but were more likely to be alcohol users (10.3% vs. 4.8%; p=0.516) or be physically less active (4.0 ± 9.0 MET-hrs/wk vs. 6.0 ± 11.1 MET-hrs/wk; p=0.065). Nevertheless, further stratification by employment status indicated that both China- or HK-born mothers who worked full-time were less physically active than their counterparts who did not work full-time (data not shown). Mothers who were born in China were less likely to have hypertension (10.3% vs. 17.5%; p=0.318).

3.4.17.1.2 Dietary characteristics and media exposure

Mothers who were born in China had a lower Western DP score (-0.77 ± 0.51 vs. -0.52 ± 0.48; p<0.001) but a similar prudent DP score (0.18 ± 1.12 vs. 0.23 ± 1.17; p=0.707) compared to mothers who were born in HK (Table 3.42). China-born mothers were more likely to report meal cooking 'usually' (74.4% vs. 68.3%; p=0.511) and food shopping at least 3 days per week (87.2% vs. 84.1%; p=0.672) than HK-born mothers. China-born mothers also had lower frequencies of breakfast skipping (0.8 ± 1.9 times/wk vs. 1.3 ± 2.2 times/wk; p=0.07), meals-away-from-home (5.1 ± 4.8 times/wk vs. 8.0 ± 4.7 times/wk; p=0.001), and a higher frequency of meals with their children (7.4 ± 4.9 times/wk vs. 6.9 ± 4.3 times/wk; p=0.780). However, further stratification by employment status indicated that both China- and HK-born mothers who worked full-time had a higher Western DP score and a lower frequency of meals with their children (China-born mothers: 5.6 ± 4.5 times/wk vs. 9.2 ± 4.8 times/wk, p=0.021; HK-born mothers: 6.3 ± 4.2 times/wk vs. 7.6 ± 4.4 times/wk, p=0.328; table not shown). Furthermore, mothers who worked full-time had a lower frequency of meal cooking, food shopping, or breakfast skipping than mothers who did not worked full-time, regardless of their place of birth.

3.4.17.2 Comparisons between daughters whose mothers were born in HK and whose were born in China

3.4.17.2.1 Demographic and lifestyle characteristics

Daughters whose mothers were born in China were less likely to be born in HK than daughters of HK-born mothers (82.1% vs. 98.4%; p=0.003); but they were similar in education level, full-time employment/study status, income level, BMI, and prevalence of central obesity (Table 3.43). Daughters of China-born mothers were less

likely to be ever smokers (5.1% vs. 11.1%; p=0.301) or alcohol users (0.0% vs. 3.2%; p=0.019). However, daughters of China- or HK-born mothers were similar in leisure-time physical activity level (6.5 ± 9.0 MET-hrs/wk vs. 7.7 ± 11.6 MET-hrs/wk; p=0.871) and self-perceived health (p=0.522).

3.4.17.2.2 Dietary characteristics and media exposure

Daughters of China- or HK-born mothers were similar in their Western and prudent DP scores (Table 3.44). Despite a lower frequency of meals-away-from-home (8.0 ± 4.4 times/wk vs. 8.9 ± 4.0 times/wk; p=0.121), daughters of China-born mothers had a higher frequency of fried food consumption (2.5 ± 2.7 times/wk vs. 2.0 ± 1.9 times/wk; p=0.785) and a lower frequency of meals with their mother (5.8 ± 3.2 times/wk vs. 6.4 ± 3.8 times/wk; p=0.615) compared to daughters of HK-born mothers. In general, daughters who were living with their mothers had a higher frequency of meals with their mothers, regardless of the maternal place of birth (Table not shown). In addition, the frequency of meals-away-from-home was similar between daughters of China- and HK-born mothers, after adjustment for cohabitation status. There was no observable difference in media exposure between daughters of China- and HK-born mothers.

3.4.18 Associations of DP scores and the BMI status

Separate binary logistic regressions were performed to assess the odds ratio (OR) for being overweight (in mothers and daughters) and underweight (in daughters) across quartiles of Western and prudent DP scores (Table 3.45). All models were adjusted for age, energy intake, daily time spent on total media, and leisure-time physical activity level (MET-hrs/wk).

3.4.18.1 Western DP

Mothers or daughters in the higher quartiles of western DP were associated with higher odds of being overweight. Compared to those in the lowest quartile, the ORs for overweight in the highest quartile were 3.06 (95%CI 0.77, 12.26) for mothers and 6.47 (95%CI 0.58, 71.78) for daughters, after adjustment for age, calorie intake, education level, leisure-time moderate/vigorous physical activities, and total daily hours spent on media. Furthermore, daughters in the higher quartiles of western DP may also increase the risk of being underweight (Highest vs lowest quartiles: OR 1.42; 95%CI 0.20. 10.24). However, the odds of being overweight tended to be stronger than the odds of being underweight in daughters with higher Western DP score.

3.4.18.2 Prudent DP

The practice of prudent DP seemed to be protective for being overweight in mothers but not in daughters. Compared to the lowest quartile, the odds ratio of being overweight was 0.35 (95%CI 0.08, 1.56) in mothers but 2.79 (95%CI 0.47, 16.54) in daughters. Higher quartiles of prudent DP were also associated with an increase risk of underweight in daughters (highest vs. lowest quartiles: OR 1.77; 95%CI 0.39, 8.18), but the risk of being overweight tended to be stronger than the risk of being underweight.

3.5 Discussion

3.5.1 Representativeness of study participants

The study participants were mainly recruited from a community-based random sampling of households in a major district (Shatin and Ma On Shan) in Hong Kong. The study participants were comparable to the general population for age-specific characteristics in education level, marital status, and smoking status, except that there was a higher proportion of daughter participants reporting secondary education

attainment (90.4%) and never married (98.1%) compared to the general population (77.2% and 74.9% respectively) (247;248). The higher proportion of never married among daughter participants is likely because most (92.3%) of the daughter participants were at the lower end (age < 25y) of their age group (20-29y). The BMI status and the prevalence of central obesity in the mother participants were also comparable to women of similar age in the general population (249). The study findings may be generalizable to the local Chinese families with adult daughters.

The response rate of 56.9 percent in this study, although modest, is comparable to other dietary studies involving families with adult children (response rate ranged from 51% to 58%) (70;130;138). Incentives relevant to the study populations (Testing for fasting blood cholesterol for mothers, testing for thalassaemia trait for daughters, or cash coupon) were provided as an inducement to increase the participation rate. Multiple invitations by mail and by telephone were made to ensure that potential participants were aware of the study.

3.5.2 Comparisons of Western DP characteristics with other populations

3.5.2.1 Foods and nutrients characterizing Western DP

The Western DP in this study was the first component identified by the PCA procedure. The foods/food groups contributing to this component resembled most of the foods/food groups characterized for Western DP. Consistent with other population data or women's studies (37;40-42;44;50;250), the key foods contributing to the Western DP identified in this study included red meat, processed meat, sugar-sweetened drinks, French fries, cakes and snacks, high-fat dairy, mayonnaise, pizza, egg, and cream soup. The fact that the factor loadings of Western pattern foods resembled those found in Western populations reveals the universal characteristics of Western DP across

populations. For example, the positive factor loadings of red meat and processed meat (0.65 and 0.59, respectively) found in this study were comparable to those found in the Nurses' Health Cohort (red meat: 0.55–0.62 and processed meat: 0.49–0.59) (43;251) and the Swedish Mammography Screening cohort (0.45 and 0.58, respectively) (41). Furthermore, the positive associations between the Western DP score and the intake of energy, total and saturated fat, but negative associations with carbohydrates, dietary fibre, and folate found in this study were consistent with the findings shown in the Western populations (35;41;50) and in other Asian populations (29;120). These findings reveal that a direct comparison of Western DP identified across populations is highly possible.

3.5.2.2 Individual characteristics associated with Western DP

3.5.2.2.1 Demographic Characteristics

The findings in this study are consistent with the demographic characteristics found in other populations, in that the practice of Western DP was associated with younger age (36;42;43;48;49) and higher BMI in women (27;42;42;43;47;50;50;51;55;120). Previous studies indicated that the Western DP was associated with lower education (41;48;94) and income (48) in Western regions but with higher education (29;49;120) and income (49;120) in Asian countries. The current study shows that mothers who completed secondary education were less likely to practice Western DP but daughters who completed secondary education seemed to be more likely to practice Western DP. This suggests that education is protective for practicing Western DP in the mother generation. However, since most daughters (93.8%) had completed secondary education, it limited the study's ability to assess the association between education and practice of Western DP in the daughter generation.

The fact that women who were born in Hong Kong or had a longer duration residing in Hong Kong having a higher Western DP score demonstrated the dietary influence by a long-term exposure to the Westernized food environment and by the Western culture in Hong Kong. However, the full-time employment of mothers also played an important role in the practice of Western DP in both mothers and daughters, likely because mothers who worked full-time committed less time in family meal preparation and had less frequency of meals with their children.

3.5.2.2.2 Lifestyle and dietary characteristics

Similar to other populations (36;37;42;90;92;94), women with higher Western DP scores were generally associated with unhealthy lifestyle practices. Participants with higher Western DP score in this study were more likely to be ever smokers and less likely to be physically active. Consistent with the findings in other populations (37;38), the prevalence of supplement users in the mother participants was negatively associated with Western DP score (37). Similar to the dietary Westernization taking place in other Asian populations (61;63;65;252), this study finds that the practice of Western DP was associated with higher frequency of breakfast skipping and consumption of deep-fried foods, snack foods, sugar-sweetened drinks, and food-away-from-home. The current study supports that there is a clustering of unhealthy lifestyles with Western dietary practices in the local population. Previous studies have shown inconsistent results on the relationship of alcohol use with Western DP (29;37;48); however, such association cannot be determined in this study due to the low prevalence of alcohol use in this population.

3.5.3 Characteristics of Western DP specific to the Hong Kong Chinese population

The DPs identified in this study also reflect some characteristics of the local Chinese population. There was a discrepancy of higher intakes of fish and seafood being classified as a part of prudent diet in most Western studies (34), (32;40;42;43;46;253)but were characteristics for both Western and prudent DPs in this population. Hong Kong was a fishing port before developed into a metropolitan city. With such geographical circumstances, a wide variety of fish and seafood were readily available and accessible across all income groups and therefore contributed as a common dish in the local diet. Similar findings of seafood-meat association were also shown in other Asian populations where seafood was abundant (87;254). Another interesting phenomenon is the discrepancy of identifying poultry as a characteristic of Western DP in this study but as a characteristic of healthy DP in Western populations. This may be related to the consumption practice in our study population. It is found that the Western DP in this study explained 31.8% and 3.1% variability for the poultry intake with skin and without skin respectively (data not shown). This demonstrated that the higher intake of poultry was associated with eating poultry with the skin on in our study population. However, since there is no information available on whether the consumption of poultry is with or without skin in other DP studies, further comparisons with other populations were not possible. The findings suggest that the consumption practices, for example, removing skin and visible fat before consumption, should be incorporated into the DP assessment.

3.5.4 Effects of Western DP on health risks in Hong Kong Chinese women

This study supports that adherence to Western DP is associated with elevated obesity risks in Chinese women. Longitudinal studies have provided strong evidence

that practices of Western DP predicted weight gain and increased risk of obesity in women (52;53). Higher Western DP scores in this study were associated with 3- to 6-fold increased risks of overweight in the study participants. Also, mothers with higher Western DP scores had a higher prevalence of central obesity or poor weight control. A local cohort study also supported the detrimental effects of Western DP on the risk of obesity, in that snack consumption, which is a major component of Western DP, was associated with an increased risk of developing overweight in Chinese adults (255).

This study also highlights an important public health concern about the health effects of Western DP in the local female population. Despite very few studies conducted in Asia, a population-based prospective cohort in Japan demonstrated that adherence to Western DP was associated with a 2.2-fold increased risk of colon cancer in women (29). Other longitudinal studies in Asia also observed that the 'Animal food' or "meat-rich" pattern, which closely resembled Western DP, was associated with an increased risk of cardiovascular mortality (87;88), glucose intolerance (49), and mortality due to diabetes (87). Other long-term health consequences of practising Western DP among the Chinese populations have yet to be determined.

3.5.5 Effects of family meals on the practice of Western DP

3.5.5.1 Effects of family meals on overall diet quality

Multivariate models in this study noted that family meals are protective from practicing Western DP in both mother and daughter generations. This finding is consistent with previous studies that frequency of family dinner was associated with a reduced risk of obesity (256-258). Sen (257) reported that adolescents who had family dinners of at least 3 or 4 times a week were 62–80% lower in the risk of becoming overweight. Eating family dinners has shown positive associations with the intake of

fruits and vegetables and negative associations with the intake of fried food and soft drinks in children and adolescents (259). Family dinners or social eating, in general, were also associated with greater intakes of fruits, vegetables, calcium, and fibre in young adults (260). On the other hand, routine family meals experienced in mid-life women have been associated with both higher energy and fat intake but also higher intake of fruits and vegetables (261). The nutrition quality of family meals may predict the overall dietary behaviours within the family and the availability of healthy or unhealthy snacks at home (262). Furthermore, family meals may also provide opportunities for parents to monitor and discuss on healthy and unhealthy dietary practices with their children, to serve as role models for eating behaviours, and to establish family connectedness, which may help protect children from eating disorders (263). The current study suggests that frequency of family meals (not only family dinners) is associated with a better overall diet quality. The finding of an inverse association between the frequency of family meals and Western DP scores in both mother and daughter generations extends the possible beneficial effects of family meals to parents and adult children.

3.5.5.2 Modelling and intergenerational transfer of dietary pattern

There is evidence in this study that mothers served as a role model of dietary practices for their daughters. The positive correlations were noted between mothers' and daughters' DP scores, particularly when mothers and daughters were living together. The multivariate adjusted model indicated that mothers' Western DP scores were significant predictors of their daughters' Western DP scores, independent of the frequency of meals eaten together. The reverse influence by daughters on their mothers' Western dietary practice was not shown in this study because daughters' Western DP

scores did not predict their mothers' Western DP scores. Family studies suggest that similarity of dietary intakes is arguably related more to shared environmental influences than shared genetic factors (71;126;127;129). Children with mothers having greater adherence to Western DP may develop preferences towards Western foods through mothers' dietary modelling and availability of Western food choices. This study data adds to the literature that familial resemblance in DP also exists. However, further studies are warrant to examine the DP association after mothers and their daughters lived apart.

3.5.5.3 Implications for promoting family meals

3.5.5.3.1 Reduction of obesity risk

Based on the study findings, promotion of family meals is likely to be beneficial in reducing the risk of overweight in middle-age or young adult women. Previous studies suggested that family meals of at least three to four times per week are necessary for observable positive dietary benefits (264-267). Given the rising burden of obesity in Hong Kong, policy makers have been suggested to budget population-wide and school-based health promotion programmes on diet (268). This study suggests that family meal promotion should be considered in health programmes or school curriculum.

3.5.5.3.2 Aspects to be considered with the promotion of family meals

Consistent with previous studies (264), this study found that full-time employment status of mothers and older age of children were associated with lower frequency of family meals. Major barriers for participating in family meals may include scheduling difficulties (267;269-271), low perceived importance of family meals (269), or the distance of job away from home (270). The nutritional quality of family meals

may be influenced by parents' job satisfaction and security, cooking skills and enjoyment of cooking perceived by the meal preparers, availability of a partner or family members that can help with meal preparation, and work fatigue or strain experienced by the meal preparers (270;271).

Another concern related to the promotion of family meals is the effect of TV viewing during mealtime. Several research have suggested an inverse association between TV viewing during family meals and the diet quality (272-274). TV viewing during family meals was associated with lower intakes of fruit and vegetables in adolescents (273) and parents (272). In the current study, it is also found that TV viewing and frequency of family meals was independently associated with the Western DP score in the opposite direction. Despite this, family meals while watching TV have shown to result in a better dietary quality than with no regular family meals (273). Promotion of family meals would likely improve the dietary quality among family members regardless of with or without TV viewing while eating, although family meals without TV viewing is more encouraged.

3.5.5.3.3 Strategies for the promotion of family meals

Strategies for promoting family meals may range from "building awareness of the importance of family meals" for families who do not have regular family meals to "providing new ideas to keep meals interesting" for families who often eat together (275). For example, frequency of family meals may be increased through emphasizing family meals as a useful mechanism for enhancing family togetherness and communication (269) or as a setting to reinforce values and traditions that are important to the family (267), providing food preparers and other family members with healthy quick meal skills and options which may incorporate low-cost and easy-to-prepare

foods (267;270;271), engaging family members (even small children) in meal preparation, setting up, or cleaning the meal table (267;271), and scheduling regular family meals without TV viewing (267;276). Messages about family meal promotion can be delivered through supermarket posters, hospitals, insurance companies, school lunch menus, school nurses, community events calendars in the newspaper or on the radio, church bulletins, parent-teacher associations, day-care centres, community centres, or youth organizations (267). Such strategies have been used in a state-wide nutrition program in the United States as a way to reduce obesity risk in low-income families and have shown to be effective in increasing frequency of family meals (275).

3.5.6 Effects of media exposure on dietary practices

3.5.6.1 Dose-response relationship between media exposure and practice of Western DP

This study supports that media exposure is influential on individual dietary behaviours. The multivariate analysis quantified a dose-response relationship of practicing Western DP with the daily hours spent on total media for mothers and with the daily hours spent on TV viewing for daughters. Higher TV viewing likely increases exposure to Western food cultures and reinforces the priming effects of food commercials. Furthermore, eating while watching TV may distract the dietary controls and the memory of the amount of food consumed, resulting in elevated overall energy intake (80;200;202;205;206). Several television-reduction messages has been developed and incorporated into nutrition programmes targeting low-income families as a way to address the obesity issues in children (277). Recent intervention studies targeting a reduction in TV viewing have shown potential positive effects in lowering energy intake in children (278) and adults (279). In a two-year intervention, overweight children in the

intervention group decreased the amount of time spent on watching TV and using the computer by an average of 5.2hrs per week (0.74hrs per day), and were associated with a reduction of 300kcal intake per day compared to a reduction of 150kcal intake per day in the control group (278). In a 3-week intervention, overweight and obese adults in the intervention group significantly decreased on average 2.9hrs of TV viewing per day and were associated with a reduction of 125kcal intake per day compared to a reduction of 38kcal intake per day (279). Both studies also reduced the time spent in sedentary activities but did not increase the light or higher-level physical activities. The current study shows that one major pathway mediating the association between TV viewing and obesity is through influencing dietary behaviours.

3.5.6.2 Potential media influences of thin ideal body weight and practice of DP on BMI status

This study suggests a possible media effect of thin ideal body stereotyping in Chinese women. This study indicated that higher media exposure, particularly TV viewing and leisure-time internet use, was associated with being overweight in mothers and daughters, or underweight in daughters. Increased exposure to thin ideal portrayed in the media may elevate women's dissatisfaction of their body weight and tendency to dietary restraints, emotional eating, and/or eating regardless of individuals' satiety state (189;212;215;216). A study of Hong Kong female adolescents and young adults also support a positive association of BMI with dieting behaviours as well as food preoccupation (e.g. eating binges) (280). Although the temporal association cannot be determined, higher media exposure in the underweight or overweight participants in the current study may indicate the long-term consequences of dietary restriction or binge eating.

Furthermore, the practice of Western DP among the overweight or underweight participants may interact with the media effects on BMI status. The current study showed that there were greater proportions of overweight mothers or daughters, or underweight daughters, in the upper quartiles of Western DP score. This suggests that the practice of Western DP, accompanying with higher energy and fat intake, may heighten the media influence on body dissatisfaction and disordered eating behaviours.

3.5.6.3 Leisure-time internet use and DP associated with poor self-rated health

The finding that a negative association between leisure-time internet use and prudent DP score in daughters warrants further investigation. A local study found an inverse dose-response relationship of increasing internet use and quality of life (281). In the current study, daughters with higher internet use had lower adherence to the prudent diet and those who practiced less prudent diet rated a poor self-reported health. This finding suggests that the association of internet use and the quality of life may be partly mediated through the poor dietary practice (lower adherence to prudent diet) associated with internet use.

3.5.6.4 The role of radio in healthy eating promotion

The negative association between exposure to radio listening and the Western DP score in this study reveals an interesting finding. As suggested in the qualitative study (Chapter 4), the radio broadcast very few food advertisements or advertisements overall, compared to other media. The study participants also mentioned a local government-funded and commercial-free radio channel. Further, the priming effects of food promotions from the radio were likely to be lower due to the non-visual nature of the food stimuli. The current finding may also be of value in the area of public health promotion planning. Using radio broadcasting for health promotion is attractive because

of its broad coverage, low cost compared to other media, low literacy barrier, and efficient dissemination of immediate information (282). Previous studies involving radio messages for health promotion have proved successful for skin cancer prevention (282), gun safety practices (283), breast health (284), hand hygiene (285), and at times of public health crisis (286). The local health authority has recently used radio messages in media campaigns for cervical screening and healthy eating promotion. The current study suggests that using radio may work in the mother generation but may be less effective in the daughter generation; since the time spent on radio listening in the daughter generation was less than half of that in the mother generation. Age-stratified evaluation on the effects of using radio messages for health promotion is warranted.

3.5.7 Accuracy of FFQ to assess DP

3.5.7.1 Comparison with previous validation studies

The validity of the dietary instrument is a major concern in most dietary studies. The FFQ used in the current study was designed to capture the dietary characteristics of Western DP practiced in a local Chinese women population. The FFQ was based on an FFQ with a good reproducibility currently used in the local Chinese women (228;229). Also, the performance of the study FFQ was evaluated in randomly selected study participants using three 3-d DRs over a period of one year, a method employed previously in a large prospective cohort study on diet and cancer (287). To date, only two studies in Western (114;288) and one study in Asian (289) populations have assessed the validity of Western DP measured by FFQ. Compared to the major food items (factor loading $\geq$0.30) for the Western DP identified in the previous studies, the correlation coefficients of food intakes between baseline FFQ and DRs ranged 0.23–0.62 (Pearson r) in Hu's study (114), 0.16–0.60 (Spearman r) in Khani's study (288),

and 0.21–0.56 (Pearson r) in the current study. Compared to the major food items for Western DP from a validation study in Japan (289), the Pearson correlations for the energy-adjusted intakes between baseline FFQ and DRs ranged 0.18–0.72 in that study and 0.11–0.78 for the corresponding food items in the current study. These findings suggest that the performance of the study FFQ is reasonably comparable to other FFQs with good validity for Western DP assessment.

Another issue is that the number of food items and types of food included in the FFQ can significantly affect the factor solution (106). The FFQ used in this study included 102 foods and food groups, which were relevant to the local population and included foods that were based on exhaustive literature review to identify specific foods contributing to Western DP. Our findings also presented a DP that resembled Western DP identified in previous studies. It is believed that the study FFQ is adequate to assess Western DP in the local Chinese population.

3.5.7.2 Comparison with previous validation studies conducted in the Chinese populations

The relationship of the food and nutrient intakes between interviewer-administered FFQ and self-reported DRs in this study were also comparable to the recent validation studies conducted in other Chinese populations (290-292). Shu and colleagues (290) assessed the FFQ validity on randomly selected study participants using twenty-four bi-weekly 24-hr recalls over one year and indicated correlation coefficients of 0.41–0.66 for broad food groups, 0.52–0.66 for energy and macronutrients, and 0.41–0.59 for micronutrients. Zhang and Ho (292) validated their study FFQ in a group of women volunteers using six 3-day DRs over a year and indicated correlation coefficients of 0.37–0.67 for broad food groups, 0.25–0.58 for

energy and macronutrients, and 0.25–0.57 for micronutrients. Compared to these studies, the corresponding correlation coefficients showed in the current study were 0.16–0.44 for broad food groups (data not shown), 0.33–0.61 for energy and macronutrients, and 0.20–0.51 for micronutrients. The percentage agreements for classifying food intakes into the same and extreme quartiles were 37–51% and 2–6% in Shu's study (290), 36–54% and 2–10% in the Zhang and Ho's study (292), and 25–40% and 2–9% in this study. The percentage agreements for classifying nutrient intakes into the same and extreme quartiles were 33–46% and 1–6% in Shu's study (290), 21–54% and 3–11% in Zhang and Ho's study (292), and 24–46% and 3–12% in the current study. The non-overlappling time frames for reporting dietary intakes may underestimate the FFQ validity in the current study. Previous studies generally showed lower correlations in the intakes of foods (114;289) and nutrients (293) between FFQ and subsequently reported DRs. Nevertheless, the findings from the validation study support that the study FFQ had an acceptable validity as other FFQs used in Chinese women.

3.5.8 Accuracy and reproducibility of MDQ

3.5.8.1 Comparison with previous studies on MDQ reproducibility

The self-report media exposure were assessed twice over one year and compared with the self-report data based on one to three 3-d MD records. The study instrument indicates acceptable reproducibility, with ICC of 0.4 or above for most of media measures. The modest agreements for TV viewing and magazine reading may in fact reflect that some media exposure did not follow a habitual pattern. The decreasing exposure to TV among our sample in the repeated measures was consistent with the downward trend observed in the local surveys (146). In addition, the advance of TV broadcasting services has made TV shows available for viewing online anytime. Such

changes in media services are likely to induce greater variability in the exposure to traditional media. Furthermore, although previous studies generally found a higher ICC (0.32 – 0.93) for media exposure measures, all were based on 1-week to no more than 3-month repeatability assessments (294). The current study is the first study to assess the long-term reproducibility of self-report media exposure and suggests that questionnaire-based assessment of media exposure is capable of capturing individual, long-term habitual media use in Chinese women.

3.5.8.2 Comparison with previous MD validation studies

Very few validation studies were conducted for media exposure (294). One major reason may be the lack of reliable objective measures for media exposure assessment. Previous validation studies used objective measures that can only indirectly assess the media exposure by measuring the duration of low energy expenditure or the low bodily motions associated with media exposure, assuming that all types of media exposure were sedentary (149;160). A recent study (295) using an electronic TV monitor as an objective measure is intriguing and similar techniques may be incorporated for the assessment of other electronic media such as internet use and radio listening. However, objective measures for print media, such as newspapers or magazines, have yet to be developed. One study used 3-day behavioural logs to assess the questionnaire-based media exposure in 130 volunteers and found a Spearman's rank-order correlation of 0.2 for magazine/book reading to 0.6 for computer use (185). Compared to Salmon's study (185), the current study collected one to three 3-day logs specific to media exposure and found a higher correlation (Pearson r: 0.37–0.69) for all media exposure types. Despite the small sample size, the validity in this study showed a fair to good agreement between the media exposure measures reported from the MDQs

and from the MD records. This supports that the study questionnaire is able to provide a robust estimate of the past year's media exposure.

3.5.9 Limitations of the study

3.5.9.1 Study design

3.5.9.1.1 Assessment of temporal associations

The cross-sectional design of the study impeded the ability to identify cause-effect associations between the study variables. The association between media exposure and Western DP may act in both directions. Media exposure to the food advertisements in a Westernized food environment is likely to promote the consumption of Western-style foods. On the other hand, the higher frequency of consuming ready-to-serve foods or food-away-from-home may allow less time for food preparation or cooking. As such, it may avail more spare time for engaging in media entertainment.

This study also cannot determine whether the Westernization of DP among the younger generation is a true cohort effect or a period effect (whereby mothers practiced a similar Western DP when they were at the same age [period] as their daughters). Difference in DP across generations may reflect food preferences at different stages of life (296). However, the qualitative analysis (Chapter 4) supports that daughters followed a more Westernized dietary practice compared to their mothers when they were at the same age. The use of a cross-sectional design is also consistent with previous studies designed to measure dietary Westernization across generations (25;252;297). Nevertheless, a cohort study would help to address the above issues and should be considered.

3.5.9.1.2 Generalizability of the study

This study included adult females, mothers and daughters only. The generational transition towards Western DP found in this study may also be true in the local male population, given that men are exposed to the same Westernizing food environment. Future studies to assess the Westernization of DP in local male population are warranted to test this hypothesis.

Most daughters were living with their mothers since they were born. Therefore, it is not possible to assess the effects of cohabitation years on the mother-daughter association on DP. It is also less likely to generalize the study findings for mother-son association on DP. This study can be generalized to Chinese families with mothers and adult daughters living together.

3.5.9.2 Sample size

The power analyses suggested that the sample size in this study may not be sufficient to detect the effects of media exposure to newspaper or magazine reading. Previous studies indicated that reading during mealtimes showed no observable influence on dietary intake in adults (205) but magazine reading of dieting or weight loss topics might increase the risk of fasting or skipping meals in adolescent (208) and young adult (190) females. The current study shows that the time spent on magazine reading was associated with the Western DP score in the bivariate correlation (For mothers: $r = 0.138$; $p = 0.166$; for daughters: $r = 0.262$; $p = 0.007$) but the association was not evident in the multivariate model. This study suggests that there is a possible effect of magazine reading on DP and based on the study findings, a sample size of 112–409 is needed to address this hypothesis in future studies.

3.5.9.3 Selection bias

Mother subjects were initially participants of a longitudinal study on the association of diet and lifestyle factors and mammographic density. Using this cohort as our target sample might preclude mother subjects not interested or unwilling to undergo mammography. However, this cohort was recruited from a population-based cluster sampling based on the distribution of housing types (private, government-subsidized, public) in a major district and was designed to be comparable to the general population.

Mother participants in this study were more likely to have a better health profile and practice healthy lifestyles than nonparticipants. Mother participants were less likely to be ever smokers or alcohol users, had a slightly lower BMI, and were less likely to have central obesity than nonparticipants. Mother participants were also more likely to be high school graduates and had a longer duration living in Hong Kong. Nevertheless, mother participants and nonparticipants were similar in age, family history of breast cancer, income level, marital status, and employment status. Daughter participants and nonparticipants were similar for age and cohabitation status, although more daughter participants reported a full-time employment or study status than nonparticipants. This study found that the duration residing in Hong Kong would increase the Western DP score in mothers; however, the difference in the numbers of years in Hong Kong between participants and nonparticipants was insignificant. The full-time employment or study status was not a predictor for Western or prudent DP score for daughters in this study. This suggests that the assessment of DP scores in this study was less likely to be affected by the differences in the demographic characteristics between participants and nonparticipants.

3.5.9.4 Measurement errors

3.5.9.4.1 Self-reported measures

One limitation is the measurement errors associated with the self-reported data. Using self-reported media exposure measures and DP assessment would be likely to obscure the media-diet association, but the direction is difficult to assess. However, the reliability of objective measures of dietary or media exposure assessment has not yet been well established. Incorporating information and communication technologies in dietary measurements such as digital photography and pendant-like video camera (298) was under testing with an aim to assess unbiased measures of dietary behaviours but the full evaluation remains to be undertaken (299) and there are several major limitations (e.g. protection of individual privacy) that need to be resolved. For assessment of media exposure, a recent study used an electronic TV monitor to assess TV viewing objectively but such techniques have not been incorporated into validation studies of other media exposure (295). Nevertheless, it is supported that the self-report measure is sufficient to characterize individual's TV viewing behaviours (295).

3.5.9.4.2 Assessment of media effects by MD exposure

Another limitation is that the media exposure was mainly assessed by the time spent on individual media but the associated media content was not assessed. It is possible that the effects of media exposure on dietary behaviours would be determined by both the duration and the content being exposed. Previous studies have consistently shown that time spent on media (e.g. TV viewing and computer use) were associated with poor health outcomes (140;168;170;177;234). There is also evidence that assessment of media effects based on the overall time spent on individual medium is sufficient to examine the media-diet association. Connolly and colleagues (186) found

that the number of hours spent on TV watching, but not the number of alcohol commercials or alcohol in entertainment recalled, was a significant predictor of the frequency and the amount of alcohol consumed in adulthood for adolescent females. Tiggemann (190) indicated that the time spent on overall TV viewing had consistent associations with BMI (Pearson r: 0.18 vs. 0.23; both $0.01<p<0.05$) and disordered eating behaviours (0.09 vs. 0.06; both non-significant), as compared to the time spent specifically on particular media content (e.g. soap operas, music videos). On the other hand, reviews (300-302) of health and behavioural interventions using various media channels have also been shown to be effective for positive attitudes and behavioural changes. These studies suggested that both the total hours spent on individual medium and the media contents being exposed are pertinent in the assessment of the media-diet relationship. However, the media contents that assumed to be responsible for the media effects need to be carefully identified. Therefore, further qualitative or experimental studies are necessary to explore the media contents that are influential on individual DP.

Furthermore, in reference to a media influence scale on body image (303), it is recommended to develop a multidimensional media influence scale that assesses the self-perceived media influence on Western DP. Dimensions of the scale may investigate the awareness of media's promotion on Western DP, importance of media as a valuable source of information for Western DP, internalization of or adoption of Western dietary culture, tendency to associate the Western DP with social status, or perception of pressure from the media, compared to family or peers, on dietary choices.

3.5.9.5 Recall bias

Recall bias is also a concern in this study because the dietary intakes and media exposure were assessed for the previous 12 months. The seasonal variation in dietary

intake is well documented and variation in media exposure over time is also possible. Therefore assessing the year round dietary intake and media exposure are pertinent to capture the overall pattern. The study used trained interviewers and visual aids to collect dietary data, aiming to assist participants to recall and to quantify their frequency of food intakes, particularly for seasonal foods. The MDQ was self-administered because a recent review showed a similar level of reliability of self-report compared to interviewer-administered data (294).

3.5.9.6 DP identification by PCA method

Using PCA to derive DP may introduce a limitation on the representativeness of DP in this study since PCA is a data dependent statistical method. Subjectivity on the food list of the FFQ, standardizing the food intakes (e.g. by serving size or weight, energy adjustment, and log-transformation), grouping of food items, the number of food variables to be inputted, the use and the type of rotation, the numbers of factors to be retained, and the naming of the identified DPs, would affect the characteristics presented and the variance explained by the identified DPs. However, the PCA method is most commonly used in the assessment of Western DP. The current study purposely employed the data processing and statistical procedures that were consistently used in the previous studies in order to minimize subjectivity and to facilitate comparisons across studies. The DPs identified in this study were based on the dietary information of two generations of Chinese women who were comparable to the general population in various characteristics. Therefore, the DPs identified in this study could at least represent the DPs of Chinese young and mid-age adult women in Hong Kong.

3.5.10 Strengths of the study

The major strength of the study is that the participants were drawn from a population-based community sample, and were comparable to the age- and gender-specific characteristics in the general population. The differences in the demographic characteristics between study participants and nonparticipants were minimal or not related to the DP scores identified in this study. Also, this study advanced the local dietary instrument and developed a Chinese-version MDQ to allow further studies on the relationship of Western DP and media effects with the health risks in local Chinese populations. Both dietary and media exposure instruments were carefully examined and of acceptable validity. This study presents acceptable internal and external validities.

3.5.11 Conclusions

This cross-sectional study indicates that the Western DP practiced in the local Chinese population resembled in many ways that shown in the Western populations. Besides similar in food and nutrient intakes, individuals who practiced Western DP were also similar in the demographics (e.g. lower education, younger age), lifestyles (e.g. smoking, skipping breakfast, high frequency of meals-away-from-home) as in the Western populations. The practice of Western DP was also associated with higher BMI and poor weight control in the middle-age mother generation.

This is among the first few studies to assess the association of Western DP between mothers and their adult children. This study suggests that there was an intergenerational transfer of Western DP in the Chinese population. The study reveals that the practice of Western DP in mothers was a positive predictor for their daughters' Western DP but not vice versa. The association was independent of the number of meals

eaten together. On the other hand, the frequency of family meals was negatively associated with the Western DP scores in both mothers and daughters.

This is among the few studies that investigate the association of Western DP with media exposure in the Chinese population. A dose-response relationship was indicated for the Western DP score with the daily hours spent on total media exposure for the mother generation, and with the daily hours spent on TV viewing for the daughter generation. On the other hand, a negative relationship was indicated for the Western DP score with the daily hours spent on radio listening for the mother generation. Such association was independent of the total media exposure.

3.5.12 Implications of the study

The study findings provide an important implication for the obesity control for the local Chinese adult population. There is international consensus that governments should bear a central role in empowering and encouraging behaviours changes in individuals, families, and communities towards healthy diet and physical activity patterns (304). A recent review also emphasized that population-based strategies should be "multifaceted and designed to actively involve stakeholders and other major concerned parties" in promoting healthy eating practices (305). The finding that family meals are important in midlife and young adult females against dietary westernization and unhealthy eating suggested that promoting family meals could reduce obesity risk. However, family meal promotions have not been considered as key components in most interventions for obesity prevention in adults (306;307). Before further intervention studies on promoting family meals in adults could be tested, qualitative studies on the food choice coping strategies by family meal preparers and other family members, particular working mothers, are salient to identify work and family structures, family

adaptive strategies, family food roles, or other influential factors that are conducive to or barriers for practicing regular family meals (271;308). Public health strategies should consider the promotion of family meals and empowerment of mothers or women in general, on the importance of and skills for healthy eating as long-term approaches for family health promotion and obesity prevention.

The findings that the association of media exposure with the westernization of DP as well as the risk of over- and under-weight suggest adverse health and dietary effects associated with media exposure. Further longitudinal studies to assess the cause-effect relationship, qualitative research (e.g. content analysis, focus group interviews) and experimental studies to identify specific media contents that are responsible for the media effects would strengthen the media-health association. In addition, the current regulations on the advertisements, particularly on the weight loss programmes or products, should be re-examined to ensure that the public, especially children, is protected from the promotion of unrealistic weight loss. Furthermore, future interventions on obesity prevention or healthy eating promotion should consider targeting on reducing media exposure, particularly TV exposure, to evaluate particular media exposure or contents on health-related risks.

3.6 Figures

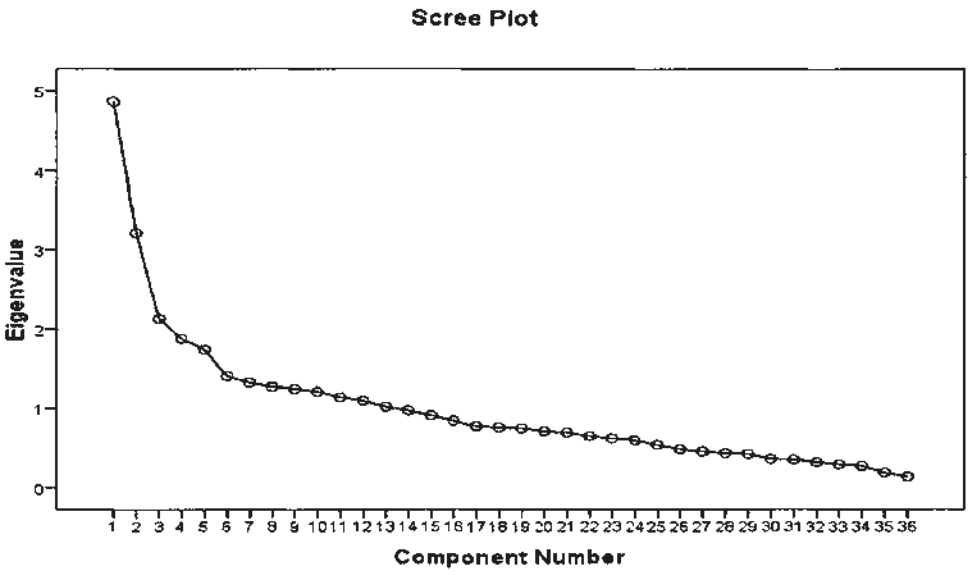
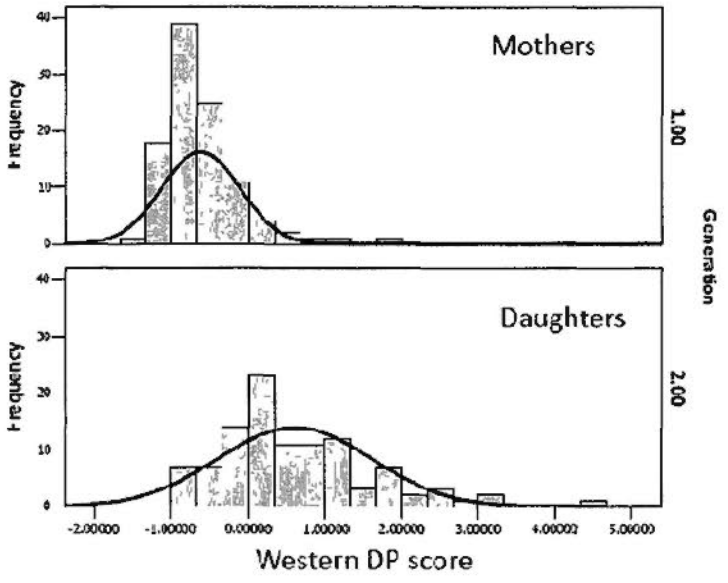


Figure 3.1 Scree plot from principal component analysis

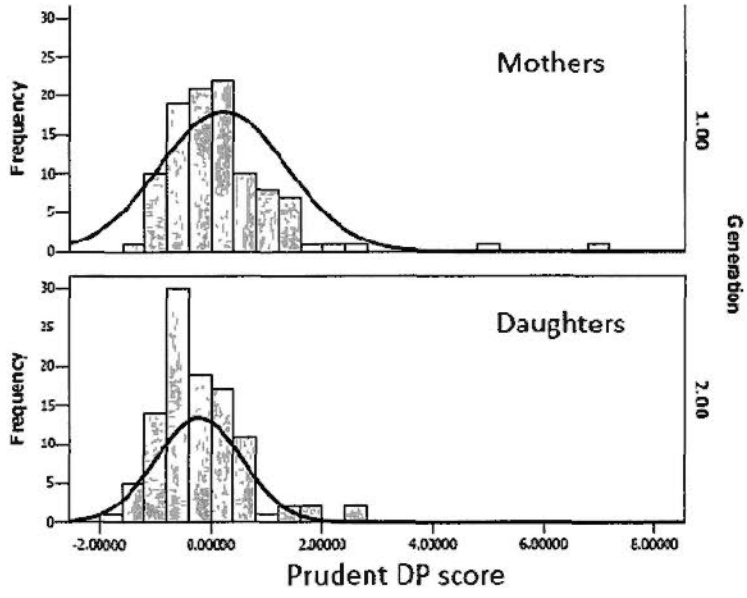


Difference in mean score between mother and daughter generations:

Mother: -0.62 ± 0.51
Daughter: 0.61 ± 0.99
(p<0.001)

Mean difference in western DP score within mother-daughter pairs –
-1.23 ± 1.01 (p<0.001)

Figure 3.2 Distribution of Western DP scores in mother and daughter generations



Difference in mean score between mother and daughter generations:

Mother: 0.22 ± 1.15
Daughter: -0.21 ± 0.78
(p=0.001)

Mean difference in prudent DP score within mother-daughter pairs =
0.42 ± 1.28 (p=0.002)

Figure 3.3 Distribution of prudent DP scores in mother and daughter generations

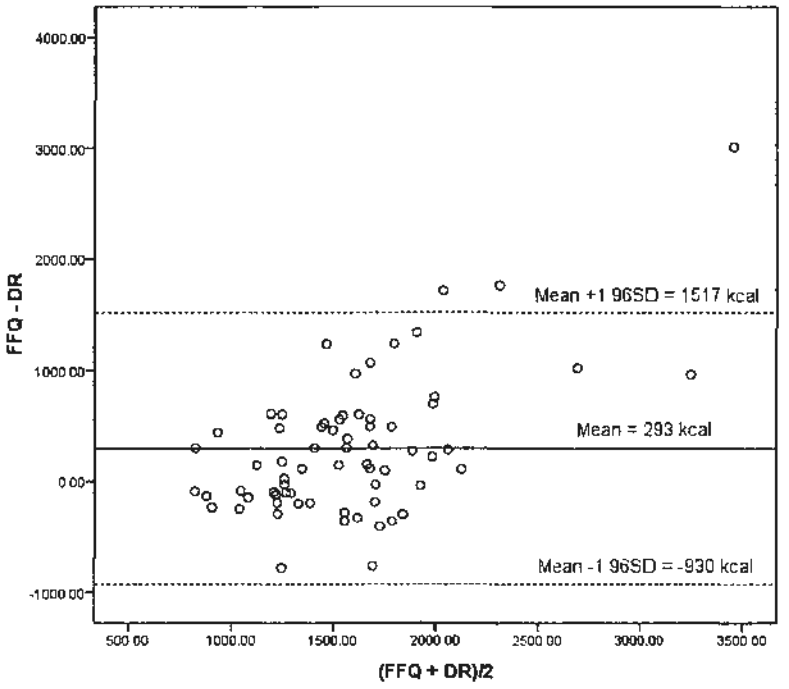


Figure 3.4 Bland-Altman plot to assess the agreement for energy intake between FFQ and DRs in 68 participants (31 mothers, 37 daughters)

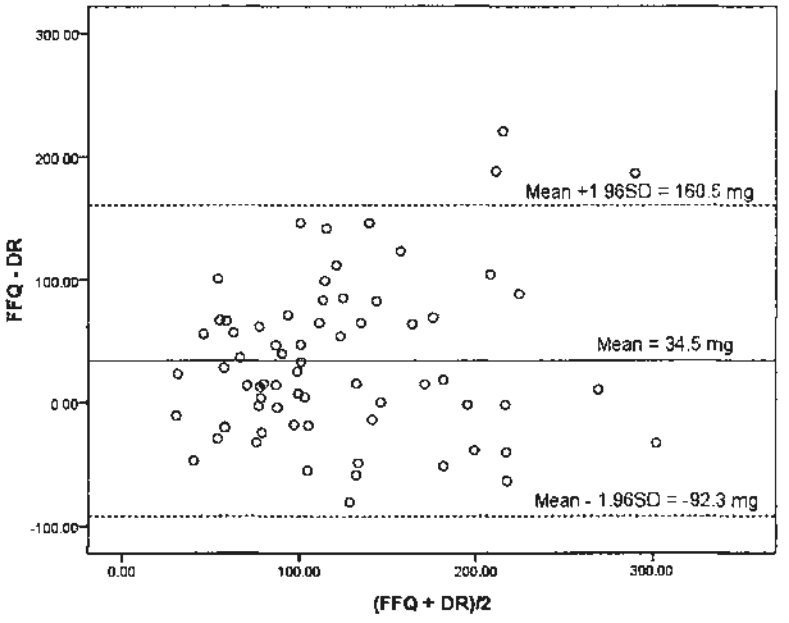


Figure 3.5 Bland-Altman plot to assess the agreement for vitamin C intake between FFQ and DRs in 68 participants (31 mothers, 37 daughters)

3.7 Tables

Table 3.1 Food groupings used in the DP analysis

Foods or food groups	Food items
Rice and noodles	Rice, noodles (Chinese-style), pasta, congee, rice roll, wheat gluten
Whole grains	oatmeal, whole wheat bread
Refined bread	Plain roll (e.g. white bread, mantau, bagel), rolls with filling (e.g. cocktail bun, pineapple bun, doughnut), pancakes or waffles
Cakes and snacks	Chocolate bars or pieces, cakes (e.g. tart, pastry, muffin), cookies (e.g. sandwich biscuit, wafer), potato chips, corn chips
Processed meat	Processed meat (e.g. bacon, sausages, luncheon meat, ham)
Red meat	Beef, pork, lamb, meat ball
Liver	Pig's liver
Chinese sausage	Chinese sausage
Fish and seafood	Freshwater fish, seawater fish, small fish with edible bone (e.g. canned sardines), shrimp/prawn
Processed seafood	Fish ball, seafood ball
Salted fish	Chinese-style salted fish
Poultry	Chicken or turkey with skin, Chicken or turkey without skin, other poultry (e.g. duck, goose, pigeon, quail), chicken feet
Egg	Eggs or preserved eggs (e.g. alkaline egg, salted egg)
Low-fat dairy products	Skim or low-fat milk (<2% fat), yogurt
High-fat dairy products	Whole milk (>3% fat), cream/sour cream, ice cream, cheese, evaporated/condensed milk, milkshake
Butter	Butter
Margarine	Margarine
Mayonnaise	Mayonnaise
Cooking oil	Cooking oil (e.g. corn oil, peanut oil, olive oil, safflower oil)
Cream soup	Chowder or cream soup
French fries	French fries (including potato wedges, hash browns)
Pizza	Pizza

(continued next page)

Table 3.1 Food groupings used in the DP analysis (continued)

Foods or food groups	Food items
Green, leafy vegetables	Dark green leafy vegetables (e.g. broccoli, spinach, Chinese cabbage), light green leafy vegetables (e.g. cauliflower, celery, lettuce)
Corn and potatoes	Corn and potatoes (e.g. potatoes, yams, water chestnuts, lotus root, taro)
Other vegetables	Non-leafy vegetables (e.g. melons, carrots, radishes, tomatoes, eggplant, squash, cucumbers, pumpkin), mushrooms (including algae and Jew's ear)
Fruits	Citrus fruits (e.g. oranges, tangerines, grapefruit, kiwi), grapes, bananas, melons (e.g. watermelon, cantaloupe, honeydew), non-citrus fruits (e.g. apple, pear, apricot, peach, plum, mango, pineapple)
Tofu	Tofu (firm), tofu (soft), tofu (silky), tofu (dried), tofu (pre-packed), tofu (with egg), tofu (Chiu-chow), tofu (sponge), tofu (fermented & deep-fried), tofu (deep-fried), tofu dessert
Other Soy products	Soybean film (Fujok), soybean film (sweetened), soybean stick (deep-fried), soybean stick (plain), soybean sheet, vegetarian chicken/pork, vegetarian duck, Vermicelli (soybean-made), thousand sheets (soybean-made)
Legumes	Peas (e.g. string beans), fresh soybean, soybean (raw), soybean (roasted & salted) ,soybean sprouts, dried beans (e.g. red bean, mung bean, broad bean)
Soymilk	Soymilk (home-made), soymilk (pre-packed), soymilk (low-fat), soymilk powder
Soy condiments	Soy paste, fermented tofu (spicy), fermented tofu (plain), miso (for soup)
Pickles	Pickles
Nuts	Peanuts, other nuts, peanut butter
Sugar-sweetened drinks	Sugar-sweetened carbonated beverages, fruit flavoured drinks
Tea	Tea, lemon tea
Coffee	Coffee

Table 3.2 Characteristics of participants and non-participants

	Participants	Non-participants	p^d
Mothers[a]			
No. of subjects	103	78	
Age[b], y	43.2 ± 1.9	42.2 ± 5.2	0.083
BMI[b], kgm^{-2}	23.8 ± 3.3	24.4 ± 3.5	0.231
Years residing in HK[b]	34.5 ± 12.0	31.6 ± 13.2	0.129
Completed high school , %	39.8	26.9	0.071
Full-time employment , %	38.8	41.0	0.766
Family history of breast cancer, %	9.7	10.3	0.903
Waist circumference > 80cm, %	27.5	41.9	**0.045**
Alcohol user (≥ 1 times/wk), %	7.8	10.3	0.171
Cigarette smoker, %			
Never	92.2	87.2	**0.034**
Former	5.8	2.6	
Current	1.9	10.3	
Monthly household income, %			
< HK$10,000	9.7	9.6	0.993
≥ HK$30,000	24.3	25.0	
Marital Status, %			
Married	87.4	83.3	0.744
Divorced	11.7	15.4	
Widow	1.0	1.3	
Self-rated health, %			
Better than age of peers	28.3	30.6	0.927
About the same	50.5	50.0	
Worse than age of peers	14.1	11.1	
Don't know	7.1	8.3	
Daughters			
No. of subjects	104	78	
Age[b], y	20.8 ± 2.6	21.6 ± 3.1[c]	0.052
Full-time employment or study, %	96.2	90.9[c]	0.322
Currently living with mother, %	90.4	93.2[c]	0.535

[a] Mothers' information was based on their baseline information from MMGD study
[b] Mean ± SD
[c] Daughters' information was from 58 non-participants
[d] p-value obtained by Student's t-test for continuous variables and by chi-square test for categorical variables

Table 3.3 Characteristics of study participants

	Mothers (n=103)	Daughters (n=104)	p^b
Age, y	46.1 ± 1.9 [a]	20.8 ± 2.6	**<0.001**
Years residing in HK	37.4 ± 12.0	20.1 ± 3.1	**<0.001**
	%	%	
Completed high school	39.8	90.4	**<0.001**
Full-time employment or study	48.5	96.2	**<0.001**
Hypertensive	14.6	1.0	**<0.001**
Alcohol user (≥ 1 times/wk)	6.8	1.9	**0.023**
Supplement use	30.1	11.5	**0.001**
Waist circumference > 80cm	42.7	8.7	**<0.001**
BMI status			
<18.5 kg/m^2	1.9	27.9	**<0.001**
18.5 – 22.9 kg/m^2	44.7	52.9	
≥23 kg/m^2	53.4	19.2	
Cigarette smoker			
Never	92.2	91.3	0.224
Former	5.8	2.9	
Current	1.9	5.8	
Marital Status			
Never married	0	98.1	**<0.001**
Married	85.4	1.9	
Divorced/widow	14.5	0	
Place of birth			
Hong Kong	61.2	91.3	**<0.001**
China	36.9	6.7	
Others	1.9	1.9	

[a] Mean ± SD

[b] p-value obtained by Student's t-test for continuous variables and by Chi-square test for categorical variables

Table 3.4a Characteristics of mother participants in the FFQ validation study

	Mothers		
	FFQ validation study participants (n=31)	Overall sample (n=103)	p^a
	Mean ±SD	Mean ±SD	
Age, y	46.5 ± 1.7	46.1 ± 1.9	0.336
BMI, kgm^{-2}	24.1 ± 3.7	23.8 ± 3.4	0.732
Years residing in HK	39.0 ± 11.1	37.4 ± 12.0	0.394
Leisure-time PA, MET-hrs/wk	7.0 ± 12.3	5.2 ± 10.3	0.317
Total energy intake, kcal	1521 ± 384	1578 ± 609	0.916
Western DP score	-0.6 ± 0.4	-0.6 ± 0.5	0.692
Prudent DP score	0.2 ± 0.8	0.2 ± 1.2	0.470
Media exposure, hours per day			
Newspapers	0.6 ± 0.4	0.5 ± 0.4	0.278
Magazines	0.1 ± 0.2	0.1 ± 0.2	0.285
Television	2.9 ± 1.5	2.6 ± 1.5	0.315
Radio	1.6 ± 2.7	1.1 ± 2.0	0.564
Leisure-time internet use	0.3 ± 0.8	0.3 ± 0.7	0.836
All	5.5 ± 3.3	4.6 ± 2.5	0.260
	%	%	
High school completion	35.5	39.8	0.824
Full-time employment	41.9	48.5	0.518
Waist > 80cm	41.9	42.7	0.938
Alcohol user (≥ 1 times/wk)	9.7	6.8	0.884
Ever smoker	3.2	7.8	0.634
Monthly household income[b]			
< HK$10,000	9.7	9.7	0.453
≥ HK$30,000	35.5	24.3	
Marital Status			
Never married	0.0	0.0	0.690
Married	90.3	85.4	
Divorced/Widow	9.7	14.5	

[a] Comparison with all mothers or daughters participating in the cross-sectional study; p-value was obtained by Mann-Whitney U test for continuous variables and by Chi-square test for categorical variables. Yate's correction was used for 2x2 table if smallest expected frequency <5.

[b] Personal income for daughters.

Table 3.4b Characteristics of daughter participants in the FFQ validation study

	Daughters		
	FFQ Validation study participants (n=37)	Overall sample (n=104)	p^a
	Mean ± SD	Mean ± SD	
Age, y	21.5 ± 2.4	20.8 ± 2.6	0.132
BMI, kgm^{-2}	20.7 ± 3.5	20.8 ± 3.4	0.912
Years residing in HK	20.9 ± 2.5	20.1 ± 3.1	0.185
Leisure-time PA, MET-hrs/wk	6.1 ± 5.7	7.1 ± 10.6	0.690
Total energy intake, kcal	2211 ± 999	2139 ± 676	0.864
Western DP score	0.4 ± 0.8	0.6 ± 1.0	0.239
Prudent DP score	-0.2 ± 0.8	-0.2 ± 0.8	0.932
Media exposure, hours per day			
Newspapers	0.4 ± 0.3	0.3 ± 0.3	**0.027**
Magazines	0.1 ± 0.1	0.1 ± 0.2	0.774
Television	2.4 ± 1.2	2.4 ± 1.5	0.979
Radio	0.1 ± 0.3	0.5 ± 1.2	0.302
Leisure-time internet use	2.1 ± 1.3	2.3 ± 1.7	0.586
All	5.1 ± 2.1	5.7 ± 2.9	0.430
	%	%	
High school completion	94.6	90.4	0.656
Full-time employment	91.9	96.2	0.559
Waist > 80cm	8.1	8.7	1.000
Alcohol user (≥ 1 times/wk)	0.0	1.9	0.968
Ever smoker	5.4	8.7	0.783
Monthly income			
< HK$10,000	81.1	92.3	0.111
≥ HK$10,000	18.9	7.7	
Marital Status			
Never married	100.0	98.1	0.968
Married	0.0	1.9	
Divorced/Widow	0.0	0.0	

[a] Comparison with all mothers or daughters participating in the cross-sectional study; p-value was obtained by Mann-Whitney U test for continuous variables and by Chi-square test for categorical variables. Yate's correction was used for 2x2 table if smallest expected frequency <5.

Table 3.5 Median comparisons for food intakes between FFQ and DRs among 68 study participants (31 mothers, 37 daughters)

Food intake, g per day	FFQ		DRs	
	Median	P25, P75	Median	P25, P75
Rice and noodles	348.2	298.6, 442.2	344.9	277.4, 439.3
Whole grains	2.1	0.0, 8.4	0.0	0.0, 6.5
Refined bread	29.2	15.4, 44.3	35.4*	20.3, 53.6
Cakes and snacks	15.4	8.7, 25.3	16.8	6.4, 29.3
Red meat	95.2	60.7, 147.5	61.8***	40.7, 102.5
Organ meat	0.0	0.0, 0.0	0.0**	0.0, 2.2
Poultry	46.8	28.8, 91.0	41.4**	19.0, 64.3
Processed meat	3.0	0.2, 18.2	13.3	0.0, 23.1
Chinese sausage	0.0	0.0, 0.0	0.0	0.0, 0.0
Fish and seafood	46.4	23.0, 87.6	67.5	39.5, 101.6
Processed seafood	5.0	1.7, 10.6	9.8**	0.0, 31.2
Egg	21.1	7.1, 37.1	16.8	9.2, 30.2
High-fat dairy	21.6	9.5, 43.2	19.6	6.0, 45.2
Low-fat dairy	5.4	0.0, 46.9	0.0	0.0, 27.4
Leafy vegetables	214.3	142.9, 296.6	126.9***	77.2, 183.1
Other vegetables	54.6	24.0, 94.0	40.9	20.1, 68.5
Corn and potato	19.9	7.0, 36.7	9.8***	0.0, 16.6
Legumes	8.9	4.5, 19.9	3.3**	0.0, 11.8
Fruits	131.4	67.2, 221.1	90.6**	35.4, 176.4
Tofu	32.3	19.2, 61.4	7.7***	0.0, 29.8
Other soy products	2.7	0.0, 6.7	0.0***	0.0, 0.0
Soy condiments	0.9	0.0, 1.9	0.0***	0.0, 0.0
Soymilk	35.7	8.9, 112.9	0.0***	0.0, 1.1
Sugar-sweetened drinks	28.0	0.0, 88.9	33.3	0.0, 93.1
French fries	6.0	0.0, 15.6	0.0	0.0, 9.8
Pizza	0.0	0.0, 0.0	0.0	0.0, 0.0
Nuts	0.0	0.0, 3.3	0.0**	0.0, 1.0
Butter	0.0	0.0, 0.1	0.0	0.0, 0.6
Margarine[a]	0.0	0.0, 0.2	-	-
Cooking oil[a]	15.0	10.0, 20.0	-	-
Mayonnaise	0.4	0.0, 1.5	0.0	0.0, 2.2
Cream soup	0.0	0.0, 7.1	0.0	0.0, 0.0
Tea	171.4	57.1, 336.9	71.1**	7.9, 230.3
Coffee	0.0	0.0, 14.3	0.0	0.0, 22.2
Salted fish	0.0	0.0, 0.0	0.0	0.0, 0.0
Pickles	0.8	0.0, 2.7	0.0	0.0, 4.2

*p<0.05; **p<0.01; ***p<0.001

[a] Margarine and cooking oil were not reported in the 3-d DRs.

Table 3.6 Partial correlations for food items/groups between FFQ and DRs among 68 study participants (31 mothers, 37 daughters)

Food intake, g per day	Partial correlations[a]	
	Crude	Energy-adjusted
Rice and noodles	0.44***	0.47***
Whole grains	0.41**	0.38**
Refined bread	0.45***	0.42***
Cakes and snacks	0.39*	0.31*
Red meat	0.28*	0.11
Organ meat	0.24	0.22
Poultry	0.28*	0.20
Processed meat	0.56***	0.38**
Chinese sausage	0.02	0.04
Fish and seafood	0.13	0.20
Processed seafood	0.38**	0.29*
Egg	0.21	0.19
High-fat dairy	0.48***	0.26*
Low-fat dairy	0.32**	0.31*
Leafy vegetables	0.34**	0.37**
Other vegetables	0.09	0.15
Corn and potato	0.23	0.21
Legumes	0.04	0.02
Fruits	0.44***	0.46***
Tofu	0.23	0.23
Other soy products	0.17	0.15
Soy condiments	0.12	0.11
Soymilk	0.41**	0.35**
Sugar-sweetened drinks	0.41**	0.34**
French fries	0.28*	0.09
Pizza	0.21	0.12
Nuts	0.18	0.19
Butter	0.30*	0.30*
Margarine[b]	-	-
Cooking oil[b]	-	-
Mayonnaise	0.28*	0.24*
Cream soup	0.04	0.03
Tea	0.51***	0.49***
Coffee	0.79***	0.78***
Salted fish	0.10	0.09
Pickles	0.30*	0.27*

[a] Adjusted for the number of DRs completed; *p<0.05; **p<0.01; ***p<0.001

[b] Margarine and cooking oil were not reported in the 3-d DRs.

Table 3.7 Cross classification of food intakes between FFQ and DRs among 68 study participants (31 mothers, 37 daughters)

Food intakes, g per day	Same quartile	Adjacent quartile	One quartile apart	Opposite quartile
Rice and noodles	40	39	17	4
Whole grains	24	56	17	3
Refined bread	50	32	18	0
Cakes and snacks	31	50	17	2
Red meat	38	38	21	3
Organ meat	69	3	28	0
Poultry	40	32	22	6
Processed meat	44	35	18	3
Chinese sausage	77	0	23	0
Fish and seafood	35	35	15	15
Processed seafood	35	40	18	7
Egg	25	44	24	7
High-fat dairy	35	40	18	7
Low-fat dairy	49	29	22	0
Leafy vegetables	41	38	18	3
Other vegetables	28	46	13	13
Corn and potato	29	43	18	10
Legumes	24	32	32	12
Fruits	37	43	17	3
Tofu	34	33	20	13
Other soy products	21	56	23	0
Soy condiments	21	47	26	6
Soymilk	47	40	6	7
Sugar-sweetened drinks	41	28	25	6
French fries	22	52	23	3
Pizza	71	0	29	0
Nuts	54	24	22	0
Butter	63	8	29	0
Margarine[a]	-	-	-	-
Cooking oil[a]	-	-	-	-
Mayonnaise	43	29	28	0
Cream soup	56	16	28	0
Tea	44	40	12	4
Coffee	85	6	9	0
Salted fish	87	0	13	0
Pickles	27	49	24	0
Mean	**43**	**32**	**20**	**4**

[a] Margarine and cooking oil were not reported in the 3-d DRs.

Table 3.8 Pearson's correlations for food intakes reported from FFQ and DRs with the Western and prudent DP scores among 68 study participants (31 mothers, 37 daughters)

Food intake[a], g per day	Correlation coefficients with Western DP score		Correlation coefficients with prudent DP score	
	FFQ	DRs	FFQ	DRs
Rice and noodle	0.30*	-0.01	0.15	0.06
Whole grains	-0.30*	-0.18	0.46***	0.09
Refined bread	0.08	-0.08	0.35**	0.15
Cakes and snacks	0.64***	0.36**	0.34**	0.20
Red meat	0.53***	0.40**	-0.01	0.03
Organ meat	-0.12	0.05	0.04	-0.06
Poultry	0.61***	0.33**	-0.13	-0.13
Processed meat	0.68***	0.36**	0.11	-0.06
Chinese sausage	-0.01	-0.09	0.24*	-0.01
Fish and seafood	0.23	0.27*	0.37**	0.16
Processed seafood	0.72***	0.65***	0.34**	0.15
Egg	0.51***	0.09	0.04	-0.11
High-fat dairy	0.61***	0.52***	0.07	0.19
Low-fat dairy	0.05	0.14	0.44***	0.01
Leafy vegetables	-0.10	-0.07	0.61***	0.34**
Other vegetables	0.15	-0.26*	0.46***	0.13
Corn and potato	0.29*	-0.19	0.39**	0.28*
Legumes	-0.27*	-0.10	0.71***	-0.06
Fruits	-0.18	-0.38**	0.67***	0.36**
Tofu	0.10	-0.04	0.74***	0.27*
Other soy products	0.43***	-0.02	0.40**	-0.06
Soy condiments	0.14	0.01	0.36**	-0.07
Soymilk	0.39**	-0.08	0.31*	0.16
Sugar-sweetened drinks	0.61***	0.48***	-0.13	-0.16
French fries	0.74***	0.22	0.18	-0.18
Pizza	0.48***	0.44***	0.22	0.26*
Nuts	0.01	-0.20	0.42***	0.28*
Butter	-0.04	-0.14	-0.02	-0.11
Margarine[b]	0.17	-	-0.06	-
Cooking oil[b]	0.28*	-	-0.14	-
Mayonnaise	0.53***	0.11	0.09	-0.11
Cream soup	0.52***	0.09	0.18	-0.06
Tea	-0.06	-0.27*	-0.01	0.11
Coffee	-0.04	-0.09	-0.11	-0.03
Salted fish	0.07	-0.09	0.12	0.03
Pickles	0.37**	0.21	0.10	0.16

*p<0.05; **p<0.01; ***p<0.001

[a] Untransformed intakes

[b] Margarine and cooking oil were not reported in the 3-d DRs.

Table 3.9 Median comparisons for nutrient intakes between FFQ and DRs among 68 study participants (31 mothers, 37 daughters)

Nutrient intake per day	FFQ		DRs[a]		%Df[b]
	Median	P25, P75	Median	P25, P75	
Energy, kcal	1648	1240, 2006	1359	1179, 1702	14.7
Protein, g	99.1	69.6, 126.5	73.4	61.2, 93.7	23.7
Total fat, g	46.9	32.5, 67.0	40.1	32.1, 51.8	15.5
Saturated fat, g	14.0	9.3, 19.4	11.1	8.0, 13.9	17.2
Carbohydrates, g	191.2	163.5, 252.6	125.5	103.1, 163.9	41.9
Dietary fibre, g	15.6	11.8, 19.5	11.5	9.4, 15.6	25.7
Calcium, mg	639.0	518.5, 818.8	435.5	332.4, 533.0	36.1
Iron, mg	14.1	12.0, 17.1	10.9	8.3, 13.2	30.2
Phosphorus, mg	1115	880, 1428	837	666, 1030	30.1
Magnesium, mg	282.9	228.3, 340.1	182.8	152.4, 217.3	42.9
Zinc, mg	10.5	8.1, 13.7	7.5	5.5, 9.1	37.4
Thiamine, mg	1.7	1.2, 2.2	1.0	0.8, 1.5	38.8
Riboflavin, mg	1.6	1.2, 2.0	1.1	0.9, 1.3	34.9
Niacin, mg	21.9	16.5, 28.2	14.4	10.9, 17.2	42.1
Folate, μg	300.6	240.2, 406.1	164.4	114.0, 206.2	62.7
Retinol, μg	189.7	129.8, 279.6	142.6	105.3, 209.3	24.8
Vitamin C, mg	121.0	87.7, 185.4	90.2	64.6, 147.5	29.8
Vitamin E, mg	5.9	4.5, 7.6	2.9	2.3, 3.9	61.0
Cholesterol, mg	338.4	216.6, 516.7	276.9	225.3, 367.0	17.2

[a] Significantly different from the intakes reported in FFQ; all $p<0.01$.
[b] Mean percentage difference, %Df: (FFQ - DRs)/[(FFQ + DRs)/2] x 100%

Table 3.10 Partial correlations for nutrient intakes between FFQ and DRs among 68 study participants (31 mothers, 37 daughters)

Nutrient intake per day	Partial correlations[a]	
	Crude	Energy-adjusted
Energy, kcal	0.49***	-
Protein, g	0.35**	0.13
Total fat, g	0.47***	0.40**
Saturated fat, g	0.61***	0.60***
Carbohydrates, g	0.50***	0.30*
Dietary fibre, g	0.34**	0.38**
Calcium, mg	0.47***	0.42**
Iron, mg	0.22	0.27*
Phosphorus, mg	0.35**	0.22
Magnesium, mg	0.31*	0.41**
Zinc, mg	0.32**	0.12
Thiamine, mg	0.44***	0.13
Riboflavin, mg	0.51***	0.38**
Niacin, mg	0.43***	0.26*
Folate, μg	0.37**	0.40**
Retinol, μg	0.37**	0.44***
Vitamin C, mg	0.49***	0.48***
Vitamin E, mg	0.20	0.22
Cholesterol, mg	0.33**	0.20

[a] Adjusted for the number of DRs completed; *p<0.05; **p<0.01; ***p<0.001

Table 3.11 Cross-classification of nutrient intakes between FFQ and DRs among 68 study participants (31 mothers, 37 daughters)

Nutrient intakes per day	Same quartile	Adjacent quartile	One quartile apart	Opposite quartile
Energy, kcal	38	41	15	6
Protein, g	33	38	20	9
Total fat, g	35	31	31	3
Saturated fat, g	46	41	10	3
Carbohydrates, g	34	39	20	7
Dietary fibre, g	24	46	24	6
Calcium, g	41	38	15	6
Iron, mg	38	34	18	10
Phosphorus, mg	35	34	22	9
Magnesium, mg	35	35	23	7
Zinc, mg	35	34	21	10
Thiamine, mg	44	34	15	7
Riboflavin, mg	38	37	21	4
Niacin, mg	35	35	26	4
Folate, μg	37	34	22	7
Retinol, μg	31	38	28	3
Vitamin C, mg	38	43	16	3
Vitamin E, mg	28	35	28	9
Cholesterol, mg	34	40	14	12
Mean	**36**	**37**	**20**	7

Table 3.12 Pearson's correlations for nutrient intakes estimated from FFQ and DRs with the Western and prudent DP scores among 68 study participants (31 mothers, 37 daughters)

Nutrient intakes per day[a]	Correlation coefficients with Western DP score		Correlation coefficients with Prudent DP score	
	FFQ	DRs	FFQ	DRs
Energy, kcal	0.80***	0.45***	0.56***	0.11
Protein, g	0.76***	0.47***	0.37**	0.02
Total fat, g	0.85***	0.46***	0.39**	0.10
Saturated fat, g	0.89***	0.64***	0.26*	-0.05
Carbohydrates, g	0.56***	0.20	0.51***	0.18
Dietary fibre, g	0.16	-0.11	0.89***	0.29*
Calcium, mg	0.32**	0.28*	0.83***	0.34**
Iron, mg	0.53***	0.17	0.75***	0.14
Phosphorus, mg	0.69***	0.38**	0.58***	0.13
Magnesium, mg	0.38**	0.08	0.84***	0.28*
Zinc, mg	0.75***	0.41***	0.40**	0.03
Thiamine, mg	0.61***	0.30*	0.44***	0.17
Riboflavin, mg	0.69***	0.51***	0.55***	0.16
Niacin, mg	0.75***	0.45***	0.29*	0.02
Folate, μg	0.11	-0.02	0.83***	0.41**
Retinol, μg	0.43***	0.31*	0.42***	-0.17
Vitamin C, mg	-0.04	-0.28*	0.72***	0.42***
Vitamin E, mg	0.38**	0.05	0.80***	0.19
Cholesterol, mg	0.79***	0.45***	0.14	-0.10

*p<0.05; **p<0.01; ***p<0.001

[a] Untransformed intakes

Table 3.13a Characteristics of mother participants for the assessment of MDQ reproducibility

	Mothers		
	MDQ reproducibility study participants (n=50)	Overall sample (n=103)	p^a
	Mean ± SD	Mean ± SD	
Age, y	46.1 ± 1.8	46.1 ± 1.9	0.826
BMI, kgm^{-2}	23.9 ± 3.3	23.8 ± 3.4	0.831
Years residing in HK	36.0 ± 11.7	37.4 ± 12.0	0.343
Leisure-time PA, MET-hrs/wk	7.4 ± 13.3	5.2 ± 10.3	0.409
Media exposure, hours per day			
Newspapers	0.4 ± 0.4	0.5 ± 0.4	0.711
Magazines	0.1 ± 0.2	0.1 ± 0.2	0.657
Television	3.0 ± 1.7	2.6 ± 1.5	0.255
Radio	0.8 ± 1.2	1.1 ± 2.0	0.616
Leisure-time internet use	0.4 ± 0.8	0.3 ± 0.7	0.584
All	4.7 ± 2.3	4.6 ± 2.5	0.863
	%	%	
High school completion	38.0	39.8	0.830
Full-time employment	46.0	48.5	0.768
Waist > 80cm	44.0	42.7	0.881
Alcohol user (≥ 1 times/wk)	2.0	6.8	0.388
Ever smoker	4.0	7.8	0.592
Household income			
< HK$10,000	10.0	9.7	0.839
≥ HK$30,000	20.0	24.3	
Marital Status			
Never married	0.0	0.0	0.666
Married	88.0	85.4	
Divorced/Widow	12.0	14.5	

[a] Comparison with all mother participants in the cross-sectional study; p-values were obtained by Mann-Whitney test for continuous variables and by Chi-square test for categorical variables. Yate's correction was used for 2x2 table if the smallest expected frequency was less than 5.

Table 3.13b Characteristics of daughter participants for the assessment of MDQ reproducibility

	Daughters		
	MDQ reproducibility study participants (n=44)	Overall sample (n=104)	p^a
	Mean ± SD	Mean ± SD	
Age, y	21.5 ± 2.4	20.8 ± 2.6	0.649
BMI, kgm^{-2}	20.7 ± 3.5	20.8 ± 3.4	0.657
Years residing in HK	20.9 ± 2.5	20.1 ± 3.1	0.945
Leisure-time PA, MET-hrs/wk	6.1 ± 5.7	7.1 ± 10.6	0.637
Media exposure, hours per day			
Newspapers	0.4 ± 0.3	0.3 ± 0.3	0.128
Magazines	0.1 ± 0.1	0.1 ± 0.2	0.851
Television	2.7 ± 1.5	2.4 ± 1.5	0.412
Radio	0.7 ± 1.6	0.5 ± 1.2	0.551
Leisure-time internet use	2.4 ± 1.6	2.3 ± 1.7	0.830
All	6.2 ± 3.0	5.7 ± 2.9	0.287
	%	%	
High school completion	88.6	90.4	0.981
Full-time employment	93.2	96.2	0.723
Waist > 80cm	9.1	8.7	1.000
Alcohol user (≥ 1 times/wk)	0.0	1.9	0.883
Ever smoker	6.8	8.7	0.964
Monthly income			
< HK$10,000	90.9	92.3	1.000
≥ HK$10,000	9.1	7.7	
Marital Status			
Never married	100.0	98.1	0.883
Married	0.0	1.9	
Divorced/Widow	0.0	0.0	

[a] Comparison with all daughter participants in the cross-sectional study; p-values were obtained by Mann-Whitney test for continuous variables and by Chi-square test for categorical variables. Yate's correction was used for 2x2 table if the smallest expected frequency was less than 5.

Table 3.14a Characteristics of mother participants for MDQ validation

	Mothers		
	MDQ Validation study participants (n=24)	Overall sample (n=103)	p^a
	Mean ± SD	Mean ± SD	
Age, y	45.8 ± 2.1	46.1 ± 1.9	0.510
BMI, kgm^{-2}	23.0 ± 3.0	23.8 ± 3.4	0.248
Years residing in HK	40.0 ± 10.9	37.4 ± 12.0	0.352
Leisure-time PA, MET-hrs/wk	7.7 ± 13.9	5.2 ± 10.3	0.540
Media exposure, hours per day			
Newspapers	0.4 ± 0.4	0.5 ± 0.4	0.963
Magazines	0.1 ± 0.2	0.1 ± 0.2	0.573
Television	2.5 ± 1.4	2.6 ± 1.5	0.829
Radio	0.7 ± 1.1	1.1 ± 2.0	0.751
Leisure-time internet use	0.4 ± 0.6	0.3 ± 0.7	0.616
All	4.1 ± 2.1	4.6 ± 2.5	0.440
	%	%	
High school completion	45.8	39.8	0.589
Full-time employment	41.7	48.5	0.543
Waist > 80cm	33.3	42.7	0.400
Alcohol user (≥ 1 times/wk)	0.0	6.8	0.414
Ever smoker	4.2	7.8	0.859
Monthly household income			
< HK$10,000	16.7	9.7	0.342
≥ HK$30,000	12.5	24.3	
Marital Status			
Never married	0.0	0.0	1.000
Married	87.5	85.4	
Divorced/Widow	12.5	14.5	

[a] Comparison with all mother participants in the cross-sectional study; p-values were obtained by Mann-Whitney U test for continuous variables and by chi-square test for categorical variables. Yate's correction was used for 2x2 table if the smallest expected frequency was less than 5.

Table 3.14b Characteristics of daughter participants for MDQ validation

	Daughters		
	MDQ Validation study participants (n=18)	Overall sample (n=104)	p^a
	Mean ± SD	Mean ± SD	
Age, y	20.4 ± 2.6	20.8 ± 2.6	0.453
BMI, kgm^{-2}	20.9 ± 3.4	20.8 ± 3.4	0.745
Years residing in HK	19.3 ± 2.7	20.1 ± 3.1	0.217
Leisure-time PA, MET-hrs/wk	8.7 ± 15.9	7.1 ± 10.6	0.778
Media exposure, hours per day			
Newspapers	0.5 ± 0.4	0.3 ± 0.3	0.125
Magazines	0.1 ± 0.2	0.1 ± 0.2	0.726
Television	2.5 ± 1.9	2.4 ± 1.5	0.931
Radio	0.6 ± 1.5	0.5 ± 1.2	0.770
Leisure-time internet use	2.7 ± 2.0	2.3 ± 1.7	0.484
All	6.5 ± 3.2	5.7 ± 2.9	0.316
	%	%	
High school completion	100.0	90.4	0.364
Full-time employment	100.0	96.2	0.897
Waist > 80cm	11.1	8.7	1.000
Alcohol user (≥ 1 times/wk)	0.0	1.9	1.000
Ever smoker	0.0	8.7	0.419
Monthly income			
< HK$10,000	100.0	92.3	0.483
≥ HK$10,000	0.0	7.7	
Marital Status			
Never married	100.0	98.1	1.000
Married	0.0	1.9	
Divorced/Widow	0.0	0.0	

[a] Comparison with all daughter participants in the cross-sectional study; p-values were obtained by Mann-Whitney U test for continuous variables and by chi-square test for categorical variables. Yate's correction was used for 2x2 table if the smallest expected frequency was less than 5.

Table 3.15 Descriptive statistics, test-retest ICCs and 95% CI for 1-year MDQ reproducibility among 94 study participants (50 mothers, 44 daughters)

Daily hour spent (hr/d)	1st MDQ[a]	2nd MDQ	Diff[c]	ICC[d]	95%CI
Newspaper reading	0.41 ± 0.35	0.42 ± 0.44	-0.01 ± 0.44	0.47	0.30 – 0.62
Magazine reading	0.10 ± 0.16	0.10 ± 0.13	-0.00 ± 0.17	0.37	0.18 – 0.53
Radio listening	0.70 ± 1.30	0.80 ± 1.46	-0.10 ± 1.26	0.65	0.51 – 0.75
TV watching	2.84 ± 1.65	2.57 ± 1.80[b]	0.27 ± 2.04	0.36	0.18 – 0.53
Leisure-time internet use	1.29 ± 1.57	1.30 ± 1.55	-0.01 ± 1.01	0.85	0.79 – 0.90
All media	5.35 ± 2.74	5.19 ± 3.05	0.16 ± 2.63	0.57	0.41 – 0.69

[a]MDQ: media exposure questionnaire; mean ± SD;
[b]Significantly different from 1st MDQ; *p<0.05
[c]Diff = (1st MDQ – 2nd MDQ)
[d] All p<0.001

Table 3.16 Descriptive statistics[a], Pearson's correlation coefficients (r) between the average of MD records and the first and second administrations of MDQs among 42 study participants (n=24 mothers, 18 daughters)

Daily time spent (hrs/d)	1st MDQ (n=42)	2nd MDQ (n=36)	MD records (n=42)	Diff[d] from MD records		Correlations[e] with MD records	
				1st MDQ	2nd MDQ	1st MDQ	2nd MDQ
Newspaper reading	0.46 ± 0.39	0.41 ± 0.36	0.31 ± 0.35[b]	0.15 ± 0.40	0.10 ± 0.32	0.49**	0.55**
Magazine reading	0.11 ± 0.20	0.09 ± 0.11	0.13 ± 0.16	-0.01 ± 0.25	-0.05 ± 0.15	0.07	0.50**
Radio listening	0.69 ± 1.25	1.01 ± 1.72	0.44 ± 0.77[bc]	0.25 ± 0.90	0.50 ± 1.41	0.78***	0.64***
TV viewing	2.53 ± 1.58	2.74 ± 2.08	2.38 ± 1.28	0.15 ± 1.59	0.31 ±1.95	0.48**	0.44**
Leisure-time internet use	1.36 ± 1.77	1.07 ± 1.47	0.96 ± 1.16[b]	0.40 ± 1.10	0.36 ± 1.11	0.80***	0.69***
All media	5.15 ± 2.82	5.31 ± 3.31	4.22 ± 1.66[bc]	0.93 ± 2.46	1.23 ± 1.69	0.50**	0.37*

[a] Mean ± SD
[b] Significantly different from the 1st MDQ; $p<0.05$
[c] Significantly different from the 2nd MDQ; $p<0.05$
[d] Diff = (MDQ – MD records)
[e] *$p<0.05$; **$p<0.01$; ***$p<0.001$

Table 3.17 Meal characteristics and dietary intakes of all study participants

	Mothers (n=103)	Daughters (n=104)	*p*
	Mean ± SD	Mean ± SD	
Meal Characteristics			
Breakfast skipped, days per week	1.1 ± 2.1	2.1 ± 2.0	**0.001**
Fried foods, days per week	1.1 ± 1.3	2.2 ± 2.2	**<0.001**
Meals-away-from-home, days per week			
Breakfast[a], %	36.2 ± 36.7	28.0 ± 31.5	**<0.001**
Lunch	2.6 ± 2.5	4.2 ± 1.8	**<0.001**
Dinner	1.3 ± 1.3	2.3 ± 1.7	**<0.001**
Afternoon tea	0.9 ± 1.6	0.9 ± 1.1	0.910
All	6.8 ± 4.9	8.5 ± 4.1	**0.008**
Family meals[b], days per week			
Breakfast	1.3 ± 2.0	0.9 ± 1.3	0.096
Lunch	1.1 ± 1.3	1.2 ± 1.1	0.404
Dinner	4.7 ± 2.5	4.1 ± 2.2	**0.048**
All	7.1 ± 4.5	6.2 ± 3.5	0.111
Dietary intakes, per day			
Energy, kcal	1578 ± 609	2139 ± 676	**<0.001**
Nutrients, per 1000kcal			
Protein, g	51.3 ± 11.1	56.3 ± 9.1	**0.001**
Total fat, g	32.7 ± 7.4	40.2 ± 6.0	**<0.001**
Saturated fat, g	8.0 ± 1.8	11.0 ± 1.8	**<0.001**
Carbohydrates, g	129.1 ± 23.4	104.7 ± 17.5	**<0.001**
Dietary fibre, mg	11.3 ± 2.8	7.7 ± 2.3	**<0.001**
Calcium, mg	418.1 ± 141.6	331.6 ± 103.3	**<0.001**
Iron, mg	9.1 ± 1.6	7.5 ± 1.1	**<0.001**
Phosphorus, mg	640.2 ± 117.9	626.9 ± 82.2	0.349
Magnesium, mg	184.8 ± 38.0	141.6 ± 24.4	**<0.001**
Zinc, mg	5.8 ± 0.9	6.2 ± 1.1	**0.002**
Thiamin, mg	1.0 ± 0.2	0.9 ± 0.2	0.063
Riboflavin, mg	0.9 ± 0.2	0.9 ± 0.1	0.314
Niacin, mg	11.7 ± 2.4	12.7 ± 2.2	**0.001**
Folate, μg	222.1 ± 68.9	151.4 ± 50.7	**<0.001**
Retinol, μg	119.2 ± 91.4	113.2 ± 47.8	0.555
Vitamin C, mg	95.6 ± 40.2	59.1 ± 27.2	**<0.001**
Vitamin E, mg	5.6 ± 1.4	5.3 ± 1.3	0.070
Cholesterol, mg	171.6 ± 64.5	220.9 ± 66.3	**<0.001**

[a] Percentage of total breakfasts taken per week

[b] For mothers, family meals refer to meals eaten with any children. For daughters, family meals refer to meals eaten with mother

Table 3.18 Media exposure and leisure-time physical activity of all study participants

	Mothers (n=103)	Daughters (n=104)	*p*
Media Exposure, hours/d			
Newspapers	0.5 ± 0.4[a]	0.3 ± 0.3	**0.005**
Magazines	0.1 ± 0.2	0.1 ± 0.2	0.621
Television	2.6 ± 1.5	2.4 ± 1.5	0.355
Radio	1.1 ± 2.0	0.5 ± 1.2	**0.004**
Leisure-time internet use	0.3 ± 0.7	2.3 ± 1.7	**<0.001**
All	4.6 ± 2.5	5.7 ± 2.9	**0.007**
Most frequently read magazine topics[b], %			
Celebrity/Entertainment	50.0	62.5	**<0.001**
Women/Fashion	25.0	64.1	
Health	38.5	4.7	
Travel	5.8	20.3	
News	21.2	9.4	
Sports	3.9	1.6	
Others	4.7	3.1	
Leisure-time physical activities, Met-hrs per week	5.2 ± 10.3	7.1 ± 10.6	0.181

[a] Mean ± SD

[b] Among participants (mothers, n=54; daughters, n=68) who read magazines at least once a month. Participants were allowed to choose up to 2 topics; therefore, the percentage may add up over 100 percent.

Table 3.19 Pearson's correlations between food intakes[a]

	Red meat	Processed meat	Poultry	Egg	Fish & seafood	Processed seafood	High-fat dairy	Cakes & snacks	French fries	Pizza	Sugar drinks	Cream soup	Cooking oil
Processed meat	0.365***												
Poultry	0.479***	0.292***											
Egg	0.291***	0.222**	0.325***										
Fish & seafood	0.419***	0.152*	0.195**	0.159*									
Processed seafood	0.307***	0.397***	0.227**	0.131	0.264***								
High-fat dairy	0.404***	0.360***	0.239**	0.201**	0.238**	0.400***							
Cake & snacks	0.320***	0.243***	0.293***	0.156*	0.164*	0.317***	0.230**						
French fries	0.291***	0.214**	0.426***	0.186**	0.102	0.369***	0.187**	0.398***					
Pizza	0.193***	0.161*	0.137*	0.024	0.200**	0.265***	0.077	0.210**	0.355***				
Sugar drinks	0.272***	0.352***	0.354***	0.202**	0.050	0.305***	0.200**	0.395***	0.323***	0.099			
Cream soup	0.185**	0.179*	0.157*	0.148*	0.045	0.185**	0.162*	0.356***	0.164*	0.166*	0.354***		
Cooking oil	0.278***	0.294***	0.356***	0.175*	0.137*	0.185**	0.147*	0.238**	0.251***	0.146*	0.323***	0.079	
Mayonnaise	0.043	0.153*	0.239**	0.122	0.057	0.213**	0.110	0.229**	0.304***	0.216**	0.181**	0.339***	0.235**
Margarine	0.034	0.094	0.034	0.169*	0.092	0.125	0.119	0.213**	0.004	-0.041	0.015	0.176*	0.034
Butter	-0.037	0.036	0.020	0.176*	-0.077	0.003	0.053	-0.022	0.024	0.020	-0.015	-0.071	-0.032
Liver	-0.020	-0.009	0.102	-0.009	-0.082	0.061	-0.007	0.097	0.315***	0.061	0.144*	0.103	-0.030
Chinese sausage	0.104	0.036	0.078	0.233**	0.269***	0.085	0.013	0.057	0.002	0.050	0.005	0.011	0.013
Salted fish	-0.060	-0.036	-0.069	-0.077	0.047	0.096	0.153*	-0.001	-0.020	0.010	0.022	0.164*	-0.092
Pickles	0.168*	0.230**	0.229***	0.168*	0.076	0.271***	0.139*	0.032	0.094	0.166*	0.090	0.073	0.100
Nuts	-0.012	-0.052	0.033	-0.037	0.140*	0.149*	0.008	0.239***	0.266***	0.162*	0.031	0.150*	-0.062
Rice & noodles	0.170*	0.122	0.113	0.249***	0.139*	0.178*	0.160*	0.031	-0.025	-0.039	0.113	0.038	0.087
Refined bread	0.140	0.016	0.018	0.097	0.072	0.223**	0.082	0.313***	0.155*	0.197**	0.084	0.063	0.038

[a]Food items were not showed if the correlations were non-significant and $r < 0.15$; *p<0.05; **p<0.01; ***p<0.001

Table 3.19 Pearson's correlations between food intakes[a] (continued)

	Leafy veg	Other veg	Corn & potatoes	Fruits	Tofu	Other soy products	Legumes	Soy milk	Soy condiment	Whole grain	Rice & noodles	Refined bread
Other veg	0.350***											
Corn and potatoes	0.073	0.264***										
Fruits	0.272***	0.041	0.128									
Tofu	0.265***	0.143*	0.236**	0.242***								
Tofu products	0.412***	0.177*	0.089	-0.090	0.494***							
Legumes	0.410***	0.299***	0.241***	0.305***	0.342***	0.099						
Soymilk	0.313***	0.095	0.104	-0.009	0.529***	0.755***	0.084					
Soy condiment	0.110	0.147*	0.012	0.021	0.385***	0.168*	0.152*	0.202**				
Wholegrain	0.025	-0.055	0.055	0.180**	0.192**	0.035	0.211**	-0.038	0.081			
Rice & noodles	0.227**	0.191**	0.196**	0.114	0.108	0.038	0.213**	0.021	-0.055	0.007		
Refined bread	0.101	-0.001	0.153*	0.176*	0.249***	0.154*	0.048	0.282***	0.192**	0.070	0.088	
Nuts	0.109	-0.050	0.009	0.216**	0.375***	-0.010	0.070	0.100	0.045	0.178*	-0.052	0.136
Butter	0.314***	0.256	-0.001	-0.039	-0.063	-0.018	0.209**	-0.052	0.034	-0.065	0.222	0.012
Mayonnaise	0.068	0.124	0.101	-0.002	0.044	0.026	-0.051	0.032	0.197**	-0.006	-0.006	0.059
High-fat dairy	0.017	0.091	0.043	-0.154*	0.058	-0.006	-0.024	0.129	0.211	-0.140*	0.160*	0.082
Low-fat dairy	0.040	-0.048	0.127	0.097	0.273***	0.026	0.119	-0.042	0.009	0.115	-0.001	0.030
Red meat	-0.077	0.078	0.210**	-0.120	0.050	-0.052	-0.001	0.112	0.149*	-0.134	0.170*	0.104
Chinese sausage	-0.001	-0.024	0.054	0.155*	0.281	0.019	0.127	0.092	0.187	0.235**	0.135	0.197**
Egg	0.031	0.203**	0.334***	-0.016	0.204	0.081	0.205**	0.120	0.243***	0.054	0.249***	0.097
Fish & seafood	0.075	0.073	0.173*	0.017	0.285	-0.032	0.228**	0.126	0.247***	0.067	0.139*	0.072
Processed seafood	-0.051	0.072	0.178*	0.042	0.258***	0.025	0.006	0.183**	0.189**	-0.055	0.178*	0.223**
Sugar drinks	-0.182**	-0.016	0.156*	-0.165*	0.011	0.005	-0.158*	0.095	-0.064	-0.257***	0.113	0.084
Pizza	-0.109	-0.037	0.119	-0.094	0.138*	-0.004	-0.097	0.189**	0.211**	-0.002	-0.039	0.197**
French fries	-0.113	0.052	0.165*	0.009	0.037	-0.021	-0.138*	0.119	0.027	-0.166*	-0.025	0.155*
Cakes & snacks	0.041	0.071	0.159*	0.061	0.159*	0.032	-0.056	0.198**	0.141*	-0.090	0.031	0.313***

[a]Food items were not showed if the correlations were non-significant and $r < 0.15$; *$p<0.05$; **$p<0.01$; ***$p<0.001$

Table 3.20 Food group loadings[a] for the two major DPs identified by Principal component Analysis

Foods/Food groups	Western	Prudent
Red meat	0.65	-
Poultry	0.65	-
Sugar-sweetened drinks	0.63	-
French fries	0.63	-
Processed seafood	0.61	0.21
Cakes and snacks	0.60	0.16
Processed meat	0.59	-
High-fat dairy	0.52	-
Cooking oil	0.49	-
Cream soup	0.45	-
Mayonnaise	0.41	-
Pizza	0.41	-
Egg	0.40	0.31
Fish and seafood	0.34	0.33
Pickles	0.30	-
Margarine	0.19	-
Liver	-	-
Tofu	-	0.78
Leafy vegetables	-0.19	0.62
Legumes	-	0.60
Soymilk	-	0.59
Other soy products	-	0.57
Soy condiments	0.19	0.43
Other vegetables	-	0.39
Fruits	-0.19	0.38
Refined bread	0.20	0.37
Corn and potatoes	0.28	0.35
Chinese sausages	-	0.33
Whole grains	-0.22	0.30
Rice and noodles	0.16	0.29
Nuts	-	0.28
Low-fat dairy	-	0.19
Butter	-	0.16
Coffee	-	-
Tea	-	-
Salted fish	-	-
% variance of food intake explained	13.5	8.9

[a]Absolute values < 0.15 were excluded from the table for simplicity.

Table 3.21 Mean daily intakes of foods/food groups according to quartiles of Western DP score (all participants)

	Component 1: Western				
	Q1 (-1.47 – -0.75)	**Q2** (-0.73 – -0.29)	**Q3** (-0.28 – 0.42)	**Q4** (0.45 – 4.45)	p_{trend}[b]
No. of Participants,%					
Mothers	45.6	37.9	12.6	3.9	**<0.001**
Daughters	3.8	12.5	37.5	46.2	
Food intakes[a], grams/d					
Rice and noodles	420.1 ± 142.6	404.6 ± 129.4	353.9 ± 90.5	348.2 ± 129.0	**0.001**
Refined bread	33.9 ± 20.6	42.4 ± 42.4	40.8 ± 26.8	31.1 ± 29.5	0.202
Whole grains	11.5 ± 15.8	6.1 ± 7.1	5.5 ± 8.0	3.6 ± 6.9	**0.003**
Poultry	51.0 ± 35.9	63.8 ± 42.4	78.6 ± 44.9	92.9 ± 72.3	**0.001**
Red meat	84.2 ± 49.1	99.4 ± 43.9	121.0 ± 61.8	110.4 ± 68.9	**0.013**
Processed meat	11.1 ± 9.4	11.9 ± 9.5	14.4 ± 13.6	21.5 ± 35.2	**<0.001**
Liver	0.4 ± 0.9	0.6 ± 1.8	0.7 ± 1.8	0.7 ± 2.3	0.103
Chinese sausage	0.4 ± 0.6	0.5 ± 0.8	0.3 ± 1.6	0.1 ± 1.2	0.175
Egg	25.2 ± 15.2	24.7 ± 14.3	24.5 ± 23.2	31.5 ± 37.9	0.588
Fish and seafood	54.8 ± 42.1	56.9 ± 56.9	57.3 ± 48.7	48.6 ± 57.2	0.869
Processed seafood	7.0 ± 6.7	12.4 ± 9.5	8.0 ± 7.7	10.8 ± 24.5	**<0.001**
Salted fish	0.2 ± 0.5	0.2 ± 0.5	0.1 ± 0.3	0.2 ± 0.8	0.559
High-fat dairy	23.6 ± 17.1	36.7 ± 26.0	29.2 ± 32.0	44.1 ± 44.1	**0.006**
Low-fat dairy	46.2 ± 89.5	43.6 ± 70.3	40.9 ± 62.5	29.0 ± 60.7	0.387
Fruits	187.2 ± 124.2	150.7 ± 150.7	121.3 ± 74.1	101.3 ± 90.0	**<0.001**
Leafy vegetables	311.7 ± 178.6	259.5 ± 126.6	219.1 ± 93.9	181.5 ± 94.4	**<0.001**
Other vegetables	73.7 ± 53.8	63.0 ± 32.6	65.2 ± 49.2	62.8 ± 60.2	0.153
Corn and potatoes	28.2 ± 20.9	30.2 ± 21.8	25.8 ± 24.3	29.5 ± 35.9	0.923
Legumes	19.8 ± 15.2	16.3 ± 14.2	8.7 ± 7.0	8.5 ± 12.2	**<0.001**
Tofu	67.0 ± 59.1	51.8 ± 33.6	42.8 ± 36.0	25.2 ± 47.7	**<0.001**
Other soy products	8.6 ± 10.9	5.5 ± 5.0	9.7 ± 15.6	4.1 ± 10.1	0.193
Soymilk	103.9 ± 172.9	71.4 ± 60.3	64.9 ± 55.7	42.3 ± 97.2	**0.022**
Soy condiments	1.0 ± 1.1	1.3± 1.2	1.0 ± 1.1	1.0 ± 2.4	0.921
Pickles	2.8 ± 2.8	3.2 ± 4.5	2.0 ± 3.4	3.8 ± 9.3	0.100
Sugar-sweetened drinks	33.0 ± 31.8	40.5 ± 40.5	75.5 ± 75.5	117.2 ± 118.9	**<0.001**
French fries	6.6 ± 7.4	6.8 ± 7.1	15.0 ± 11.4	15.9 ± 28.7	**<0.001**
Pizza	1.9 ± 1.9	3.0 ± 3.1	2.5 ± 3.1	3.9 ± 7.6	**0.001**
Cream soup	6.1 ± 8.3	6.3 ± 6.7	10.0 ± 14.4	13.4 ± 22.3	**0.001**
Cakes and snacks	22.0 ± 16.0	21.0 ± 15.3	25.5 ± 18.1	28.5 ± 34.8	**0.007**
Nuts	11.0 ± 19.2	6.6 ± 8.7	3.6 ± 5.6	4.1 ± 15.3	0.514
Tea	319.5 ± 359.8	334.1 ± 329.5	182.8 ± 161.8	343.1 ± 718.7	0.598
Coffee	17.5 ± 50.7	37.0 ± 37.0	17.0 ± 44.9	29.9 ± 54.9	0.731
Cooking oil	12.0 ± 7.6	15.9 ± 9.0	16.5 ± 9.6	19.5 ± 15.8	**0.043**
Mayonnaise	0.7 ± 0.9	0.8 ± 0.7	0.9 ± 2.1	2.0 ± 3.2	**0.001**
Butter	0.6 ± 2.8	0.3 ± 0.9	0.3 ± 1.0	0.3 ± 1.1	0.259
Margarine	0.3 ± 0.5	0.2 ± 0.7	0.5 ± 0.9	0.4 ± 1.4	0.277

[a] Energy-adjusted mean daily intakes; mean ± SD

[b] Test for trend by linear regression

Table 3.22 Mean daily intakes of foods/food groups according to quartiles of prudent DP score (all participants)

	Component 2: Prudent				
	Q1 (-1.60– -0.63)	Q2 (-0.62– -0.21)	Q3 (-0.19– 0.36)	Q4 (0.37– 7.06)	p_{trend} [b]
No. of participants,%					
Mothers	18.4	20.4	30.1	31.1	**0.003**
Daughters	30.8	29.8	20.2	19.2	
Food intakes[a], grams/d					
Rice and noodles	368.2 ± 111.3	376.4 ± 112.6	392.0 ± 123.0	389.1 ± 158.6	0.342
Refined bread	29.3 ± 17.5	32.9 ± 20.6	43.0 ± 31.1	42.8 ± 33.0	**0.003**
Whole grains	2.9 ± 4.8	5.3 ± 7.9	7.1 ± 9.5	11.0 ± 15.2	**<0.001**
Poultry	93.7 ± 46.3	78.6 ± 52.5	68.2 ± 40.5	46.7 ± 60.2	**<0.001**
Red meat	118.1 ± 46.9	130.7 ± 54.9	91.8 ± 48.8	75.1 ± 64.1	**<0.001**
Processed meat	22.7 ± 24.6	19.6 ± 22.4	8.4 ± 9.4	8.3 ± 17.7	**<0.001**
Liver	0.6 ± 1.4	0.5 ± 1.5	1.2 ± 2.7	0.2 ± 0.7	0.347
Chinese sausages	0.1 ± 0.3	0.2 ± 0.4	0.3 ± 0.7	0.6 ± 2.1	**0.001**
Egg	25.2 ± 18.3	26.5 ± 24.4	25.0 ± 22.8	29.2 ± 31.3	0.213
Fish	43.7 ± 37.2	51.8 ± 39.5	54.0 ± 42.0	67.9 ± 61.4	0.065
Processed seafood	11.4 ± 11.8	8.1 ± 8.1	9.4 ± 8.2	9.3 ± 23.1	0.631
Salted fish	0.1 ± 0.3	0.2 ± 0.5	0.2 ± 0.8	0.1 ± 0.4	0.498
High fat dairy	43.2 ± 57.7	30.7 ± 33.5	34.3 ± 49.1	25.8 ± 39.5	**0.017**
Low-fat dairy	32.5 ± 57.9	26.9 ± 40.0	36.9 ± 74.0	63.2 ± 97.0	0.064
Fruits	77.1 ± 57.1	121.2 ± 68.8	170.6 ± 74.8	189.5 ± 144.1	**<0.001**
Leafy vegetables	167.4 ± 65.3	215.8 ± 96.0	266.0 ± 106.8	319.9 ± 191.5	**<0.001**
Other vegetables	40.1 ± 35.2	63.0 ± 38.3	68.6 ± 47.9	92.4 ± 60.5	**<0.001**
Corn and potatoes	17.2 ± 16.5	29.3 ± 21.6	32.9 ± 28.0	34.1 ± 33.2	**0.009**
Legumes	5.7 ± 5.9	9.1 ± 7.2	13.5 ± 12.0	24.8 ± 16.8	**<0.001**
Tofu	23.2 ± 22.6	35.4 ± 25.1	41.3 ± 32.1	86.0 ± 67.8	**<0.001**
Other soy products	3.9 ± 4.3	3.4 ± 3.5	8.0 ± 9.0	12.6 ± 18.6	**<0.001**
Soymilk	50.8 ± 53.4	58.8 ± 60.5	68.0 ± 67.4	103.9 ± 186.5	**<0.001**
Soy condiments	0.6 ± 0.6	0.7 ± 1.0	1.1 ± 1.4	1.8 ± 2.4	**<0.001**
Pickles	2.9 ± 6.0	3.4 ± 6.6	2.4 ± 3.9	3.3 ± 5.6	0.957
Sugar-sweetened drinks	128.2 ± 91.6	64.0 ± 61.3	54.6 ± 63.8	21.2 ± 71.1	**<0.001**
French fries	14.4 ± 10.8	12.7 ± 11.1	11.0 ± 23.2	6.4 ± 18.0	**<0.001**
Pizza	2.9 ± 3.8	2.7 ± 3.0	3.0 ± 3.5	2.7 ± 6.8	0.663
Cream soup	9.0 ±11.1	8.1 ± 14.2	10.9 ± 16.3	7.9 ± 16.1	0.382
Cakes and snacks	26.6 ± 18.8	23.0 ± 15.5	29.1 ± 28.3	18.4 ± 24.5	**0.033**
Nuts	2.8 ± 4.3	4.0 ± 8.2	7.4 ± 13.0	11.0 ± 21.0	**0.008**
Tea	333.8 ± 738.2	217.5 ± 204.0	301.0 ± 280.7	327.5 ± 363.4	0.485
Coffee	31.0 ± 68.0	22.7 ± 56.0	26.4 ± 49.6	21.5 ± 47.3	0.497
Cooking oil	20.7 ± 13.0	15.7 ± 9.0	14.6 ± 9.4	13.1 ± 11.9	**<0.001**
Mayonnaise	1.1 ± 1.9	0.9 ± 1.4	1.4 ± 2.8	1.0 ± 2.0	0.426
Butter	0.2 ± 0.4	0.2 ± 0.5	0.6 ± 1.6	0.4 ± 2.8	0.084
Margarine	0.3 ± 0.6	0.2 ± 0.5	0.5 ± 1.3	0.3 ± 1.1	0.633

[a] Energy-adjusted by residual method; mean ± SD

[b] Test for trend by linear regression

Table 3.23 Mean daily nutrient intakes according to quartiles of Western DP score (all participants)

	Component 1: Western				
	Q1 (-1.47 – -0.75)	**Q2** (-0.73 – -0.29)	**Q3** (-0.28 – 0.42)	**Q4** (0.45 – 4.45)	p_{trend}[b]
Energy, Kcal	1419 ± 540	1498 ± 372	1826 ± 301	2686 ± 667	**<0.001**
Nutrient intakes[a]					
Protein, g	99.4 ± 18.2	99.7 ± 17.6	106.1 ± 17.6	99.9 ± 21.2	0.568
Total fat, g	64.2 ± 11.7	67.9 ± 11.6	71.1 ± 9.7	75.1 ± 14.9	**<0.001**
SFA, g	15.2 ± 3.7	16.9 ± 2.9	18.4 ± 2.9	19.9 ± 4.3	**<0.001**
Carbohydrates, g	225.5 ± 37.6	214.6 ± 38.1	199.2 ± 29.4	196.0 ± 41.8	**<0.001**
Dietary fibre, g	19.8 ± 6.5	16.7 ± 4.5	14.5 ± 3.4	12.7 ± 4.8	**<0.001**
Calcium, mg	813.3 ± 298.6	703.8 ± 198.9	652.8 ± 188.5	554.5 ± 231.8	**<0.001**
Iron, mg	16.9 ± 4.3	14.9 ± 2.0	14.2 ± 2.0	12.8 ± 2.5	**<0.001**
Magnesium, mg	344.3 ± 80.1	304.5 ± 51.2	280.3 ± 46.9	255.0 ± 58.8	**<0.001**
Phosphorus, mg	1244 ± 246	1189 ± 154	1203 ± 157	1119 ± 184	**0.011**
Zinc, mg	11.6 ± 1.2	11.5 ± 1.6	11.8 ± 2.0	11.4 ± 2.7	0.629
Thiamine, mg	2.1 ± 0.8	1.9 ± 0.2	1.9 ± 0.3	1.7 ± 0.4	**<0.001**
Riboflavin, mg	2.0 ± 0.5	1.9 ± 0.3	1.9 ± 0.2	1.8 ± 0.3	**0.006**
Niacin, mg	22.9 ± 3.5	22.9 ± 3.8	24.5 ± 4.1	23.7 ± 5.1	0.188
Folate, μg	407.2 ± 164.2	345.5 ± 108.0	296.4 ± 73.3	265.4 ± 84.0	**<0.001**
Retinol, μg	198.3 ± 102.6	219.0 ± 123.6	220.0 ± 110.8	227.7 ± 137.1	0.084
Vitamin C, mg	169.6 ± 70.8	139.2 ± 64.2	118.3 ± 38.9	107.1 ± 53.9	**<0.001**
Vitamin E, mg	10.6 ± 2.3	10.4 ± 2.4	9.9 ± 2.2	10.1 ± 3.5	0.077
Cholesterol, mg	335.6 ± 119.0	370.0 ± 103.3	387.1 ± 103.3	429.5 ± 207.9	**0.004**

[a] Energy-adjusted by residual method; mean ± SD
[b] Test for trend by linear regression

Table 3.24 Mean daily nutrient intakes according to quartiles of prudent DP score (all participants)

	Component 2: Prudent				
	Q1 (-1.60– -0.63)	**Q2** (-0.62 – -0.21)	**Q3** (-0.19 – 0.36)	**Q4** (0.37 – 7.06)	p_{trend}[b]
Energy, Kcal	1623 ± 668	1705 ± 547	1840 ± 604	2265 ± 798	**<0.001**
Nutrient intakes[a]					
Protein, g	101.6 ± 16.3	105.3 ± 16.7	97.3 ± 16.6	101.0 ± 24.1	0.709
Total fat, g	76.1 ± 11.6	70.5 ± 9.7	66.6 ± 12.5	65.4 ± 14.1	**<0.001**
SFA, g	19.7 ± 3.0	18.6 ± 3.0	16.8 ± 3.4	15.4 ± 4.5	**<0.001**
Carbohydrates, g	190.9 ± 30.3	200.9 ± 29.6	220.8 ± 33.1	222.1 ± 49.4	**<0.001**
Dietary fibre, g	11.3 ± 2.9	14.2 ± 2.9	17.4 ± 3.1	20.5 ± 7.1	**<0.001**
Calcium, mg	529.1 ± 140.9	588.6 ± 144.1	680.0 ± 168.7	921.1 ± 303.5	**<0.001**
Iron, mg	12.5 ± 1.7	14.0 ± 1.5	14.9 ± 2.0	17.4 ± 4.3	**<0.001**
Phosphorus, mg	1116 ± 138	1171 ± 144	1171 ± 161	1294 ± 259	**<0.001**
Magnesium, mg	243.0 ± 38.3	273.0 ± 34.2	300.8 ± 43.0	365.3 ± 78.7	**<0.001**
Zinc, mg	11.4 ± 1.9	12.1 ± 1.9	11.2 ± 1.6	11.6 ± 2.3	0.864
Thiamine, mg	1.8 ± 0.3	2.0 ± 0.4	1.8 ± 0.3	2.0 ± 0.9	**<0.001**
Riboflavin, mg	1.8 ± 0.3	1.8 ± 0.2	1.9 ± 0.3	2.0 ± 0.5	**<0.001**
Niacin, mg	24.0 ± 3.9	24.9 ± 3.9	23.0 ± 3.1	22.0 ± 5.1	**0.001**
Folate, µg	241.8 ± 67.1	290.9 ± 61.0	348.1 ± 73.8	430.5 ± 169.1	**<0.001**
Retinol, µg	204.3 ± 94.3	193.6 ± 94.2	249.9 ± 164.1	217.3 ± 104.0	0.942
Vitamin C, mg	93.0 ± 35.2	117.6 ± 36.2	147.7 ± 46.1	174.4 ± 85.3	**<0.001**
Vitamin E, mg	10.0 ± 2.8	9.6 ± 2.3	10.3 ± 2.1	11.2 ± 3.0	**0.002**
Cholesterol, mg	402.0 ± 98.0	397.4 ± 109.2	363.4 ± 137.4	360.6 ± 203.4	**0.017**

[a] Energy-adjusted by regression method; mean ± SD
[b] Test for trend by linear regression

Table 3.25 Mothers' demographic and lifestyle characteristics according to quartiles of Western DP score (n=103)

	Component 1: Western			
	Q1 (-1.45 – -0.76)	**Q2** (-0.73 – -0.31)	**Q3 + Q4** (-0.27 – 1.95)	p_{trend}[b]
No. of subjects, %	45.6	37.9	16.5	
Age, y	46.3 ± 2.0[a]	45.9 ± 1.8	46.0 ± 1.9	0.313
Years residing in HK	33.4 ± 13.2	38.6 ± 10.9	45.6 ± 2.2	**0.002**
Born in HK, %	44.7	66.7	94.1	**0.002**
Completed high school ,%	46.8	35.9	29.4	0.167
Marital status, %				
Married	87.2	84.6	82.4	0.762
Divorced/widowed	12.7	15.4	17.6	
Monthly household income, %				
< HK$10,000	12.8	7.7	5.9	0.745
≥ HK$30,000	21.3	33.3	11.8	
Fulltime work/study, %	36.2	64.1	47.1	0.136
Ever smoker, %	8.5	2.6	17.6	0.506
Alcohol user (≥1/wk), %	6.4	7.7	5.9	0.903
Waist >80cm, %	34.0	46.2	58.8	0.065
BMI, kgm^{-2}	23.1 ± 3.3	23.9 ± 2.6	25.8 ± 4.6	**0.046**
Weight change status, %				
Increase or fluctuate	17.0	12.8	52.9	**0.040**
Decrease or maintain	68.1	84.6	41.2	
Leisure-time PA, MET-hrs/wk[c]	6.2 ± 12.4	5.0 ± 9.3	2.9 ± 4.6	0.406
Self-perceived health, %				
Better than age of peers	21.3	35.9	17.6	0.409
About the same	66.0	51.3	70.6	
Worse than age of peers	8.5	12.8	11.8	

[a] Mean ± SD

[b] Test for trend by linear regression (for continuous variables) or by Chi-square test for linear-by-linear association (for categorical variables)

[c] Leisure-time physical activities: MET-hrs/wk, metabolic equivalent (energy expenditure per kilogram of body weight per hour of activity divided by the energy expenditure per kilogram of body weight per hour at rest) hours per week

Table 3.26 Mothers' demographic and lifestyle characteristics according to quartiles of prudent DP score (n=103)

	Component 2: Prudent				
	Q1 (-1.35– -0.63)	Q2 (-0.57– -0.22)	Q3 (-0.15– 0.36)	Q4 (0.37– 7.06)	p_{trend}[b]
No. of subjects, %	18.4	20.4	30.1	31.1	
Age, y	45.7 ± 2.2	46.2 ± 1.5	46.3 ± 2.0	46.0 ±1.9	0.339
Years residing in HK	34.7 ±12.8	39.2 ±10.4	37.5 ±13.0	37.6 ±11.6	0.389
Born in HK, %	52.6	66.7	64.5	59.4	0.818
Completed high school,%	36.8	28.6	45.2	43.8	0.382
Marital status, %					
Married	68.4	95.2	83.9	90.6	0.161
Divorced/widowed	31.6	4.8	16.1	9.4	
Monthly household income,%					
< HK$10,000	5.3	9.5	9.7	12.5	0.741
≥ HK$30,000	21.1	23.8	29.0	21.9	
Fulltime work/study, %	36.8	47.6	48.4	56.3	0.200
Ever smoker, %	15.8	4.8	9.7	3.1	0.189
Alcohol user (≥1/wk), %	5.3	0.0	6.5	12.5	0.170
Waist >80cm, %	52.6	42.9	35.5	43.8	0.528
BMI, kgm^{-2}	25.1 ± 4.1	23.9 ± 3.5	22.9 ± 3.2	23.9 ± 3.0	0.688
Weight change status, %					
Increase or fluctuate	36.8	9.5	16.1	25.0	0.264
Decrease or maintain	52.6	85.7	83.9	56.3	
Leisure-time PA, MET-hrs/wk[c]	3.2 ±10.2	6.6 ±11.2	5.0 ± 8.1	5.7 ±11.9	0.944
Self-perceived health, %					
Better than age of peers	5.3	23.8	41.9	25.0	0.481
About the same	84.2	71.4	38.7	62.5	
Worse than age of peers	10.5	4.8	12.9	12.5	

[a] Mean ± SD

[b] Test for trend by linear regression (for continuous variables) or by Chi-square test for linear-by-linear association (for categorical variables)

[c] Leisure-time physical activities: MET-hrs/wk, metabolic equivalent (energy expenditure per kilogram of body weight per hour of activity divided by the energy expenditure per kilogram of body weight per hour at rest) hours per week

Table 3.27 Daughters' demographic and lifestyle characteristics according to quartiles of Western DP score (n=104)

	Component 1: Western			
	Q1 + Q2 (-0.97 – -0.29)	Q3 (-0.28 – 0.42)	Q4 (0.45 – 4.45)	p_{trend} [b]
No. of subjects, %	16.3	37.5	46.2	
Age, y	21.3 ± 2.7[a]	20.4 ± 2.1	21.0 ± 2.8	0.978
Years residing in HK	20.1 ± 3.5	20.3 ± 2.1	20.0 ± 2.2	0.808
Born in HK, %	82.4	100.0	87.5	0.806
Education level, %				
High school graduate	58.8	56.4	64.6	0.369
University degree	29.4	30.8	29.2	
Marital status, %				
Never married	100.0	97.4	97.9	0.695
Married	0.0	2.6	2.1	
Household income, %				
< HK$10,000	11.8	5.1	12.5	0.516
≥ HK$30,000	29.4	25.6	22.9	
Fulltime work/study, %	100.0	92.3	97.9	0.894
Ever smoker, %	5.9	7.7	10.4	0.532
Alcohol user (≥1/wk), %	0.0	0.0	4.2	0.173
Waist >80cm, %	5.9	7.7	10.4	0.532
BMI, kgm^{-2}	20.4 ± 2.6	21.0 ± 3.6	20.7 ± 3.5	0.898
Weight change status, %				
Increase or fluctuate	23.5	28.2	27.1	0.513
Decrease or maintain	47.1	56.4	54.2	
Leisure-time PA, MET-hrs/wk[c]	10.2 ±11.5	5.0 ±6.3	7.8 ±12.7	0.615
Perceived health, %				
Better than age of peers	23.5	10.3	14.6	0.990
About the same	52.9	51.3	64.6	
Worse than age of peers	23.5	35.9	16.7	

[a] Mean ± SD

[b] Test for trend by linear regression (for continuous variables) or by Chi-square test for linear-by-linear association (for categorical variables)

[c] Leisure-time physical activities: MET-hrs/wk, metabolic equivalent (energy expenditure per kilogram of body weight per hour of activity divided by the energy expenditure per kilogram of body weight per hour at rest) hours per week

Table 3.28 Daughters' demographic and lifestyle characteristics according to quartiles of prudent DP score (n=104)

	Component 2: Prudent				p_{trend}[b]
	Q1 (-1.60– -0.64)	Q2 (-0.62– -0.21)	Q3 (-0.19– 0.33)	Q4 (0.37– 2.73)	
No. of subjects, %	30.8	29.8	20.2	19.2	
Age, y	21.2 ± 2.7	20.6 ± 2.5	20.8 ± 2.4	20.6 ± 2.5	0.466
Years residing in HK	20.0 ± 3.9	20.3 ± 2.7	20.0 ± 2.7	20.3 ± 2.7	0.903
Born in HK, %	87.5	96.8	90.5	90.0	0.656
Education level, %					
High school graduate	84.4	58.0	57.2	60.0	0.326
University degree	65.6	35.5	33.3	35.0	
Marital status, %					
Never married	96.9	96.8	100.0	100.0	0.313
Married	3.1	3.2	0.0	0.0	
Monthly Household income, %					
< HK$10,000	9.4	6.5	14.3	10.0	0.819
≥ HK$30,000	25.0	19.4	42.9	15.0	
Fulltime work/study, %	96.9	96.8	100.0	90.0	0.383
Ever smoker, %	18.8	6.5	4.8	0.0	**0.017**
Alcohol user (≥1/wk), %	3.1	0.0	4.8	0.0	0.736
Waist >80cm, %	6.3	6.5	4.8	20.0	0.155
BMI, kgm^{-2}	20.8 ± 3.0	20.6 ± 3.2	20.8 ± 3.7	20.9 ± 4.1	0.628
Weight change status, %					
Increase or fluctuate	25.0	25.8	42.9	15.0	0.606
Decrease or maintain	50.0	58.1	42.9	65.0	
Leisure-time PA, MET-hrs/wk[c]	4.2 ± 9.1	8.2 ± 9.8	10.2 ± 15.1	7.0 ± 7.1	0.218
Perceived health, %					
Better than age of peers	3.1	22.6	4.8	30.0	**0.005**
About the same	53.1	48.4	81.0	55.0	
Worse than age of peers	40.6	25.8	9.5	15.0	

[a] Mean ± SD

[b] Test for trend by linear regression (for continuous variables) or by Chi-square test for linear-by-linear association (for categorical variables)

[c] Leisure-time physical activities: MET-hrs/wk, metabolic equivalent (energy expenditure per kilogram of body weight per hour of activity divided by the energy expenditure per kilogram of body weight per hour at rest) hours per week

Table 3.29 Frequency of media exposure according to quartiles of Western DP score

Media exposure, hours/d	Component 1: Western			p_{trend}[b]
Mothers (n=103)	**Q1** (-1.45 – 0.76)	**Q2** (-0.73 – -0.31)	**Q3 + Q4** (-0.27 – 1.95)	
Newspapers	0.4 ± 0.4[a]	0.5 ± 0.4	0.5 ± 0.5	0.843
Magazines	0.1 ± 0.1	0.1 ± 0.2	0.2 ± 0.3	0.166
Radio	1.3 ± 2.0	0.8 ± 1.3	1.3 ± 2.9	0.625
Television	2.6 ± 1.3	2.6 ± 1.8	3.2 ± 2.1	**0.038**
Leisure-time internet use	0.3 ± 0.7	0.3 ± 0.5	0.6 ± 1.0	0.295
All	4.7 ± 2.5	4.3 ± 2.1	5.8 ± 3.7	**0.035**
Daughters (n=104)	**Q1 + Q2** (-0.97 – -0.29)	**Q3** (-0.28 – 0.42)	**Q4** (0.45 – 4.45)	
Newspapers	0.4 ± 0.3	0.3 ± 0.3	0.3 ± 0.3	0.970
Magazines	0.1 ± 0.1	0.1 ± 0.2	0.2 ± 0.2	**0.007**
Radio	0.5 ± 1.5	0.5 ± 1.1	0.4 ± 1.1	0.740
Television	2.5 ± 1.5	2.2 ± 1.4	2.5 ± 1.5	0.277
Leisure-time internet use	1.7 ± 1.1	2.1 ± 1.6	2.7 ± 1.9	**0.021**
All	5.3 ± 2.9	5.3 ± 2.8	6.1 ± 3.0	**0.026**

[a] Mean ± SD
[b] Test for trend by linear regression

Table 3.30 Frequency of media exposure according to quartiles of prudent DP score

Media exposure, hours/d	Component 2: Prudent				p_{trend}[b]
Mothers (n=103)	**Q1** (-1.35– -0.63)	**Q2** (-0.57– -0.22)	**Q3** (-0.15– 0.36)	**Q4** (0.37– 7.06)	
Newspapers	0.5 ± 0.5	0.4 ± 0.3	0.5 ± 0.5	0.5 ± 0.4	0.288
Magazines	0.1 ± 0.1	0.1 ± 0.1	0.2 ± 0.3	0.1 ± 0.2	0.799
Radio	0.8 ± 2.0	0.7 ± 1.1	1.7 ± 2.6	1.0 ± 1.5	0.717
Television	3.7 ± 1.9	2.5 ± 1.2	2.3 ± 1.3	2.5 ± 1.9	0.853
Leisure-time internet use	0.4 ± 1.0	0.1 ± 0.3	0.3 ± 0.4	0.5 ± 0.9	0.513
All	5.5 ± 2.4	3.8 ± 1.8	5.0 ± 3.0	4.6 ± 2.8	0.687
Daughters (n=104)	**Q1** (-1.60– -0.64)	**Q2** (-0.62– -0.21)	**Q3** (-0.19– 0.33)	**Q4** (0.37– 2.73)	
Newspapers	0.2 ± 0.3	0.3 ± 0.3	0.5 ± 0.4	0.3 ± 0.3	0.181
Magazines	0.1 ± 0.2	0.1 ± 0.1	0.2 ± 0.2	0.1 ± 0.2	0.196
Radio	0.2 ± 0.7	0.4 ± 1.0	0.8 ± 2.0	0.4 ± 0.7	0.399
Television	2.4 ± 1.3	2.5 ± 1.4	2.8 ± 1.9	1.9 ± 1.2	0.238
Leisure-time internet use	2.6 ± 2.0	2.5 ± 1.7	2.1 ± 1.4	1.9 ± 1.5	0.154
All	5.6 ± 2.7	5.8 ± 2.7	6.3 ± 3.8	4.7 ± 2.4	0.384

[a] Mean ± SD

[b] Test for trend by linear regression

Table 3.31 Frequency of media exposure according to BMI status

Media exposure, hours/d	BMI status (kgm^{-2})			p^a	p^b
	<18.5	18.5–22.9	≥23		
Mothers (n=103)					
No. of subjects, %	1.9	44.7	53.4		
Newspapers	0.1 ± 0.1[c]	0.6 ± 0.4	0.4 ± 0.4	**0.004**	**0.024**
Magazines	0.0 ± 0.0	0.1 ± 0.2	0.1 ± 0.2	0.649	0.502
Radio	0.7 ± 0.2	1.5 ± 2.6	0.8 ± 1.2	0.545	0.105
Television	1.9 ±0.6	2.6 ± 1.7	2.8 ± 1.7	0.419	0.535
Leisure-time internet use	0.1 ± 0.2	0.2 ± 0.3	0.4 ± 0.9	0.961	0.073
All	2.9 ± 1.1	5.0 ± 3.0	4.5 ± 2.3	0.437	0.394
Daughters (n=104)					
No. of subjects, %	27.9	52.9	19.2		
Newspapers	0.4 ± 0.3	0.3 ± 0.3	0.4 ± 0.3	0.105	0.050
Magazines	0.1 ± 0.2	0.1 ± 0.2	0.1 ± 0.1	0.479	0.589
Radio	1.0 ± 1.8	0.2 ± 0.6	0.4 ± 0.8	0.788	**0.038**
Television	2.5 ± 1.4	2.3 ±1.4	2.6 ± 1.7	0.154	0.391
Leisure-time internet use	2.4 ± 2.1	2.1 ± 1.5	2.7 ± 1.7	0.297	0.215
All	6.4 ± 3.6	5.1 ± 2.5	6.2 ± 2.6	0.126	**0.028**

[a] p-value by Kruskal-Wallis test
[b] p-value by Student's t-test comparing normal weight with overweight for mothers and comparing normal weight with overweight and underweight combined for daughters
[c] Mean ± SD

Table 3.32 Mothers' meal pattern characteristics according to the quartiles of Western DP score (n=103)

	Component 1: Western			
	Q1 (-1.45 – 0.76)	**Q2** (-0.73 – -0.31)	**Q3+Q4** (-0.27 – 1.95)	p_{trend} [b]
Meal cooking "usually", %	76.6	64.1	70.6	0.420
Food shopping ≥3d/wk, %	89.4	82.1	82.4	0.369
Supplement use, %	21.3	28.2	5.9	0.397
Frequency per week[a]				
Fried foods	1.0 ± 1.2	1.0 ± 0.9	1.9 ± 2.0	**0.001**
Skipped breakfast	1.1 ± 2.2	0.9 ± 1.7	1.5 ± 2.5	0.134
Meals-away-from-home				
Breakfast[c], %	31.5 ± 35.5	37.5 ± 36.7	45.7 ± 40.3	0.059
Lunch	2.4 ± 2.5	2.8 ± 2.4	2.8 ± 2.5	0.612
Dinner	0.9 ± 1.0	1.7 ± 1.7	1.3 ± 0.8	0.474
Afternoon tea	1.1 ± 1.9	0.7 ± 1.3	0.8 ± 1.5	0.793
All	6.2 ± 5.0	7.5 ± 4.9	7.3 ± 4.1	0.420
Meals with any children				
Breakfast	1.5 ± 2.3	1.3 ± 1.7	0.8 ± 1.8	0.116
Lunch	1.3 ± 1.5	1.0 ± 1.3	0.8 ± 0.2	0.261
Dinner	5.3 ± 2.4	4.5 ± 2.6	3.9 ± 2.6	0.133
All	8.1 ± 4.7	6.7 ± 4.2	5.5 ± 4.5	0.063
Meals with daughter participating in this study				
Breakfast	0.9 ± 1.5	1.0 ± 1.2	0.8 ± 1.1	0.392
Lunch	1.1 ± 0.9	1.3 ± 1.2	1.4 ± 1.4	0.201
Dinner	4.3 ± 2.2	3.9 ± 2.2	3.9 ± 2.1	0.327
All	6.3 ± 3.5	6.2 ± 3.6	6.0 ± 3.8	0.595

[a] Mean ± SD

[b] Test for trend by linear regression (for continuous variables) and Chi-square test for linear-by-linear association (for categorical variables)

[c] Percentage of breakfasts taken per week

Table 3.33 Mothers' meal pattern characteristics according to the quartiles of prudent DP score (n=103)

	Component 2: Prudent				
	Q1 (-1.35– -0.63)	Q2 (-0.57– -0.22)	Q3 (-0.15–0.36)	Q4 (0.37–7.06)	p_{trend} [b]
Meal cooking "usually", %	63.2	85.7	61.3	75.0	0.822
Food shopping ≥3d/wk, %	78.9	90.5	83.9	87.5	0.597
Supplement use, %	15.8	38.1	32.3	31.3	0.418
Frequency per week[a]					
Fried foods	0.9 ± 0.7	1.2 ± 1.7	1.2 ± 1.1	1.2 ± 1.5	0.068
Skipped breakfast	1.1 ± 2.2	1.0 ± 2.2	1.1 ± 2.0	1.2 ± 2.0	0.073
Meals-away-from-home					
Breakfast[c],%	39.7 ± 44.4	26.6 ± 27.0	46.3 ± 39.6	29.9 ± 32.7	0.165
Lunch	3.0 ± 2.8	2.8 ± 2.5	2.6 ± 2.5	2.3 ± 2.3	0.508
Dinner	1.6 ± 1.9	1.0 ± 0.9	1.5 ± 1.5	1.0 ± 0.8	0.503
Afternoon tea	0.7 ± 1.2	0.8 ± 1.8	1.2 ± 2.0	0.8 ± 1.3	0.195
All	7.9 ± 5.2	6.2 ± 4.3	7.9 ± 5.8	5.6 ± 3.8	0.694
Meals with any children					
Breakfast	0.7 ± 0.9	1.4 ± 2.1	1.5 ± 2.5	1.4 ± 1.9	0.560
Lunch	1.3 ± 1.7	1.0 ± 1.4	1.0 ± 1.1	1.1 ± 1.2	0.924
Dinner	4.5 ± 2.6	4.5 ± 2.8	4.8 ± 2.6	5.0 ± 2.3	0.156
All	6.4 ± 4.3	6.8 ± 4.8	7.4 ± 5.0	7.5 ± 4.1	0.286
Meals with daughter participating in this study					
Breakfast	0.7 ± 1.2	1.0 ± 1.1	1.0 ± 1.5	0.8 ± 1.5	0.720
Lunch	1.1 ± 1.1	1.5 ± 1.3	1.0 ± 1.1	1.3 ± 1.0	0.576
Dinner	3.8 ± 2.4	4.3 ± 2.2	4.2 ± 2.3	4.0 ± 2.1	0.730
All	5.6 ± 3.6	6.9 ± 3.3	6.2 ± 3.9	6.1 ± 3.4	0.730

[a] Mean ± SD

[b] Test for trend by linear regression (for continuous variables) and Chi-square test for linear-by-linear association (for categorical variables)

[c] Percentage of breakfasts taken per week

Table 3.34 Daughters' meal pattern characteristics according to the quartiles of Western DP score (n=104)

	Component 1: Western			
	Q1+Q2 (-0.97 – -0.29)	**Q3** (-0.28 – 0.42)	**Q4** (0.45 – 4.45)	p_{trend} [b]
Supplement use, %	0.0	17.9	10.4	0.553
Frequency per week				
Fried foods	0.8 ± 0.6[a]	1.6 ± 1.4	3.1 ± 2.7	**<0.001**
Skipped breakfast	1.8 ± 2.2	1.6 ± 1.6	2.5 ± 2.1	**0.037**
Meals-away-from-home				
Breakfast[c], %	13.6 ± 18.1	27.3 ± 32.4	34.1 ± 33.4	0.140
Lunch	3.2 ± 2.0	4.3 ± 1.6	4.4 ± 1.9	0.060
Dinner	1.5 ± 1.0	2.1 ± 1.6	2.7 ± 1.9	**0.007**
Afternoon tea	0.6 ± 0.8	0.9 ± 1.2	1.0 ± 1.1	**0.028**
All	5.9 ± 3.2	8.5 ± 3.8	9.5 ± 4.3	**0.004**
Meals with mother				
Breakfast	1.6 ± 2.3	1.0 ± 1.2	0.6 ± 0.8	0.071
Lunch	1.7 ± 1.2	1.3 ± 1.1	0.9 ± 1.0	**0.022**
Dinner	4.6 ± 1.9	4.5 ± 2.2	3.6 ± 2.2	0.059
All	8.0 ± 4.1	6.8 ± 3.4	5.1 ± 3.1	**0.010**

[a] Mean ± SD

[b] Test for trend by linear regression (for continuous variables) and Chi-square test for linear-by-linear association (for categorical variables)

[c] Percentage of breakfasts taken per week

Table 3.35 Daughters' meal pattern characteristics according to the quartiles of prudent DP score (n=104)

	Component 2: Prudent				
	Q1 (-1.60– -0.64)	Q2 (-0.62– -0.21)	Q3 (-0.19– 0.33)	Q4 (0.37 – 2.73)	p_{trend} [b]
Supplement use, %	6.3	6.5	14.3	25.0	**0.033**
Frequency per week					
Fried foods	1.9 ± 1.6[a]	2.5 ± 3.1	2.3 ± 1.9	2.1 ± 2.0	0.815
Skipped breakfast	3.0 ± 2.1	1.7 ± 1.8	1.4 ± 1.4	1.7 ± 2.0	**0.011**
Meals-away-from-home					
Breakfast[c],%	33.9 ± 39.4	23.1 ± 27.2	24.3 ± 28.0	30.4 ± 27.6	0.354
Lunch	4.1 ± 1.9	4.2 ± 1.7	4.7 ± 1.6	3.7 ± 2.0	0.702
Dinner	2.6 ± 2.0	1.9 ± 1.2	2.2 ± 1.6	2.4 ± 1.8	0.962
Afternoon tea	0.8 ± 0.8	0.7 ± 0.9	0.9 ± 0.9	1.3 ± 1.7	0.156
All	8.5 ± 4.2	7.8 ± 3.5	9.2 ± 4.3	9.0 ± 4.8	0.597
Meals with mother					
Breakfast	0.5 ± 0.7	1.1 ± 1.7	0.7 ± 1.0	1.4 ± 1.6	**0.023**
Lunch	0.8 ± 0.9	1.5 ± 1.0	1.4 ± 1.3	1.3 ± 1.2	0.380
Dinner	3.3 ± 2.3	4.5 ± 2.0	4.6 ± 2.3	4.2 ± 1.8	0.278
All	4.7 ± 3.1	7.1 ± 3.6	6.7 ± 3.5	6.9 ± 3.6	0.070

[a] Mean ± SD

[b] Test for trend by linear regression (for continuous variables) and Chi-square test for linear-by-linear association (for categorical variables)

[c] Percentage of breakfasts taken per week

Table 3.36 Pearson's correlation coefficients between DP scores and study variables

	Western		Prudent	
	Mother	Daughter	Mother	Daughter
Age	-0.100	0.003	-0.095	-0.072
Energy intake	**0.552**[c]	**0.857**[c]	**0.788**[c]	**0.494**[c]
Mother's DP score	1.000	**0.219**[a]	1.000	0.162
Family meals	-0.184	**-0.253**[b]	0.106	0.178
Years living together	0.037	0.002	-0.041	-0.004
tNEWS	0.020	0.004	-0.106	0.132
tMAG	0.138	**0.262**[b]	-0.025	0.128
tRADIO	0.049	0.033	-0.036	0.084
tTV	**0.205**[a]	0.108	-0.018	-0.117
tNET	0.104	**0.227**[a]	0.065	-0.141
All Media	**0.208**[a]	**0.218**[a]	-0.040	-0.086
MET-hr/wk	-0.083	0.050	-0.007	0.122
Meal out	0.080	**0.280**[b]	-0.039	0.052
HK lifetime	**0.303**[b]	0.024	0.086	0.012

[a,b,c]: Correlation is significant at the 0.05, 0.01, and 0.001 level (2-tailed) respectively.

Abbreviations: Family meals: frequency of meals per week with any children [for mothers], frequency of meals per week with mothers [for daughters]; Years living together: duration (in years) of mothers and daughters living together; tNEWS, tMAG, tRADIO, tTV, tNET, All Media: daily hours spent on newspapers, magazines, listening to radio, TV viewing, leisure-time internet use, and total media exposure respectively; MET-hr/wk: Leisure-time moderate/vigorous physical activities, metabolic equivalent hours per week; Meal out: frequency of meals prepared away from home per week; HK lifetime: years living in Hong Kong.

Table 3.37 Determinants of Western DP score for mothers and daughters by multiple linear regression models

Dependent Variable: dietary score	Independent variables[a]	R^2 change	B	SE of B	Beta	p-value	Partial Corr.
Mother Western DP score (n=103)	*Age & energy model* (Total R^2=0.306)						
	Age, y	0.010	-0.006	0.022	-0.023	0.781	-0.028
	Energy intake, kcal	0.295	0.000	0.000	0.549	0.000	0.546
	Final model (Total R^2=0.482)						
	Age, y	0.010	-0.032	0.020	-0.121	0.116	-0.160
	Energy intake, kcal	0.295	0.000	0.000	0.520	0.000	0.573
	All media, hrs/d	0.060	0.072	0.018	0.372	0.000	0.377
	Family meals, times/wk	0.050	-0.024	0.008	-0.212	0.005	-0.280
	Years in HK	0.035	0.008	0.003	0.201	0.009	0.262
	Ln (tRadio)	0.031	-0.300	0.126	-0.220	0.019	-0.237
Daughter Western DP score (n=103)	*Age & energy model* (Total R^2=0.737)						
	Age, y	0.000	0.006	0.020	0.015	0.776	0.029
	Energy intake, kcal	0.737	0.001	0.000	0.858	0.000	0.858
	Final model (Total R^2=0.812)						
	Age, y	0.000	-0.022	0.019	-0.057	0.236	-0.121
	Energy intake, kcal	0.737	0.001	0.000	0.836	0.000	0.884
	Family meals, times/wk	0.035	-0.048	0.014	-0.170	0.001	-0.333
	Ever smoker	0.015	0.506	0.171	0.144	0.004	0.290
	tTV, hrs/d	0.014	0.082	0.031	0.121	0.010	0.259
	Mother Western DP score	0.011	0.211	0.088	0.107	0.019	0.237

[a] Independent variable: Age, energy intake (Method=Enter); mother/daughter Western DP score; daily hours spent on newspapers, magazines, television, listening to radio, leisure-time internet use, and total media use (tNews, tMAG, tTV, tRadio, tNET, and all media respectively), frequency of meals with any children (Family meals) [for mother], frequency of meals with mother (Family meals)[for daughter], frequency of meals-away-from-home (Meal out), years living in Hong Kong (HK lifetime), full-time employment (Fulltime: 1= yes, 0 = no), ever smoker (1 = yes; 0 = no) (Method=Forward).

Table 3.38 Determinants of prudent DP score for mothers and daughters by multiple linear regression models

Dependent Variable: dietary score	Independent variables[a]	R^2 change	B	SE of B	Beta	p-value	Partial Corr.
Mother prudent DP score (n=103)	*Age & energy model* (Total R^2=0.613)						
	Age, y	0.009	0.010	0.037	0.016	0.799	0.025
	Energy intake, kcal	0.613	0.001	0.000	0.791	0.000	0.786
	Final model (Total R^2=0.637)						
	Age, y	0.009	-0.001	0.037	-0.001	0.982	-0.002
	Energy intake, kcal	0.613	0.002	0.000	0.823	0.000	0.794
	Fulltime	0.015	-0.292	0.145	-0.128	0.047	-0.198
Daughter prudent DP score (n=103)	*Age & energy model* (Total R^2=0.252)						
	Age, y	0.007	-0.024	0.027	-0.077	0.375	-0.089
	Energy intake, kcal	0.245	0.001	0.000	0.495	0.000	0.497
	Final model (Total R^2=0.349)						
	Age, y	0.007	-0.017	0.026	-0.056	0.519	-0.065
	Energy intake, kcal	0.245	0.001	0.000	0.554	0.000	0.559
	tNET, hrs/d	0.060	-0.107	0.038	-0.234	0.006	-0.271
	Family meals, times/wk	0.038	0.045	0.019	0.204	0.019	0.235

[a] Independent variable: Age, energy intake (Method=Enter); mother/daughter Western DP score; daily hours spent on newspapers, magazines, Television, listening to radio, leisure-time internet use, total media use (tNews, tMAG, tTV, tRadio, tNET, and all media respectively), frequency of meals with any children (Family meals) [for mother], frequency of meals with mother (Family meals)[for daughter], frequency of meals-away-from-home (Meal out), years living in Hong Kong (HK lifetime), full-time employment (Fulltime: 1= yes, 0 = no), ever smoker (1 = yes; 0 = no) (Method=Forward).

Table 3.39 Mothers' dietary characteristics and media exposure according to their employment status

Mothers' characteristics	Employment status		p^a
	Full-time (n=50)	Part-time or economically inactive (n=53)	
Participation in family meal preparation, %			
Meal cooking "usually"	62.0	79.2	0.054
Food shopping ≥3d/wk	76.0	94.3	**0.008**
	Mean ± SD	Mean ± SD	
DP score			
Western	-0.55 ± 0.47	-0.68 ± 0.53	0.206
Prudent	0.11 ± 1.06	0.33 ± 1.23	0.336
Meal frequency, times per week			
Breakfast skipping	0.9 ± 1.9	1.3 ± 2.2	0.306
Fried foods	1.4 ± 1.6	0.9 ± 0.8	**0.034**
Meals-away-from-home			
Breakfast[b], %	34.3 ± 34.6	37.9 ± 38.8	0.631
Lunch	3.0 ± 2.6	2.3 ± 2.3	0.111
Dinner	1.4 ± 1.5	1.1 ± 1.1	0.206
Afternoon tea	0.5 ± 0.7	1.3 ± 2.1	**0.013**
All	6.9 ± 4.6	6.8 ± 5.1	0.879
Meals with any children			
Breakfast	1.1 ± 1.7	1.5 ± 2.2	0.320
Lunch	0.8 ± 1.0	1.4 ± 1.5	**0.014**
Dinner	4.2 ± 2.8	5.3 ± 2.0	**0.023**
All	6.0 ± 4.3	8.2 ± 4.5	**0.046**
Media exposure, hours/d			
Newspapers	0.4 ± 0.4	0.5 ± 0.4	0.245
Magazines	0.1 ± 0.2	0.1 ± 0.2	0.292
Radio	1.0 ± 1.8	1.2 ± 2.1	0.633
Television	2.4 ± 1.6	3.0 ± 1.7	0.053
Leisure-time internet use	0.2 ± 0.4	0.4 ± 0.9	0.116
All	4.1 ± 2.4	5.3 ± 2.8	**0.023**

[a] Independent sample t-test for continuous variables
[b] Percentage of breakfast taken per week

Table 3.40 Daughters' dietary characteristics and media exposure according to mothers' employment status

Daughters' characteristics[a]	Mothers' employment status		p^b
	Full-time (n=45)	Part-time or economically inactive (n=48)	
	Mean ± SD	Mean ± SD	
DP score			
Western	0.76 ± 0.87	0.52 ± 1.10	0.236
Prudent	-0.25 ± 0.69	-0.07 ± 0.88	0.263
Meal frequency, times per week			
Breakfast skipping	2.0 ± 2.0	1.8 ± 1.8	0.483
Fried foods	1.7 ± 1.5	2.6 ± 2.8	**0.046**
Meals-away-from-home			
Breakfast[c], %	31.4 ± 31.5	26.4 ± 31.9	0.446
Lunch	4.2 ± 1.9	4.1 ± 1.6	0.723
Dinner	2.1 ± 1.7	2.1 ± 1.6	0.936
Afternoon tea	0.8 ± 1.0	1.0 ± 1.2	0.543
All	8.5 ± 4.2	8.4 ± 4.1	0.841
Meals with mothers			
Breakfast	0.7 ± 0.8	1.2 ± 1.7	0.081
Lunch	1.0 ± 0.9	1.5 ± 1.2	**0.027**
Dinner	4.1 ± 2.4	4.5 ± 2.0	0.456
All	5.8 ± 3.4	7.2 ± 3.6	0.066
Media exposure, hours/d			
Newspapers	0.3 ± 0.3	0.3 ± 0.3	0.655
Magazines	0.1 ± 0.2	0.1 ± 0.1	0.548
Radio	0.5 ± 1.1	0.5 ± 1.4	0.992
Television	2.4 ± 1.3	2.5 ± 1.7	0.691
Leisure-time internet use	2.7 ± 1.6	2.1 ± 1.6	0.058
All	6.1 ± 2.5	5.6 ± 3.1	0.389

[a] Limited to daughters who were living with their mothers (n=93)
[b] Independent sample t-test for continuous variables.
[c] Percentage of breakfast taken per week

Table 3.41 Mothers' demographic and lifestyle characteristics according to their place of birth

Mothers' characteristics	Place of birth		p^b
	Born in HK (n=63)	Born in China (n=39)	
Age, y	46.2 ± 1.8[a]	46.0 ± 2.0	0.713
Years residing in HK	45.8 ± 1.8	23.7 ± 8.2	**<0.001**
Completed high school ,%	49.2	23.1	**0.009**
Marital status, %			
Married	85.7	84.6	0.941
Divorced/widowed	14.3	15.4	
Monthly household income, %			
< HK$10,000	4.8	17.9	0.067
≥ HK$30,000	28.6	17.9	
Fulltime work/study, %	49.2	48.7	0.962
Ever smoker, %	3.2	0.0	0.261
Alcohol user (≥1/wk), %	4.8	10.3	0.516
Hypertensive, %	17.5	10.3	0.318
Waist >80cm, %	42.9	41.0	0.856
BMI, kg/m^2	23.9 ± 3.5	23.6 ± 3.3	0.657
Weight change status, %			
Increase or fluctuate	23.8	17.9	0.649
Decrease or maintain	69.8	71.8	
Leisure-time physical activities, MET-hrs/wk[c]	6.0 ± 11.1	4.0 ± 9.0	0.065
Self-perceived health, %			
Better than age of peers	30.2	17.9	0.057
About the same	55.6	71.8	
Worse than age of peers	14.3	5.1	

[a] Mean ± SD

[b] p-value by Mann-Whitney test for continuous variables and by Chi-square test for categorical variables

[c] Leisure-time physical activities: MET-hrs/wk, metabolic equivalent (energy expenditure per kilogram of body weight per hour of activity divided by the energy expenditure per kilogram of body weight per hour at rest) hours per week

Table 3.42 Mothers' dietary characteristics and media exposure according to their place of birth

Mothers' characteristics	Born in HK (n=63)	Born in China (n=39)	p^a
Participation in family meal preparation, %			
Meal cooking "usually"	68.3	74.4	0.511
Food shopping ≥3d/wk	84.1	87.2	0.672
	Mean ± SD	Mean ± SD	
Dietary DP score			
Western	-0.52 ± 0.48	-0.77 ± 0.51	**<0.001**
Prudent	0.23 ± 1.17	0.18 ± 1.12	0.707
Meal pattern characteristics, times per week			
Fried foods	1.2 ± 1.4	1.0 ± 1.2	0.511
Skipped breakfast	1.3 ± 2.2	0.8 ± 1.9	0.070
Meals-away-from-home			
Breakfast[b]	45.1 ± 37.4	22.9 ± 31.7	**0.001**
Lunch	3.0 ± 2.4	2.1 ± 2.5	**0.023**
Dinner	1.6 ± 1.3	0.7 ± 1.2	**<0.001**
Afternoon tea	0.9 ± 1.6	0.9 ± 1.6	0.317
All	8.0 ± 4.7	5.1 ± 4.8	**0.001**
Meals with any children			
Breakfast	1.2 ± 1.8	1.4 ± 2.3	0.482
Lunch	1.1 ± 1.3	1.1 ± 1.3	0.893
Dinner	4.6 ± 2.5	4.9 ± 2.6	0.362
All	6.9 ± 4.3	7.4 ± 4.9	0.780
Media exposure, hours/d			
Newspapers	0.5 ± 0.4	0.4 ± 0.4	0.494
Magazines	0.1 ± 0.2	0.1 ± 0.2	**0.017**
Radio	1.1 ± 1.8	1.2 ± 2.2	0.522
Television	2.5 ± 1.4	3.0 ± 2.1	0.378
Leisure-time internet use	0.4 ± 0.8	0.2 ± 0.5	**0.005**
All media	4.6 ± 2.5	4.9 ± 2.9	0.863

[a] p-value by Mann-Whitney test
[b] Percentage of breakfast taken per week

Table 3.43 Daughters' demographic and lifestyle characteristics according to mothers' place of birth

Daughters' characteristics	Mothers' Place of birth		p^b
	Born in HK (n=63)	Born in China (n=39)	
Age, y	20.9 ± 2.6[a]	20.8 ± 2.5	0.880
Years residing in HK	20.8 ± 2.6	19.4 ± 3.3	0.082
Born in HK, %	98.4	82.1	**0.003**
Living with mother, %	88.9	92.3	0.573
Education, %			
High school graduate	61.9	56.4	0.854
University degree	28.6	33.3	
Monthly income, %			
< HK$10,000	92.1	92.3	0.964
≥ HK$10,000	7.9	7.7	
Fulltime work/study, %	96.8	94.9	0.621
Ever smoker, %	11.1	5.1	0.301
Alcohol user (≥1/wk), %	3.2	0.0	**0.019**
Waist >80cm, %	7.9	7.7	0.964
BMI, kg/m^2	20.6 ± 3.0	20.7 ± 3.6	0.796
Weight change status, %			
Increase or fluctuate	30.2	20.5	0.557
Decrease or maintain	50.8	59.0	
Leisure-time PA, MET-hrs/wk[c]	7.7 ± 11.6	6.5 ± 9.0	0.871
Self-perceived health, %			
Better than age of peers	17.5	10.3	0.522
About the same	58.7	56.4	
Worse than age of peers	22.2	28.2	

[a] Mean ± SD

[b] p-value by Mann-Whitney test for continuous variables and by Chi-square test for categorical variables

[c] Leisure-time physical activities: MET-hrs/wk, metabolic equivalent (energy expenditure per kilogram of body weight per hour of activity divided by the energy expenditure per kilogram of body weight per hour at rest) hours per week

Table 3.44 Daughters' dietary characteristics and media exposure according to mothers' place of birth

Daughters' characteristics	Mothers' place of birth		p^a
	Born in HK (n=63)	Born in China (n=39)	
	Mean ± SD	Mean ± SD	
Dietary DP score			
Western	0.59 ± 1.10	0.64 ± 0.83	0.340
Prudent	-0.24 ± 0.71	-0.16 ± 0.90	0.992
Meal pattern characteristics, times per week			
Fried foods	2.0 ± 1.9	2.5 ± 2.7	0.785
Skipped breakfast	2.0 ± 1.9	2.1 ± 2.1	0.950
Meals-away-from-home			
Breakfast[b]	28.1 ± 29.6	29.4 ± 35.1	0.553
Lunch	4.4 ± 1.8	3.8 ± 1.8	0.072
Dinner	2.5 ± 1.8	2.0 ± 1.6	0.107
Afternoon tea	0.8 ± 1.0	1.0 ± 1.2	0.137
All	8.9 ± 4.0	8.0 ± 4.4	0.121
Meals with mother			
Breakfast	1.1 ± 1.4	0.6 ± 1.3	**0.016**
Lunch	1.3 ± 1.2	1.0 ± 1.0	0.277
Dinner	4.0 ± 2.2	4.2 ± 2.3	0.691
All	6.4 ± 3.8	5.8 ± 3.2	0.615
Media exposure, hours/d			
Newspapers	0.3 ± 0.4	0.3 ± 0.2	0.078
Magazines	0.1 ± 0.2	0.1 ± 0.1	**0.010**
Radio	0.6 ± 1.4	0.3 ± 0.7	0.584
Television	2.3 ± 1.4	2.4 ± 1.4	0.762
Leisure-time internet use	2.2 ± 1.7	2.5 ± 1.7	0.267
All media	5.6 ± 3.2	5.6 ± 2.4	0.705

[a] p-value by Mann-Whitney test
[b] Percentage of breakfast taken per week

Table 3.45 Associations of Western and Prudent DP scores and the prevalence risk for overweight (in mothers and daughters) and underweight (in daughters)

	Overweight (BMI ≥23.0kgm^{-2})		Underweight (BMI <18.5kgm^{-2})	
	OR[a]	95%CI	OR	95%CI
Western DP score				
Mothers				
Q1 (-1.45 – 0.76)	1.00			
Q2 (-0.73 – -0.31)	1.64	(0.67, 4.00)		
Q3 + Q4 (-0.27 – 1.95)	3.06	(0.77, 12.26)		
Daughters				
Q1 + Q2 (-0.97 – -0.29)	1.00		1.00	
Q3 (-0.28 – 0.42)	6.20	(0.79, 48.44)	2.49	(0.50, 12.41)
Q4 (0.45 – 4.45)	6.47	(0.58, 71.78)	1.42	(0.20, 10.24)
Prudent DP score				
Mothers				
Q1 (-1.35 – -0.63)	1.00			
Q2 (-0.57 – -0.22)	0.88	(0.22, 3.52)		
Q3 (-0.15 – 0.36)	0.39	(0.11, 1.35)		
Q4 (0.37 – 7.06)	0.35	(0.08, 1.56)		
Daughters				
Q1 (-1.60 – -0.64)	1.00		1.00	
Q2 (-0.62 – -0.21)	1.66	(0.40, 6.86)	1.86	(0.53, 6.58)
Q3 (-0.19 – 0.33)	1.97	(0.35, 10.94)	1.70	(0.39, 7.44)
Q4 (0.37 – 2.73)	2.79	(0.47, 16.54)	1.77	(0.39, 8.18)

[a] Odds ratios (OR) come from separate binary logistic regression models comparing normal weight to overweight (for both mothers and daughters) and normal weight to underweight (for daughters only). All models were adjusted for age, calories, education level, leisure-time moderate/vigorous physical activities (Met-hr/wk), and total daily hours spent on media.

Chapter 4

A qualitative study to explore media influences and other factors contributing to the dietary practices in the two generations of Hong Kong Chinese women

Abstract

Aim: To investigate how media, family, and other possible factors influence the dietary practices in two generations of Chinese women. **Method**: 22 mothers (aged 43–49y) and 13 daughters (aged 18–23y) were enrolled for semi-structured in-depth interviews. Interviews were tape-recorded and transcribed verbatim. The findings were evaluated by respondent validation. **Results**: Three areas were discussed. 1) The generational differences in dietary practices were indicated and contributed by the discrepancies in the food environments during childhood, attitudes towards family meals, and practices of regular meal schedules; 2) Mothers were influential on adult children's dietary intakes but mothers did not recognize their influences and tended to take less responsibility for children's eating as their children grew up. Adult children were dependent on their mothers for healthy eating. Ignorance of the importance of the diet-health relationship in young adulthood was observed; 3) Increased accessibility to electronic media disturbed meal schedules and cultivated dietary norms. Priming effects of media food promotions were stronger in the Westernized food environments. Health and diet information in the media induced both positive and negative effects on the dietary behaviours in women. **Conclusion**: There may be a breakdown of intergeneration transfer of traditional dietary beliefs and attitudes in the local Chinese population. Empowering women the importance of diet-disease relationship and skills

for healthy eating, and emphasizing the roles of parental modelling and family meals may alleviate the dietary transition towards Western DP. Evaluations of alcohol taxation policy and the advertising standards for food and food-related products, particularly alcohol beverages and weight loss products, are needed.

Keywords: mother, daughter, dietary practice, media influence

4.1 Introduction

The nutrition transition towards high-fat and energy-dense diet has posed significant public health challenges in many Asian countries (12-15). Understanding the underlying driving forces behind the nutrition transition is crucial for effective interventions. Several suggested mechanisms include rapid economic growth (12;14;15), establishment of fast food restaurants and multinational food retailers (12;59), removal of food trade restrictions (12;59), advances in food production and processing (12;14;59;309), and globalization of food marketing and promotion (59). Understanding these mechanisms is useful for planning and developing policies and regulations, such as food policies and food trade agreements, at country level. However, these mechanisms may not be sufficient in providing pertinent information for designing strategies or interventions at individual or community level. The Ecologic Model of Health Behaviours (310) indicates that it is also salient to understand mechanisms underplaying at individual, interpersonal or community levels that may influence individual decision making on food choices and dietary intake (122). Family resemblance in energy and nutrient intake (123;124;126;130;311;312), food beliefs and attitudes (69;133), and food preferences (136;137) demonstrates the importance of family on dietary practices. The dietary influence in Asian families is of particular public health interest because of the potential effects of intergenerational transfer of the traditional, Asian plant-based diet within the family. Previous studies also indicated a stronger role of mothers in their children's diet at both childhood and adulthood (69;124). Furthermore, despite the consistent suggestion of media exposure as an independent risk factor for the obesity epidemic (170;171;173;196;313), the effects of media influence on dietary intake are mostly focused in children. Also, media

communication and marketing of food may induce different effects on dietary preferences and attitudes across generations. As implicated by the Ecological Model for health promotion planning (310), it is salient to identify the contributing factors at different environmental levels for more cost-effective, multi-level health interventions.

This qualitative study used the grounded theory approach (314). Based on this approach, three areas of concerns were identified. First, the study aimed to explore the views and opinions on the similarities and differences in the dietary practices between the two generations of Hong Kong Chinese women. Second, it aimed to examine the roles of mothers on the dietary intakes of their adult children. Finally, the study aimed to investigate how the media influences dietary behaviours in the two generations. Themes emerged from the qualitative interviews were used to identify the concepts and generate theoretical connections for the above areas of concerns.

4.2 Methods

4.2.1 Sample

Twenty two mothers and 13 daughters from the same study population were interviewed. To allow the transferability of the study findings to the general population, participants were selected purposively, based on a range of demographic characteristics. The sample included mothers and daughters who were working or studying full-time, or who were economically inactive; who lived in public housing, private or government-subsidized housing; who were born in Hong Kong or China; and whose Western DP score or the total media exposure in the higher or lower quartiles in the cross-sectional study sample. Mother participants aged from 43 to 49 years and daughter participants from 18 to 23 years, with years living in Hong Kong between 10 to 48 years and 15 to 23 years respectively were chosen. Approximately half of the mothers (46%) and one-

third of the daughters (31%) were overweight or obese. Majority of mothers (88.2%) were in the lower quartiles (Quartile 1 or 2) whereas majority of daughters (77%) were in the upper quartiles (Quartile 3 or 4) of Western DP score. Half of the mothers and daughters had their TV viewing or total media exposure above the median daily consumption in the whole study sample. One-fifth of the mothers (23%) and all daughters had full-time employment or study.

4.2.2 Interview settings

Eighteen semi-structured interviews were held at the School of Public Health at the Prince of Wales Hospital in Shatin between May and July 2009. An interview guide was used with the following key questions. Similar questions were asked in different ways to ascertain consistency of the responses.

1. What are the factors that you think may explain the similarities or differences in dietary practices between mothers and daughters when you were at the same age?
2. In what ways and who do you think may influence your dietary practices?
3. In what ways and whom do you think you may influence his/her dietary practices?
4. Think about any foods or drinks presented in the media (consider individually, for TV, newspaper, magazine, radio, and internet use), what foods or drinks are being displayed?
5. Can you tell me your experience about trying out any foods or drinks that were advertised or displayed in the media (consider individually, for TV, newspaper, magazine, radio, and internet use)?

All interviews were conducted in Cantonese by the same nutritionist. Each interview lasted between 1 and 2 hours, and was audio-recorded. The majority of

mothers were interviewed in small groups of 2 to 4 whereas daughters were interviewed individually. Six mother-daughter pairs were interviewed individually to explore further the differences and similarities within mother-daughter pairs and their views of media influence on the dietary practices. Participants were informed about their confidentiality and anonymity for their participation in the study. Written consents were obtained from all participants before the interviews. A cash coupon of HK$100 was provided to each participant as an incentive to compensate for time and transportation cost associated with the interview. The study was approved by the CUHK Behavioural and Survey Research Ethics Committee.

4.3 Data analysis

The audiotapes were transcribed verbatim and analyzed systematically by a matrix-based presentation of identified themes. Initial themes were identified and classified based on the levels (individual, interpersonal, organizational, community, societal) suggested by the Ecological Model (310). The Ecological Model presents a comprehensive framework to study the interrelationships between individuals and the environments in which individuals live. It provides a rich context for understanding individual behaviours and for health promotion planning (122). In this study, the individual level referred to personal characteristics (e.g. age, education) that are associated with individual's dietary practices. The interpersonal level referred to factors that were associated with the dietary influences of closely related persons or small groups (e.g. family, friends). The organizational level referred to factors that were manipulated by formal operating systems (e.g. schools, companies). The community level referred to factors that were manipulated by collective groups of common geographic areas or with common values and mutual concerns (e.g. neighbourhoods).

Media are considered as one of the key influences at community level (315). The societal level referred to factors that are controlled by one or several larger operating and policy systems that affect many aspects of lives and developments at all other levels.

Four clerical assistants who were blinded to the study objectives were involved in the interview transcription to minimize bias during the transcription process. The analysis was conducted in Cantonese. Common themes were identified with the support of quotations for each theme. The themes and findings were presented to four mother and three daughter participants for their comments. The final themes and quotations were translated into English at the end of analysis to minimize the risk of detail losing details during the translation process.

4.4 Results

4.4.1 Mother and daughter views on the similarities and differences in dietary practices between the two generations of Chinese women

During the interviews, mothers elaborated the differences in dietary practices they had when they were at the same age as their daughters. They indicated that daughters ate less at regular meals, snacked more often, ate out or ate at fast food restaurants more often, and had much greater availability and variety of food choices at home and outside home, than when mothers were at the same age as their daughters. Low concepts of meal times, easy access to food-away-from-home, irregular work or study schedules, and reduced family size were repeatedly mentioned to explain the differences in dietary practices between mother and daughter generations.

Theme 1. Attitudes towards family meal: Mothers rated family meals as very important since foods were only served at meal times throughout mothers' childhood and young adulthood. However, foods and snacks were now available all the time at

home or outside home and family meals were not viewed as an important food access in the daughter generation.

> When I was at the same age as my daughter, I ate rice (at mealtime) every day. We didn't have other things to eat (other than food served at mealtime), but they (the daughter generation) now have many things to eat, such as yogurt, ice cream, chocolate, cream crackers etc (...) She eats very little at mealtimes, so she feels hungry very soon after meals, and then she eats many other things afterwards. (No.22, mother)

> When she comes back home (from work), she tells me that she doesn't want to eat. We usually have (dinner) at about 7pm, but then she said she doesn't want to eat. She sometimes goes to 7-Eleven (a convenience store) and takes some siu mai (pork dumpling), fish balls, some other things, some noodles, something like this, eats that (on her way home), and tell me she's not that hungry and she doesn't want to eat now (at dinner time). (No.9, mother)

Theme 2: Practice of regular meal schedule: In most interviews, mothers indicated that they followed closely a regular meal schedule. However, the irregular sleep, work or study schedule of daughters were mentioned and disturbed the time when daughters had their meals. Daughters often stayed up late at night. Skipping breakfast and late night snacking was common among the daughter generation.

> Like my daughter, she wakes up late, and the (meal)time has to be shifted, afternoon tea was consumed as lunch meal. Sometimes I don't really know what she considers the meal she has just eaten to be. I think their mealtime is very messy. We had very regular schedule for meals, we woke up at regular times and had breakfast. (No.5, mother)

> I eat whenever I want to, or eat when I feel hungry. I don't have a particular schedule (to eat) (...) chocolate, potato chips, biscuit sticks and candy are the usual snacks I have. (No.33, daughter)

Theme 3: Availability and accessibility of food-away-from-home: Increased number and widely distributed Western-style fast food restaurants and supermarkets had increased the variety of food choices at low cost made foods prepared away from home, particularly fast foods, more affordable and accessible.

> They (daughters) definitely eat at fast food restaurants more often than at home. We didn't have that many (fast food restaurants) in the past. Supermarkets were very few too. That's why we had not many (food) choices, we could only choose eat or not to eat (the food that was only served at home). (No.3, mother)

> When we were young, I had never tried that (cuisines or food other than Chinese style). With no money, how could I think of going to a French restaurant? We didn't go to Tsim Sha Tsui (for dining). But now, you can buy the so-called French cuisine at supermarkets. I don't know if it is authentic or not, but you can try all kinds of food at either low or high cost, depends on how much you can afford to pay. (No.19, mother)

Reduced family size made food-away-from-home and snack foods more available and accessible for the daughter generation. Large family size in the mother generation and the strong concept of resources sharing (e.g. food) within the family precluded the opportunities to eat away from home. In contrast, the smaller family size and higher prevalence of working mothers minimized the economic burden in the

family. As such, the younger generation had more financial independence and greater ability to have meals-away-from-home more frequently.

> In the old days, most of the time my mother cooked. My father was mean. We didn't eat out most of the time because I had too many brothers and sisters. My father was reluctant to pay for eat-out meals (for the whole family). (No.7, mother)

> Even when we started working, we would definitely give a segment of our salary to the family (i.e. parents) and we would not have much left. But now most families have only one or two children, and I am working too, so they don't have to give much money to the family. I would ask them to pay at least a little, but definitely not like the large portion we gave to the family (No.9, mother).

4.4.2 Roles of mothers in adult daughters' dietary practices

Both mothers and daughters agreed that mother plays a major role for dietary practices in the family. However, mothers took a lesser role as their children grew up either because of their inability to control children's eating practices or by their own choice. In addition, mothers perceived less satisfaction and appreciation for their cooking because their children ate less often at home and mother felt difficulties in fulfilling individual taste and food preferences among their children.

Theme 1: Mother's roles for healthy eating in the family: Both mothers and daughters agreed that mothers decided what foods to serve at home and shaped the dietary practices for all family members. Although daughters ate less often at home, mothers desperately prepared a balance meal when their children ate at home. However, mothers nowadays often need to consider greatly the taste or food preference of their children.

> They (daughters) are pickier. In the past, I ate what my mom cooked, whatever she cooked, but now they have their preferences, telling me "I want to eat this and I want to eat that". (No.5, mother)

Mothers indicated that it was their responsibility to feed their children with nutritious food when the children were small. However, as the children grew up, mother felt less pressure when the children did not eat healthily. Mothers, particularly whose were working full-time, expressed that they took less responsibility as the children grew up and were relieved that they no longer needed to struggle with their children on their poor dietary intake.

> I now cook rarely. (...) In the past when my daughter was still going to school, I cooked very often. I think it's because if we have small children at home, we shouldn't feed them non nutritious food, therefore you would cook more often at home. If it's not because of the small children, no one would be willing to cook. (No.17, mother)

> When she (daughter) was small, I insisted that she had breakfast every day. I would ask her in advance what foods she would like to eat and what foods she didn't. But now, even though I would like her to have breakfast, I would not force her to take it. I would prepare the breakfast, but if she doesn't take it, that's OK for me. (No.18, mother)

On the other hand, although daughters indicated that they had more autonomy on their dietary intake and ate less healthily now than when they were small, they indicated that they were still dependent on their mothers for healthy eating. Some claimed that their practices of unhealthy diet were due to less caring from their mothers

about their diet. Daughters also thought that the food served at home were more healthy but observed that the change of mother's roles with regards to their dietary practices.

> When I was small, my mom certainly gave me healthy food to eat. But she cares less and less as I get older, so I eat less healthy as I get older. (No.27, daughter)

> When I was small, I usually ate oranges. Because my mom usually prepared some fruits at the table, so I would eat them. Now I eat fruit rarely, unless my mom asks me whether I would like to eat, otherwise, I would not prepare it for myself. (No.33, daughter)

Theme 2: Mother's modelling and communication of dietary behaviours: Most mothers indicated that their mothers or parents shaped their dietary behaviours. At the same time, however, most of the mother participants discounted their impact on their daughters and were unaware their influences on their daughter's dietary habits or preferences because they thought that daughters ate less often at home. Most daughters indicated that mothers are influential on their dietary intakes, and they had no dietary influence by their friends or they had on them. There is evidence that mothers' dietary habits were adopted by their daughters.

> Influenced by me? I can't influence them (daughters) at all. (...) The only influence I would have on them is that when the dishes I cooked don't taste good, they can't tell me. (No. 4, mother)

> I think my dietary preferences are very much like my mom's. We both don't like to eat a lot of meat or deep-fried foods, those cooked with a lot of oil. We both like to eat vegetables. (No. 24, daughter)

Mothers also expressed their inability to change their daughters' dietary transgressions. Although mother commented and advised their daughters to correct their dietary practices, mothers expressed that their daughters did not follow their advice because their daughters were more financially independent.

> I always ask them (my children) not to buy that stuff, such as potato chips and prawn crackers, especially those packed in paper cups. Those have artificial colouring at seriously high levels. But they are still eating those foods; they don't listen and I can't find any way to stop them. Many times, they don't follow your advice, the only thing I can do is to ask them to eat less (of those snacks) and to eat more fruits. (No.16, mother)

Theme 3: Satisfaction and appreciation as perceived by mothers in cooking for the family. Mothers expressed satisfaction and felt appreciation for their cooking if the food they cooked was finished by their family and there were no leftovers after the meal. However, reduced family size, higher frequency of meals-away-from-home by the children, and lower quality of food sources were mentioned as the reasons for their decreased interest and motivation to cook for the family. Some mothers also expressed a lack of skills for healthy cooking.

> Maybe it is my poor cooking skills. Always there are leftovers. The food-away-from-home is cooked with specially prepared flavouring and therefore is more appetizing. When she comes back for meals...very often I don't add many flavourings to the dishes, and the dishes don't taste good. (No.14, mother)

Due to large family size, competing for food at mealtimes between family members was common in the mother generation during their childhood and young adulthood. All food served at every family meal were consumed. However, today there

were many leftovers after meals, which discouraged mothers' interest and self-confidence in cooking.

> Now you need to coax the children (to eat) since they were small. (...) I think it's because of the change in the (family) environment. When you have more people (in the family), you can serve a variety of food. But if no one takes the food you cooked, or can't finish it, it would be wasteful. So you don't want to cook. (No.6, mother)

The low quality of food sources was mentioned and suggested as an explanation for why mothers could not cook foods as tasty and nutritious as in the past. Decreased quality of farmland, changes in the food production and food processing, and the lack of local food supply were indicated, which caused most foods to lose their original taste and nutritional value. Mothers also expressed frustration and lower confidence on deciding what foods to serve for the family. The SARS (Severe Acute Respiratory Syndrome) events, malachite green in fish, melamine in milk and milk products were mentioned to suggest the poor and unsafe food supply.

> The difference in dietary practice between now and in the past is that all food was fresh in the past. Even if it was just simply cooked, it was more nutritious than what the younger generation are experiencing now. (...) Basically many foods nowadays have added chemicals. Also, chickens are raised by chemical feed. (...) That's why all foods are less tasty than we used to have, simply because most foods nowadays have been freeze-treated and have higher artificial content. Everything is chemically modified. (No.17, mother)

I think my generation has more variety of food to eat, and the foods can be served in many different forms. I think foods nowadays are appetizing. However, we also have more variety of unhealthy foods, with additives or genetically-modified. We seem to advance in our food supply, but the foods are more harmful to health than in the past. (No.28, daughter)

4.4.3 Roles of media on dietary practices in the two generations

Rapid development of electronic media services and increased availability of various kinds of media entertainments were suggested by mothers as the main reason to explain the irregular sleep schedule and dietary practices in the daughter generation. Participants indicated that promotions on food dining and advertisements on fast food restaurants, sugar-sweetened drinks, and energy-dense snack foods, such as potato chips, were observed more frequently and in greater variety in the today's media than in the past. Participants indicated that there was more health and diet information available in the media and facilitated their changes in dietary habits. However, neither mothers nor daughters possessed sufficient knowledge and skills to evaluate the trustworthiness of the information or to modify the given recommendations for their own needs.

Theme 1: Influences of unlimited access to media on dietary practices. Both mothers and daughters usually watch TV at dinner time and in the evening. Furthermore, the 24-hr TV broadcasting and access to internet at home provided activities for daughters to stay up late at night. As such, late night snacking, usually junk foods, was more common in the daughter generation.

In the old days, the TV broadcasting ended at around midnight. When you saw the picture of the Queen, it meant there were no more shows on TV. Therefore, it was time you went to sleep. Nowadays, it is a different story. There are midnight radio programmes, midnight TV episodes, and online games anytime. (...) We didn't have these in our time (after midnight). There was nothing to watch on TV, nothing to listen to on the radio. Then you had no choice but went to bed. (No.7, mother)

I now often watch old TV episodes at midnight. I watch these episodes more often and follow more closely the storyline than the new TV episodes. (No. 29, daughter)

Most participants indicated that they played null or minimal attention to food displays or dietary behaviours in soap operas or movies but they indicated that the episodes probably reflected the dietary behaviours practiced in real life. Consumption of alcoholic beverages was most frequently mentioned as a beverage in soap operas or movies.

I'm concentrating on the storyline, not what food is being eaten. But the food eaten in the episodes are typical to what people have in their daily lives. (No. 21, mother)

(In the episodes) If they go to local, casual restaurants, ordering a pineapple bun with butter and a cup of milk tea is a must. (...) otherwise, going to a disco and consuming alcoholic beverages is inevitable. Eating hot-pot style foods with alcoholic beverages is very common recently. Does the dietary practices similar to the real life? I also eat hot-pot style foods very often, at least one or two times per month. (No.29, daughter)

Theme 2: Effects of food advertisements on the consumption of easily accessed, energy-dense snack foods and fast foods. Both mothers and daughters indicated that the food advertisements in the media (except the radio) were seen much more frequently than in the past and the variety was overwhelming. They also indicated that the advertisements were more visually attractive than previously. Most food advertisements recalled were the energy-dense snack foods such as potato chips, sugar-sweetened drinks, such as lemon tea and fruit-flavoured drinks, and fast food chain restaurants such as McDonald's, Pizza hut, and Café de Coral. Daughters were more likely to be influenced by the advertisements and to recall the slogan or the song associated with the food advertised.

> I used to like going to fast food restaurants for lunch. I really like to eat at Café de Coral. I can say I eat there almost 5 days a week. Its slogan says, "Lunch at Café de Coral, see you there!". I think it was a crazy thing to do. (No.34, daughter)

In most interviews, participants mentioned that the taste preference, food price, and proximity to the food, but not nutrition, were the primary considerations whether to try out the food that was advertised. Positive dietary modification was not considered by both mothers and daughters unless physical symptoms were apparent. Mother generation generally presented greater concerns on the nutritional value of their diet than the daughter generation because mothers had a higher prevalence of chronic health problems, such as hypertension or central obesity. Mother generation were also more aware of their age-related health risks with their dietary intake. On the other hand, daughters were generally not aware the importance of diet on their current or future health. The diet-related concerns mentioned by daughters, such as acne, dental caries,

bad breath, oedema, and weight gain, were related to appearance rather than the overall health. Furthermore, advertisements of easily accessed fast food or supermarket food promotions were more likely to stimulate actions to consume the food being advertised.

> I certainly read the supermarket advertisements for discounted goods by Wellcome and Park'nShop, and then I go there and grab a load of what I want to buy. (No. 8, mother)

> Advertisements for discounted items, supermarket advertisements. (...) when I find something I have never tried, I go there and get it, most of the time these things are snacks, such as potato chips or prawn crackers etc. (...) Also, cake shops like Maxim's or Saint Honore would send me email to do some questionnaires, they would then send me some promotion coupons to try out their new products for free. (No.25, daughter)

Theme 3: Effects of diet and health information in the media on dietary behaviours. Newspaper and TV were mentioned as the major source of health information. Information delivered by health professionals such as physicians or dieticians, by health authority, or based on research findings were perceived as trustful.

> When I was at my twenties, I like to eat more meat and eat very small amount of vegetables. But as I get older, and now there are more information in the media, and teach you many things, so you would concern more. Saying tofu and soymilk are good for you, and then I would consume them more. I didn't buy any of these foods in the past, but now I know more about it, so I changed my dietary habit gradually. (No.21, mother)

> I used to like to eat pineapple bun with butter very much. Just recently, I recognized from the news that it has a high level of Trans fat, and then I decided to eat less often, and the cocktail bun too. Since the newspaper reported the Trans fat content of various local bakery foods and discussed its issues, I'm more aware and remind myself to eat such food less often. (No.32, daughter)

However, the credibility of some media information may be questionable. Both mothers and daughters mentioned that media coverage as well as advertisements on weight loss were overwhelming nowadays and shape a thin ideal body stereotype, particularly for young women.

> Basically, I think that "weight loss" has been a hot topic for at least 10 years. The media in Hong Kong keeps talking to you about "thin and beauty, women must be thin" and there is an advertisement saying "Women have thousands of reasons to lose weight, but you better spend your money wise!", something like that. All these slogans urge you to recognize that I need to lose weight and I need to be thin to be a woman. (No.28, daughter)

> My daughter follows all the trend (of weight loss). If it said "consume more lean meat and you can lose weight", then she would eat a lot of meat. Her grandmother also follows what my daughter does! (No. 22, mother)

Nevertheless, most participants usually judged the trustworthiness of the health information in the media only by their personal experience or interpersonal comments.

> I learnt from the magazine and heard from my friends that the guava fruit are good at lowering blood glucose level. Now I eat guava every day. (No.11, mother)

> I think if the information makes sense to me, I would take its advice. However, some look weird or don't make any sense to me, I would not consider it. For example, there are some weight loss recipes. It recommends to take soup only for all meals, say to only have vegetable soup or eat grapefruits, and not eating other things else, like rice or others. I think such recipes are probably true. (No.35, daughter)

Participants also mentioned that there were more cooking demonstrations or recipes on healthy eating in the media. However, most mothers indicated that they seldom followed the recipes. Dishes were more likely to be tried out if the recipe included only a few ingredients and the ingredients were readily available. Also, the recipes must be perceived as exceptional from the dishes that are usually cooked and had to be easy to follow. Mothers indicated that dishes with many ingredients in small quantity were impractical and cumbersome because it was not possible to buy the ingredients in small amount from the food market and the extra amount of foods and condiments bought would usually be left unused and spoiled. Daughters indicated they were not aware of the cooking recipes because they neither cooked nor knew how to cook. However, daughters mentioned that they often looked up recipes and video cooking demonstrations on the internet for Western-style desserts such as cheese cakes, cookies, and pudding.

> They usually demonstrate dishes for healthy eating. They present many cooking styles, and usually not only just fish or meat only, but adding some other things else. I seldom follow the recipe because the recipe is too troublesome and has too many ingredients. You need to get a small amount of one thing and a small amount of another thing. It makes you too busy to follow it. (No.1, mother)

I would search recipes on the internet for desserts or go to "YouTube" watching the video on how to make desserts. (...) I have tried making a blue berry cheese cake. I found the recipe at the RTHK website. It not only provides you the recipes, but also video demonstration of all the steps for making the cheese cake. (No. 26, daughter)

4.5 Discussion

4.5.1 Limitations of the study and methodological considerations

The limitation of the study is that this study only used interviews, without observing the actual behaviours, to investigate factors that would affect individual's dietary behaviours. However, the study credibility was addressed by presenting the interview guide and by using a combination of small group interviews, mother-daughter pair interviews, and individual daughter interviews to identify common themes that were consistent across interview types. The validity was also enhanced by using respondent validation. The finding summary was presented to four mother and three daughter participants for their comments and they all agreed on the main findings. The sample was also purposively selected to represent mothers and daughters with different demographic backgrounds and levels of media exposure in order to enhance the transferability or the generalizability of the study findings. The findings were specifically useful to understand the contexts for Chinese families with adult children in urban China. Despite a small sample size, 18 interviews including 22 mothers and 13 daughters were conducted and offered a sound basis for thematic analysis in the qualitative study.

Another limitation of the study is related to the use of a single nutritionist as the only interviewer. Using a nutritionist as an interviewer may influence the way the respondents expressed their views. However, the respondents were informed the

importance of their free expression of views and there was no judgment for their views. All interviews were tape-recorded and were transcribed by clerical assistants who were blinded to the study objectives would help to minimize biases. To ensure a good dependability or reliability of the findings, themes were identified with the support of consistent quotations across interview groups. The analysis was conducted in Chinese before the themes and quotations were finalized. This would reduce the risk of losing data during the translation process.

4.5.2 Westernization of dietary practices in the two generations

4.5.2.1 Westernization of food environments

The study finding raises an important public health concern about the impacts of the Westernized food environments on the population health in Asia. Both mothers and daughters recognized the expansion of the chain supermarkets, convenience stores, and various types of fast food restaurants in their community and considered such changes in the food environments as a primary reason for the differences in dietary practices between mother and daughter generations. Recent studies have shown that the increased access to fast foods or pre-packed foods was associated with a higher frequency intake of energy-dense foods (316;317) and a higher risk of obesity in adults (316;318;319). Findings from a local study also supported the positive association between the neighbourhood food environment and the intake of high-fat foods in adolescents (320). The current study extends the evidence for the negative effects of local food environment on dietary intakes to the adult population in Hong Kong. The findings also support the causal link for the association of local food environment with the obesity epidemic in Asia.

4.5.2.2 Effects of the increased availability of supermarkets in Asia

The impacts of easily accessible supermarket chain stores on dietary behaviours and the risk of obesity remains undetermined. The availability of supermarkets in the neighbourhood was associated with a 9 – 24% lower prevalence of overweight, obesity, and hypertension in the North America (319;321;322). However, a survey of supermarket food choices indicated that the availability of energy-dense snack foods far outweighed the availability of fruits and vegetables (318). The impacts of supermarkets on the health-environment relationship likely depend on their roles as a neighbourhood supply for healthy or unhealthy foods. A neighbourhood analysis showed that the residents' BMI status was positively associated with the amount of shelf-space allocated to energy-dense snack foods but found no association with that for fruits and vegetables (318). A preliminary study in Thailand also suggested that the shift of food shopping from fresh markets to supermarkets may facilitate Western-style food preferences (323). The fresh markets traditionally are the main sources of fresh produces and unprocessed foods in Asian countries. More work is needed to evaluate the effects of neighbourhood supermarkets on the dietary intakes and the obesity risk in Asia.

4.5.2.3 Disproportion effects of the Westernized food environment on the dietary practices of two generations

The study observed that the Westernized food environments had a stronger negative influence on the dietary practices of the daughter generation than that of the mother generation. Consistent with previous studies (324), the participants in this study considered health as a determinant for their food choice only when chronic health conditions were apparent. However, mothers considered more dietary control because of

their perceived age-related health risks. Also, mother participants may have developed a regular meal pattern and a habit of restrained snacking since childhood. On the other hand, daughters developed an irregular meal schedule with frequent snacking given the greater availability of ready-to-serve food at home and outside home in their childhood. The perceived low importance of meal regularity in the daughter generation may also lower the frequency of family meals or other social eating which often associated with better dietary quality (260). Furthermore, several experimental studies indicated that the practice of irregular meal pattern may have detrimental effects on the physiological profiles in women. It includes elevated total and LDL cholesterol, lower fasting insulin sensitivity, greater insulin response after meals, and lower postprandial thermogenesis (325-327). On the other hand, the practice of eating three regular meals without meal skipping has been associated with better efficiency of fat oxidation and prolonged satiety feelings compared to two meals per day in young women (328). Promotions of regular meals and healthy eating among the younger generations are warranted.

4.5.3 Mother's roles for healthy eating in adult children

4.5.3.1 Parental modelling and direct communication

The study supports that the roles of parents remain significant on the dietary intakes of their adult children. Although studies on the roles of parents on adult children are limited, it is consistently recognized the parental dietary influences on adult children. Lau and colleagues (329) indicated that parents remained as a major influence on health beliefs and dietary behaviours of their college children through direct modelling. Baker and colleagues (70) supported the persistence of parental influences on adult children's eating attitudes and behaviours through perceived parental modelling and criticism, particularly for the mother-daughter effects. The findings from the quantitative study

(Chapter 3) also support mothers' influence on their daughter's DP. However, the current qualitative interviews indicated that mothers generally discounted their roles for dietary modelling in their adult children. Mothers generally did not recognize that their dietary practices were modelled in their adult daughters. Mothers in this study also expressed powerlessness in regulating their daughter's dietary misbehaviours because they believed that daughters were more financially independent to eat outside home. The findings suggest that there is a breakdown of intergenerational transmission of traditional dietary beliefs and behaviours. This finding may also be a family-level mechanism contributing to nutrition acculturation towards Westernized diet in the Asian populations.

4.5.3.2 Mothers' attitudes towards family meals

The study suggests that mother's attitudes and satisfaction on cooking for the family are crucial for the positive dietary effects on adult children. Previous studies have provided consistent evidence that family meals, especially family dinners, were associated with better diet quality (259;266) and weight status (256-258) in children and adolescents. The study echoes previous findings that family meals are partly a demonstration of love by mothers, but that as the family food planner, mothers also aim to serve foods that are acceptable to all family members, and to avoid complaints (261). The current study observed that mothers showed reduced interest and motivation to cook for the family as the children grew up. There is also some evidence that the work-family spillover making working mothers to express their family food roles as unwanted responsibilities. Previous studies suggested that mothers are satisfied with their household food roles if they were able to get help from older children or other family members for food tasks, have skills to reduce time and effort for food preparations (e.g.

skills to cook quick and healthy dishes, plan meals in advance), or have flexible work and family schedules (270;271). Conversely, dissatisfied mothers may often tradeoff nutrition for other household or work demands, increase frequency intake of take-out foods, decrease cooking enjoyment, or express frustrations on their family food roles (270;271). The role of foreign domestic helpers on the quality or frequency of family meal cannot be examined in this study because none reported any assistance from domestic helpers except one mother-daughter pair indicated the assistance received when the daughter was small. The study findings reveal potential factors associated with lowering the frequency and the quality of family meals that needed to be carefully addressed.

4.5.3.3 Awareness of dietary effects on long-term health

Another issue central to the roles of mother on adult children's diet is that neither mothers nor daughters perceived the dietary intake in young adulthood as important as in childhood or adolescence. Cumulated findings have suggested the association of dietary intake in early life with long-term health. It is suggested that dietary intakes during adolescence and young adulthood are associated with pre- and post-menopausal breast cancers (114;330-333), bone mineral density (334;335), and cardiovascular risk (52) in later life(336). However, the current study observed that both mothers and daughters were not aware the role of diet in young adulthood on their future health. Mothers in this study expressed reliefs and exercised less responsibility on their adult daughter's dietary intake as the children grew up. Daughters concerned the dietary effects on their appearance rather than the overall and long-term health. In addition, despite most daughters realized that meals-away-from-home were generally energy-dense and less healthy, they indicated low initiatives to practice healthy eating,

partly because they seldom or did not know how to cook. Empowering women on the importance of diet-disease relationship and skills for healthy eating is necessary.

4.5.4 Media influences on dietary behaviours in the two generations

4.5.4.1 Distraction effects of media exposure

Supported by previous studies in adult women (79;202), distraction from eating during dinner by media exposure is possible because most participants watched TV while having dinner. Consequences of distractions from eating while TV viewing include breaking down the cognitive restraint on dietary intake (206), directing attention away from the amount of food being consumed (203), lengthening the eating duration (202), increasing the eating pace (202), and impairing the memory of recent eating (80). This results in elevated calorie intake during (79;202) or after TV viewing (80;200). There are indications that the daughter generation is more affected by this distractibility, as evidenced by slogan recognition (205); daughters in this study presented better memories of food advertisements than mothers did.

Mood-induced eating due to the emotional distractions by the media may also be possible. It has been frequently reported in the local audience forums that audiences expressed negative mood arousal after watching evening TV episodes (337). Although the magnitude and direction of the effects on eating may vary by audience characteristics, several studies in women indicated that the induced negative mood condition distracted individual's dietary restriction and resulted in higher food consumption, particularly in restraint eaters or unsuccessful dieters (74;78;210;211). The current study also shows that the 24-hr media broadcasting and the availability of internet access at home promoted opportunities for late night snacking, which resulted in irregular meal patterns as shown in the daughter participants.

4.5.4.2 Media effects in the presence of Westernized food environment

4.5.4.2.1 Priming effects of food promotion

This study observes that the priming effects of food advertisements or promotions are likely stronger and more effective given the Westernization of the local food environment. Both mothers and daughters observed the increased intensity of food-related advertisement and promotion in the media over recent years. Advertised foods that were most frequently mentioned by the study participants were mainly low-cost items such as pre-packed snacks, sugar-sweetened drinks, or fast foods. Although most priming effects of the food promotions are short term, the effects are reinforced by frequent and repeated exposure. Furthermore, with the extensive expansion of fast food restaurants and chain supermarkets in the local community and the reduced family size, the physical and financial barriers to the consumption of advertised food are markedly reduced, as observed in the study participants. Younger generations are likely to be more strongly affected by the food advertisements because they are usually the major targets of food marketing (72). This study also found that financial incentives attached with the advertised foods were effective in promoting the associated consumption; however, most are related to fast foods or low nutrition foods. The application of promoting healthy food using financial incentives should be examined in future work.

4.5.4.2.2 Cultivation effects

This study provides some supports for the cultivation effects of media exposure. The pervasiveness of continuous exposure to weight-loss information and promotions in the media shaped women's attitudes about thin body and beauty and attempted unrealistic dieting. A survey of 617 local female nurses aged 26y indicated that 31% respondents had underweight and 33% reported ever having an eating disorder (338).

Another local study showed that adolescent girls perceived higher pressure from media than from peers or parents for thinness; and such media pressure was associated with body dissatisfaction and dieting behaviours (339). This qualitative study echoes the findings from the quantitative study (Chapter 3) that media exposure was positively associated with underweight status.

In addition, although the study participants indicated null or little attention to the food displays or eating behaviours presented in the soap operas or movies, they believed that the food-related scenes displayed in the media reflected how people behave in the real world. In addition, alcohol beverages were most frequently recalled from media scenes. These findings reveal two public health implications. First, the effect of displaying alcohol in the soap operas on women's consumption behaviours needs to be addressed. The health effects of alcohol in women are controversial yet alcohol consumption is consistently associated with increased cancer risk in women (340;341). The fact (342) that the local prevalence of female ever drinkers has increased 5-fold within the past two decades provides strong support for further investigations of media effects on the alcohol consumption pattern. Furthermore, the implementation of zero-tax policy for alcoholic beverages (except spirits) in early 2008 heightened the immediacy for evaluation of media effects on alcohol consumption in the local population (343). Policy evaluation consistently suggest that alcohol pricing and alcohol taxes are most effective in limiting alcohol consumption and reducing alcohol-related harm, compared to other public health strategies such as school-based or social marketing programmes, media advocacy, or health warnings (344;345). Although the current local code of practice on advertising standards on TV and radio restricts any liquor advertising or other forms of commercial promotion everyday between the hours of 4:00pm and

8:30pm, or the use of alcoholic beverages or products to portray as a desirable behaviour (346;347), there is no restriction on the volume of alcohol advertising beyond the specified time period. Evidences from a meta-analysis indicate that the higher the alcohol advertising expenditure, the greater alcohol consumption in the population (344). Currently, alcohol promotions can be widely distributed in newspaper, magazine, or on the internet. Legislations or public health ordinances regarding the promotion of alcoholic beverages in Hong Kong should be considered.

Second, the current findings suggest that using entertainment-education as a communication strategy for promoting healthy diet may be possible and relevant for the local population. Studies have revealed some positive impacts of entertainment-education on the dietary and health behaviours of women (348-350). Valente and colleagues (348) evaluated the impacts of "5 A Day" messages incorporated into the storyline of a primetime drama as a media promotion for fruit and vegetable consumption. The findings indicated a dose-response relationship whereby people who had higher exposure to the storyline reported more positive behavioural changes after viewing the storyline than those who were not exposed (348). However, the appropriateness of such application in local health promotion needs to be studied in greater detail.

4.5.4.3 Media effects of health and diet information on eating behaviours

Exposure to health and diet information in the media reflected both positive and negative impacts on dietary behaviours. The study participants illustrated that there is more diet and health information available in the media. Similar to the previous findings (301), the higher frequency of media coverage on health and diet issues were related to a greater attention and favourable behavioural changes towards positive health in the

study participants. However, the current study also reveals the low media literacy in the participants to assess the credibility of media information and found that most participants used only their personal experiences to judge the trustworthiness of the media information.

This study also provides the first qualitative evaluation of the use of cooking demonstrations or recipes in promoting healthy eating in the Chinese population. Despite more media attention being paid to healthy cooking demonstrations, most mother participants did not try out the dishes recommended because they found the recipes impractical for their culinary habits. Two possible negative consequences may be anticipated. First, the poorly designed recipes may induce misperceptions about healthy eating and introduce barriers towards dietary modifications. Previous studies showed that positive attitudes towards healthy eating (351) and perceived enjoyment for cooking (352) are salient for healthy dietary practices. Second, the negative perception about healthy cooking by the family food preparers would hamper the promotion of healthy eating in the family. As indicated in this study, most mothers prepared the family meals and indicated they seldom incorporated the recommended recipes into their cooking. Pilot-testing of recommended recipes and formative evaluation of recipe designs would help to improve the effectiveness of the related healthy promotion strategies.

4.6 Conclusions

This qualitative study provides further support for the thesis that the differences in the dietary practices between mother and daughter generations are true generational differences rather than a period effect. The differences in dietary practices between mothers and daughters may be due to the variations in dietary practices at different

stages of life. However, mother participants illustrated that their dietary practices were very different from their daughters when they were at the same age (period) as their daughters. Factors that contributed to the dietary transitions across generations perceived by the local population included increased accessibility and availability of foods at home and outside home, attitudinal changes towards family meals, irregular meal schedules, and the increased intensity of food advertisements and promotions in the media.

The study findings reveal that adult children are still dependent on their mothers for healthy eating. Ignorance of the diet-health association in young adulthood by both mothers and adult daughters presented in this study may partly explain the negative dietary behaviours in the younger generations and the fewer responsibilities taken by mothers for their adult children's diet. Dissatisfaction and low motivation to cook for the family encountered by mothers likely hamper the beneficial effects of family meals for both mothers and adult children. Empowering women on the importance of diet-disease relationships, skills for healthy cooking, coping strategies for work-family balance, and emphasizing the roles of parental modelling and family meals would help to address the issues.

The study findings confirmed that media have an effect on dietary behaviours. The media effects are likely enhanced in the presence of Westernized food environment as observed in this study. The mechanisms associated with media exposure may be related to distractions by media exposure during eating, priming effects of food advertisements, and cultivation effects of dietary norms. Evaluations of local healthy eating promotion in the media would help to advance the quality and the cost-effectiveness of future interventions.

Finally, the purposive nature of the sample, provision of the interview guide, and the engagement of participant validation ensure the robustness and the quality of the study. The study findings are likely generalizable to Chinese families with adult children.

4.7 Implications of the study

This qualitative study has several implications for future studies. First, this study suggests that further observational or qualitative studies are needed to understand the patterns of food shopping and the associated dietary quality in the local population in relation to the increase in the availability of supermarkets in the local environment, given that the food and its pricing offered by supermarkets (a major food source of pre-packed processed foods) may be quite different from that of the traditional fresh markets. Second, given the potential detrimental effects on the physiological profiles due to the practice of irregular meal pattern, larger-scale cross-sectional studies are suggested to test the hypothesis for the relationship of irregular meal pattern with weight control or the risk of obesity, and further longitudinal studies to examine the causal relationship if the meal pattern-obesity relationship holds. Third, longitudinal evaluations of the zero-tax alcohol policy should be implemented to monitor the changes in the population alcohol consumption pattern and the alcohol-related healthcare and social costs. Such studies would provide timely evidence for the policymakers to initiate whether revisions of the public health legislation are necessary.

Chapter 5

Summary and conclusion

This cross-sectional study used quantitative and qualitative approaches to examine the characteristics of Western DP practiced in two generations of HK Chinese women and its association with media exposure. The quantitative study used questionnaires to assess the dietary and media exposure. The Western DP was derived objectively using PCA method and a standardized score was used to assess the degree of practicing Western DP. The study findings support the hypothesis that the Western DP practiced in the HK Chinese women is similar to that identified in the Western population. The qualitative assessment further suggested that the globalization of food supply and marketing in the food environment and the reduced family size facilitated the nutrition transition towards Western DP.

The study findings are consistent with the hypothesis that the younger generation practice a more Westernized DP than the older generation. Daughter participants in this study had a higher Western DP score but a lower prudent score than their mother. The change of attitudes towards family meals and meal schedule in the younger generation offer an explanation for the generational differences in dietary behaviours. Furthermore, the multivariate analyses indicated a positive association in the Western DP scores between mothers and their daughters and suggested an existence of intergenerational transfer of Western DP in the Chinese population. However, most mother failed to recognized their dietary influences and modelling on their adult children.

This study identifies that the frequency of family meals is negatively associated with the practice of Western DP in mid-life and young adult Chinese women in HK.

The qualitative assessment in this study recognized that mothers remain playing a key role for healthy eating in their adult children. However, many mothers assumed less responsibility for the dietary intake of their adult children and presented lower motivation and satisfaction to cook for the family. Issues centred to the positive effects of family meals included attitudes towards family meals, perceived importance of regular meals, family structure, skills for cooking healthy and quick meals by the meal preparers, and dietary modelling and communication within the family. Empowering women on the importance of diet-disease relationships in young adulthood is also necessary.

This study provides support for the hypothesis that media exposure is associated with the practice of Western DP. The multivariate analyses indicated a positive dose-response relationship between media exposure and the Western DP score. A negative association between radio listening and Western DP is also likely but the effects may be limited to the mother generation only. The qualitative assessment supports that media may have effects on dietary behaviours through various mechanisms, including distractions during eating, priming effects on Westernized food intakes, and the cultivation effects of the thin ideal body stereotype and the dietary norms.

This study has several strengths. This thesis addresses the study objectives using both quantitative and qualitative approaches. Both studies presented consistent findings of a generational transition towards Western DP. In addition, the quantitative study identified a dose-response relationship between the practices of Western DP and the media exposure, and quantified the association of the DP practices between mothers and their daughters. Furthermore, the sample was drawn by random sampling from a community-based population. The study FFQ was based on a locally-relevant FFQ

currently used in epidemiological studies in Chinese women and developed from an exhaustive literature search to identify a list of food items contributing to the Western DP. Also, the study MDQ was developed based on an extensive literature search of relevant questions for exposure assessments of various media types. Both study instruments were pretested and evaluated to have acceptable validity. These instruments would enhance further studies of the diet and media effects on health for the Chinese population.

The major limitation in this study is the cross-sectional design. This precluded the assessment of temporal associations for the practice of Western DP between mothers and daughters. It also limited the ability to establish the cause-effect association between media exposure and dietary practices. The use of time spent on media as an assessment of media exposure may undermine the ability to assess the 'true' media effects on dietary behaviours. Other inherent problems are the limitation of the dietary instruments to assess the true dietary intake, the limitation of the food composition database to assess the nutrient intake, and the subjectivities in PCA procedures for the identification of DPs.

This study recommends that longitudinal studies on the effects of media exposure and the practice of Western DP on health outcomes are worth considering in future studies. In addition, qualitative research and experimental studies to identify specific media contents that are responsible for the dietary or health effects would strengthen the media-health relationship. This study also suggests that further observational studies are needed to explore the effects of regularity of meal pattern on dietary quality and health consequences in women. Besides, qualitative studies on the food choice coping strategies and food shopping patterns by family meal preparers and

other family members, particularly working mothers, would help to understand the work and family structures, family adaptive strategies, family food roles, or other influential factors that are conducive to or barriers for promoting family meals. Observational studies that include male family members may also necessary to assess whether the intergenerational associations of DP between male and female family members are similar to those demonstrated in the mother-daughter association in this study.

This study has several policy implications. First, the study supports that promotion of family meals and reduction of TV viewing should be considered as population-wide strategies for obesity prevention. Second, public or school-based health promotions should involve empowerment of women on the importance of diet-disease relationships and practical skills for healthy eating as long-term strategies for family health promotion. Third, tightening on the codes of practice for advertising standards for food and food-related products, particularly regarding weight loss programmes or products and alcoholic beverages, are necessary to ensure that public health are being protected. Finally, timely evaluation of the alcohol tax and pricing policy is urgently needed to cap the alcohol-related healthcare and social costs to a minimum.

Appendix A

Consent forms

Cross-sectional Study (Front Page)

FACUTLY OF MEDICINE
THE CHINESE UNIVERSITY OF HONG KONG

香港中文大學
醫學院

http://www.cuhk.edu.hk/med/cmd/ TEL (852) 2252 8750 電話 FAX (852) 2604 4360 圖文傳真

DEPARTMENT OF COMMUNITY AND FAMILY MEDICINE

社區及家庭醫學系

4/F School of Public Health
Prince of Wales Hospital
Shatin N.T. Hong Kong

香港新界沙田威爾斯親王醫院
公共衛生學院四樓

REFNO _____

香港家庭健康與飲食模式調查

同意書

目的及背景

隨著中西飲食文化交流及全球化的現象，女性及家庭的飲食模式亦隨時代有所轉變。研究指出飲食模式對婦女健康十分重要，但由於本地欠缺有關的資料，因此未能提出有效的香港女健康的飲食建議。有見及此，香港中文大學社區及家庭醫學系現進行一項關於家庭健康與飲食模式調查，目的旨在了解年輕女性的飲食模式與家庭飲食模式的關係，從而制定改善健康飲食推廣的方案。

研究流程

假如本人符合參加條件，所以被邀請參與此項研究，為是次參與研究的 300 名參加者其中的一位。若本人參與此項研究，本人會被安排到 [illegible] 了關於健康、日常活動及膳食之問卷訪問，整個程序約需 1 小時至 1 小時十五分。為加深了解受加者的飲食及生活模式，本人可能被隨機抽選進行數次飲食記錄表或時間活動記錄表。

問卷訪問及記錄表目的旨在瞭解本人的飲食及生活模式，提供之資料也僅作研究用途。本健康調查已得人學研究倫理委員會批准。

私隱及保密

所有關於本人或在研究期間提供的資料，是絕對保密的。本人的身份會作匿名處理，而且所搜集的資料會被存放在上鎖的抽屜裡，保持機密。研究資料只有與此項研究有關的研究人員才能翻閱。

報酬及費用

本人在此項研究中，不需為研究付上任何費用。在完成研究後，為答謝本人對此研究的支持，行政參加者可以免費獲得身體質量指數(BMI)及脂肪percentage評估，及以下的禮品 *或* 現金禮券：

☐ (1)免費 血全像 或 血脂 檢查 (需抽血約 6 毫升)，並會給予有關檢查結果的報告 *或*

☐ (2)港幣 50 元「無印良品」*或* 「百佳超級市場」現金禮券乙張。

若本人的血液檢查結果異常，本人將收到醫生轉介信作進一步的查詢。

" Serving the community through quality education caring practice and advancement of health sciences

REFNO:

利益

此項研究所得到的資料除有助香港計劃健康飲食推廣的工作外，並沒有任何可見於本人的直接利益。

風險

本人亦明白如要抽取血液約 6 毫升作檢驗，其可能對身體造成微小損傷、皮下向瘀及輕微出血。

疑問

本人亦可以就此研究提出疑問，可致電 2252 8750 與李小姐查詢。假如本人因某些原因而需要聯絡此研究的統籌何陳雪鸚教授，本人可致電 2252 8780。

退出權

參與是項研究是完全自願的，無論是拒絕參加，或是中途退出，是不需面對任何形式的損失。本人保留無條件隨時退出研究之權利。

自願同意書

本人 (中文姓名)_____ 願意參加由中文大學 公共衛生學院 社區及家庭醫學系舉辦之「香港家庭健康與飲食模式調查」。

本人經 _____ 詳細解釋，並明白以上有關此項研究的資料，本人以下的簽署表示本人完全同意參與此研究。

_____	_____	_____
參加者簽署	見證人簽署	日期
姓名(　　)	姓名(　　)	

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Qualitative Study (Front Page)

FACUTLY OF MEDICINE
THE CHINESE UNIVERSITY OF HONG KONG

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DEPARTMENT OF COMMUNITY AND FAMILY MEDICINE

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Shatin N.T. Hong Kong

香港新界沙田威爾斯親王醫院
公共衛生學院四字樓

REFNO _____

香港家庭健康與飲食模式調查：
「飲食模式與媒體資訊之關係」研究

同意書

目的及背景

中西文化交流及全球化其中一個誘因，便是媒體資訊的發展。當方的研究指出媒體使用可能對飲食或生活模式存在正面或負面的影響。爲進一步了解媒體資訊與飲食模式之關係，香港中文大學社區及家庭醫學系將進行有關之訪問。訪問目的旨在了解不同傳媒對飲食模式的影響及兩代飲食模式的差異。

研究流程

因爲本人符合參加條件，所以被邀請參與此項研究。若本人參與此項研究，本人會被邀請到沙田威爾斯親王醫院進行有關「飲食模式與媒體資訊關係」之訪問。內容主要希望了解本人對傳媒所提供的飲食資訊的意見及兩代飲食模式的差異。爲增加訪問的互動性，訪問內容會以錄音方式記錄。訪問時間約需1小時左右。

訪問期間所提供之資料純作研究用途。本研究已經大學研究倫理委員會批准。

私隱及保密

所有關於本人或在研究期間提供的資料，是絕對保密的。本人的身份會作匿名處理，而且所搜集的資料會被存放在上鎖的櫃裡，保持機密。研究資料只有與此項研究有關的研究人員才能翻閱。

報酬及費用

本人在此項研究中，不需爲研究付上任何費用。在完成訪問後，爲答謝本人對本研究的支持，每位參加者可以免費獲得以下其中一項現金禮券。

☐ (1) 港幣100元 超級市場現金禮券乙張 或

☐ (2) 港幣100元「無印良品」現金禮券乙張

"Serving the community through quality education, caring practice, and advancement of health sciences"

REFNO: _____

利益
此項研究所得到的資料除有助香港計劃健康飲食推廣的工作外，並沒有任何可見於本人的直接利益。

風險
本研究以訪問形式進行，訪問內容為非敏感性話題，不會對受訪者造成壓力。本人有權在訪問期間拒絕回答任何問題。

疑問
本人可向研究提出疑問，可致電 2252 8750 與李小姐查詢。假如本人因某些原因而需要聯絡此研究的統籌何陳雪鸚教授，本人可致電 2252 8780。

退出權
參與是項研究是完全自願的，無論是拒絕參加，或是中途退出，是不需面對任何形式的損失。本人保留無條件隨時退出研究之權利。

自願同意書

本人 (中文姓名)_____ 願意參加由中文大學 公共衛生學院 社區及家庭醫學系舉辦之「香港家庭健康與飲食模式調查：飲食模式與媒體資訊之關係」研究。

本人經 _____ 詳細解釋，並明白以上有關此項研究的資料。本人以下的簽署表示本人完全同意參與此研究。

_____	_____	_____
參加者簽署	見證人簽署	日期
姓名(　　)	姓名(　　)	

" Serving the community through quality education, caring practice, and advancement of health sciences. "

Appendix B

Food Frequency Questionnaire (FFQ)

Food Frequency Questionnaire

Introduction：
If food intake is less than 12 times/year (average less than once/per month) then the food is not counted. If consumption portion is less than half of the smallest portion to be coded, the food item will not be counted.

If food items taken are seasonal, e.g. durian, 1 time/week for 2 months, total 8 times/year still less than 12 times per year and should not be included. If 3 times/week for 2 months, total 24 times/year (> 12 times/year) the frequency should be average out into intake during the year. One should code 2 times/month.

When fitting food into household portion size e.g. small bowl (SB), the interviewer should remind subjects that they should envision the edible portion only e.g. chicken leg without bone and fit edible portion into small bowl (SB).

For coding of food frequency one should round off to 0.5/whole unit.

For easy calculation:
1 year = 336 days
1 year = 12 months
1 month = 28 days

LB=large bowl; SB=small bowl; TBSP=tablespoon; TSP: Teaspoon
1LB=200g; 1SB=100g; 1LB= 1.2MB= 2SB；1TBSP=10g；1TBSP=2TSP; 1cup=200ml

Did you have any substantial change in your dietary intake in the past 12 months?	☐ 1 = No, about the same ☐ 2 = Yes _____ ☐ 3 = Don't know	PHF
1.【Rice】（1LB）	__.__ times ☐ 1 = day ☐ 2 = week ☐ 3 = month __.__ ☐ 1=¼ LB ☐ 2=½ LB ☐ 3=1 LB ☐ 4=2 LB ☐ _____LB	P1AF P1BF P1CF P1DF P1EF
2.【Congee】（1LB）	__.__ times ☐ 1 = day ☐ 2 = week ☐ 3 = month __.__ ☐ 1=¼ LB ☐ 2=½ LB ☐ 3=1 LB ☐ 4=2 LB ☐ _____LB	P2AF P2BF P2CF P2DF P2EF
3.【Noodle (Chinese style)】（1LB） Wheat noodle, flat noodle, wudon, Wonton noodle, shanghai-style noodle, fried noodles, instant noodle	__.__ times ☐ 1 = day ☐ 2 = week ☐ 3 = month __.__ ☐ 1=¼ LB ☐ 2=½ LB ☐ 3=1 LB ☐ 4=2 LB ☐ _____LB	P3AF P3BF P3CF P3DF P3EF
*4.【Pasta】(1LB) Angel hair, spaghetti, macaroni	__.__ times ☐ 1 = day ☐ 2 = week ☐ 3 = month __.__ ☐ 1=¼ LB ☐ 2=½ LB ☐ 3=1 LB ☐ 4=2 LB ☐ _____LB	P3aAF P3aBF P3aCF P3aDF P3aEF

5.【Plain roll】（Piece [pc]） Raisin bun, roll, white bread, toast, mantau, (1pc of white bread = 0.5pc plain roll)	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1=½ pc ☐ 2=1 pc ☐ 3=2 pcs ☐ 4=4 pcs ☐ _____pcs	P4aAF P4aBF P4aCF P4aDF P4aEF
6.【Roll with filling】（pc） Cocktail bun, pineapple bun, custard bun, doughnut, chocolate bun	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1=½ pc ☐ 2=1 pc ☐ 3=2 pcs ☐ 4=4 pcs ☐ _____pcs	P4bAF P4bBF P4bCF P4bDF P4bEF
*7.【Pancake】（pc） Waffles, biscuits, scone (e.g. KFC breakfast) Scone (0.5pc)= waffle(0.5pc) = pancake (1pc)	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1=½ pc ☐ 2=1 pc ☐ 3=2 pcs ☐ 4=4 pcs ☐ _____pcs	P4dAF P4dBF P4dCF P4dDF P4dEF
*8.【Whole wheat bread】（pc） Multigrain, wholegrain	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1=½ pc ☐ 2=1 pc ☐ 3=2 pcs ☐ 4=4 pcs ☐ _____pcs	P5AF P5BF P5CF P5DF P5EF
*9.【Oatmeal】（SB）	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1=¼ SB ☐ 2=½ SB ☐ 3=1 SB ☐ 4=2 SB ☐ _____SB	P210AF P210BF P210CF P210DF P210EF
10.【Cookies】（pcs） Cheese cracker, sandwich, OREO, wafer, Maria, Malt cracker	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1=½ pc ☐ 2=1 pc ☐ 3=2 pcs ☐ 4=4pcs ☐ _____pcs	P6aAF P6aBF P6aCF P6aDF P6aEF
11.【Cake】（pc） Pastry, egg tart, muffin, croissant, pie, spongy cake, cream puff	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1=¼ pc ☐ 2=½ pc ☐ 3=1 pc ☐ 4=2 pcs ☐ _____pcs	P7AF P7BF P7CF P7DF P7EF
12.【Wheat gluten】（SB）	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1=¼ SB ☐ 2=½ SB ☐ 3=1 SB ☐ 4=2 SB ☐ _____SB	P77AF P77BF P77CF P77DF P77EF

13.【Rice roll】（pc）

__.__times
☐ 1 = day
__.__ ☐ 2 = week
☐ 3 = month

☐ 1＝½ pc
☐ 2＝1 pc
☐ 3＝2 pcs
☐ 4＝4 pcs
☐ _____pcs

P209AF
P209BF
P209CF
P209DF
P209EF

Meat:

14.【Chicken with skin】（SB）

__.__times
☐ 1 = day
__.__ ☐ 2 = week
☐ 3 = month

☐ 1＝¼ SB
☐ 2＝½ SB
☐ 3＝1 SB
☐ 4＝2 SB
☐ _____SB

P32AAF
P32ABF
P32ACF
P32ADF
P32AEF

15.【Chicken without skin】（SB）

__.__times
☐ 1 = day
__.__ ☐ 2 = week
☐ 3 = month

☐ 1＝¼ SB
☐ 2＝½ SB
☐ 3＝1 SB
☐ 4＝2 SB
☐ _____SB

P32BAF
P32BBF
P32BCF
P32BDF
P32BEF

16.【Chicken feet】（pc）

__.__times
☐ 1 = day
__.__ ☐ 2 = week
☐ 3 = month

☐ 1＝½ pc
☐ 2＝1 pc
☐ 3＝2 pcs
☐ 4＝4 pcs
☐ _____pcs

P81AF
P81BF
P81CF
P81DF
P81EF

17.【Other poultry】（1SB）
Goose, quail, pigeon

__.__times
☐ 1 = day
__.__ ☐ 2 = week
☐ 3 = month

☐ 1＝¼ SB
☐ 2＝½ SB
☐ 3＝1 SB
☐ 4＝2 SB
☐ _____SB

P33AF
P33BF
P33CF
P33DF
P33EF

18.【Pork】（1SB）
Sparerib, barbecued, ground, roasted,
siu mai (Chinese dim sum), etc,

__.__times
☐ 1 = day
__.__ ☐ 2 = week
☐ 3 = month

☐ 1＝¼ SB
☐ 2＝½ SB
☐ 3＝1 SB
☐ 4＝2 SB
☐ _____SB

P34AF
P34BF
P34CF
P34DF
P34EF

*19.【Liver】（1SB）

__.__times
☐ 1 = day
__.__ ☐ 2 = week
☐ 3 = month

☐ 1＝¼ SB
☐ 2＝½ SB
☐ 3＝1 SB
☐ 4＝2 SB
☐ _____SB

P207AF
P207BF
P207CF
P207DF
P207EF

20.【Processed meat】（slice）
Sausage, luncheon meat, bacon, frankfurter etc
Ham (1pc) = Sausage(1 small pc)= luncheon (1pc) = bacon(1.5pcs)

__.__times
☐ 1 = day
__.__ ☐ 2 = week
☐ 3 = month

☐ 1＝¼ slice
☐ 2＝½ slice
☐ 3＝1 slice
☐ 4＝2 slices
☐ _____slice

P35AF
P35BF
P35CF
P35DF
P35EF

21.【Chinese sausage】 (pc)

___.___times
___.___
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1＝¼ pc
☐ 2＝½ pc
☐ 3＝1 pc
☐ 4＝2 pcs
☐ _____pcs

P208AF
P208BF
P208CF
P208DF
P208EF

22.【Beef】 (SB)
Ground, hamburger, sirloin, t-bone, rib eye, San-jok steamed beef (Chinese dim sum) , etc

___.___times
___.___
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1＝¼ SB
☐ 2＝½ SB
☐ 3＝1 SB
☐ 4＝2 SB
☐ _____SB

P37AF
P37BF
P37CF
P37DF
P37EF

23.【Lamb/ mutton】 (SB)

___.___times
___.___
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1＝¼ SB
☐ 2＝½ SB
☐ 3＝1 SB
☐ 4＝2 SB
☐ _____SB

P37aAF
P37aBF
P37aCF
P37aDF
P37aEF

24.【Seafood ball】 (pc)

___.___times
___.___
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1＝1pc
☐ 2＝2pcs
☐ 3＝4pcs
☐ 4＝8pcs
☐ _____pcs

P38AAF
P38ABF
P38ACF
P38ADF
P38AEF

25.【Meatball】 (pc)

___.___times
___.___
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1＝1pc
☐ 2＝2pcs
☐ 3＝4pcs
☐ 4＝8pcs
☐ _____pcs

P38BAF
P38BBF
P38BCF
P38BDF
P38BEF

26.【Fish ball】 (pc)

___.___times
___.___
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1＝1pc
☐ 2＝2pcs
☐ 3＝4pcs
☐ 4＝8pcs
☐ _____pcs

P38CAF
P38CBF
P38CCF
P38CDF
P38CEF

27.【Small fish with edible bone】 (SB)
Phoenix anchovy, sardine etc

___.___times
___.___
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1＝¼ SB
☐ 2＝½ SB
☐ 3＝1 SB
☐ 4＝2 SB
☐ _____SB

P78AF
P78BF
P78CF
P78DF
P78EF

28.【Seawater fish】 (SB)

___.___times
___.___
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1＝¼ SB
☐ 2＝½ SB
☐ 3＝1 SB
☐ 4＝2 SB
☐ _____SB

P79AF
P79BF
P79CF
P79DF
P79EF

29.【Freshwater fish】 (SB)

__.__times
__.__
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1=¼ SB
☐ 2=½ SB
☐ 3=1 SB
☐ 4=2 SB
☐ _____SB

P80AF
P80BF
P80CF
P80DF
P80EF

30.【Shrimp/prawn】 (SB)
Lobster, freshwater, marine

__.__times
__.__
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1=¼ SB
☐ 2=½ SB
☐ 3=1 SB
☐ 4=2 SB
☐ _____SB

P42AF
P42BF
P42CF
P42DF
P42EF

31.【Egg】 (pc)
Alkalized, salted, quail egg etc (egg white = 0.5pc)

__.__times
__.__
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1=¼ pc
☐ 2=½ pc
☐ 3=1 pc
☐ 4=2 pcs
☐ _____pcs

P44AF
P44BF
P44CF
P44DF
P44EF

Dairy :

32.【Whole milk】 (cup)
>3%fat milk, chocolate milk, whole milk powder (2.5TBSP=250ml)

__.__times
__.__
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1=¼ cup
☐ 2=½ cup
☐ 3=1 cup
☐ 4=2 cups
☐ _____cups

P45AF
P45BF
P45CF
P45DF
P45EF

33.【Low-fat milk】 (cup)
< 2%fat, Hi-Ca, skim milk, skim milk powder (2.5TBSP = 250ml)

__.__times
__.__
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1=½ TBSP
☐ 2=1 TBSP
☐ 3=2 TBSP
☐ 4= 4 TBSP
☐ _____TBSP

P82AF
P82BF
P82CF
P82DF
P82EF

34.【Condensed/evaporated milk】 (TBL)

__.__times
__.__
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1=½ TBSP
☐ 2=1 TBSP
☐ 3=2 TBSP
☐ 4= 4 TBSP
☐ _____TBSP

P48AF
P48BF
P48CF
P48DF
P48EF

35.【Cheese】 (slice) (except pizza)
In sandwiches, pasta, bread etc

__.__times
__.__
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1=¼ slice
☐ 2=½ slice
☐ 3=1 slice
☐ 4=2 slices
☐ _____slices

P49AF
P49BF
P49CF
P49DF
P48EF

*36.【Pizza】 (pc)

__.__times
__.__
☐ 1 = day
☐ 2 = week
☐ 3 = month

☐ 1=½ pc
☐ 2=1 pc
☐ 3=2 pcs
☐ 4=4 pcs
☐ _____pcs

P49aAF
P49aBF
P49aCF
P49ADF
P49AEF

37.【Ice-cream】（SB）	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝2 SB ☐ _____SB	P83AF P83BF P83CF P83DF P83EF
*38.【Milkshake】（cup）	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1＝¼ cup ☐ 2＝½ cup ☐ 3＝1 cup ☐ 4＝2 cup ☐ _____cups	P83Aaf P83aBF P83aCF P83aDF P83aEF
*39.【Yogurt】（cup, 150ml）	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1＝½ cup ☐ 2＝1 cup ☐ 3＝1.5 cups ☐ 4＝2 cups ☐ _____cups	P83Baf P83bBF P83bCF P83bDF P83bEF
*40.【Cream/sour cream】（TBL） cream in coffee, desserts etc	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1＝½ TBSP ☐ 2＝1 TBSP ☐ 3＝2 TBSP ☐ 4＝4 TBSP ☐ _____TBSP	P83cAF P83cBF P83cCF P83cDF P83cEF
Vegetables：			
41.【Dark green leafy vegetables】（SB） Flowering cabbage, mustard green, broccoli, spinach, kale	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝2 SB ☐ _____SB	P21AF P21BF P21CF P21DF P21EF
42.【Light green leafy vegetables】（SB） Cauliflower, celery, mung bean sprout, bamboo shoot, lettuce, Napa cabbage	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝2 SB ☐ _____SB	P22AF P22BF P22CF P22DF P22EF
43.【Fresh peas】（SB） String bean, snap bean, peas, yard long bean etc	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝2 SB ☐ _____SB	P20AF P20BF P20CF P20DF P20EF
44.【Corn /potato】（SB） Corn (whole kernel/ cone), Yam, sweet potato, water chestnut, taro, lotus root	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝2 SB ☐ _____SB	P23aAF P23aBF P23aCF P23aDF P23aEF

45.【Other non-leafy vegetables】（SB） Bitter melon, tomato, carrot, turnip green, radish, cucumber, pumpkin, wax gourd etc	__.__times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1=¼ SB ☐ 2=½ SB ☐ 3=1 SB ☐ 4=2 SB ☐ _____SB	P24AF P24BF P24CF P24DF P24EF
46.【Mushroom】（SB） Mushroom, seaweed, Jew's ear	__.__times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1=¼ SB ☐ 2=½ SB ☐ 3=1 SB ☐ 4=2 SB ☐ _____SB	P25AF P25BF P25CF P25DF P25EF
Fruits：			
47.【Citrus fruits】（pc） Orange, tangerine, grapefruit, pamelo, kiwi Kiwi (2pcs) = orange (1pc)	__.__times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1=¼ pc ☐ 2=½ pc ☐ 3=1 pc ☐ 4=2 pcs ☐ _____pcs	P26AF P26BF P26CF P26DF P26EF
48.【Non-citrus fruits】（pc） Including Apple, pear, pineapple, mango and peaches	__.__times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1=¼ pc ☐ 2=½ pc ☐ 3=1 pc ☐ 4=2 pcs ☐ _____pcs	P27AF P27BF P27CF P27DF P27EF
49.【Melon】（LB）(>6 times/yr) Watermelon, honeydew, papaya	__.__times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1=¼ LB ☐ 2=½ LB ☐ 3=1 LB ☐ 4=2 LB ☐ _____LB	P28AF P28BF P28CF P28DF P28EF
50.【Banana】（pc）	__.__times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1=¼ pc ☐ 2=½ pc ☐ 3=1 pc ☐ 4=2 pcs ☐ _____pcs	P29AF P29BF P29CF P29DF P29EF
51.【Grapes】（LB）	__.__times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	☐ 1=¼ LB ☐ 2=½ LB ☐ 3=1 LB ☐ 4=2 LB ☐ _____LB	P211AF P211BF P211CF P211DF P211EF

Soy products：

52.【Tofu, firm】（1/2 cube）

___.___times
- ☐ 1 = day
- ☐ 2 = week
- ☐ 3 = month

- ☐ 1＝¼ cube
- ☐ 2＝½ cube
- ☐ 3＝3/4 cube
- ☐ 4＝1 cube
- ☐ _____cube

P9AF P9BF P9CF P9DF P9EF

53.【Tofu, soft】（1/2 cube）

___.___times
- ☐ 1 = day
- ☐ 2 = week
- ☐ 3 = month

- ☐ 1＝¼ cube
- ☐ 2＝½ cube
- ☐ 3＝3/4 cube
- ☐ 4＝1 cube
- ☐ _____cube

P8AF P8BF P8CF P8DF P8EF

54.【Tofu, pre-packed】(1/2 cube)

___.___times
- ☐ 1 = day
- ☐ 2 = week
- ☐ 3 = month

- ☐ 1＝¼ cube
- ☐ 2＝½ cube
- ☐ 3＝3/4 cube
- ☐ 4＝1 cube
- ☐ _____cube

P39AF P39BF P39CF P39DF P39EF

55.【Tofu, silky】（1/2 cube）

___.___times
- ☐ 1 = day
- ☐ 2 = week
- ☐ 3 = month

- ☐ 1＝¼ cube
- ☐ 2＝½ cube
- ☐ 3＝3/4 cube
- ☐ 4＝1 cube
- ☐ _____cube

P40AF P40BF P40CF P40DF P40EF

56.【Tofu, with egg】（SB）

___.___times
- ☐ 1 = day
- ☐ 2 = week
- ☐ 3 = month

- ☐ 1＝¼ SB
- ☐ 2＝½ SB
- ☐ 3＝1 SB
- ☐ 4＝2 SB
- ☐ _____SB

P41AF P41BF P41CF P41DF P41EF

57.【Spongy Tofu】（pc）

___.___times
- ☐ 1 = day
- ☐ 2 = week
- ☐ 3 = month

- ☐ 1＝1pc
- ☐ 2＝2pcs
- ☐ 3＝4pcs
- ☐ 4＝8pcs
- ☐ _____pcs

P11AF P11BF P11CF P11DF P11EF

58.【Tofu, deep-fried】（pc）

___.___times
- ☐ 1 = day
- ☐ 2 = week
- ☐ 3 = month

- ☐ 1＝¼ pc
- ☐ 2＝½ pc
- ☐ 3＝1 pc
- ☐ 4＝2 pcs
- ☐ _____pcs

P58AF P58BF P58CF P58DF P58EF

59.【Tofu (Fuyu), fermented & spicy】（pc）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1=½ cube ☐ 2=1 cube ☐ 3=2 cube ☐ 4=4 cube ☐ _____cube	P18AAF P18ABF P18ACF P18ADF P18AEF
60.【Tofu (Fuyu), fermented & plain】（pc）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1=½ cube ☐ 2=1 cube ☐ 3=2 cube ☐ 4=4 cube ☐ _____cube	P18BAF P18BBF P18BCF P18BDF P18BEF
61.【Tofu, fermented & deep-fried】（pc）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1=¼ pc ☐ 2=½ pc ☐ 3=1 pc ☐ 4=2 pcs ☐ _____pcs	P47AF P47BF P47CF P47DF P47EF
62.【Tofu, dried】（pc）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1=¼ pc ☐ 2=½ pc ☐ 3=1 pc ☐ 4=2 pcs ☐ _____ pcs	P12CAF P12CBF P12CCF P12CDF P12CEF
63.【Tofu, Chiu-Chow style】（pc）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1=¼ pc ☐ 2=½ pc ☐ 3=1 pc ☐ 4=2 pcs ☐ _____pc	P50AF P50BF P50CF P50DF P50EF
64.【Soybean, roasted & salted】（pc）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1=¼ SB ☐ 2=½ SB ☐ 3=3/4 SB ☐ 4=1 SB ☐ _____SB	P51AF P51BF P51CF P51DF P51EF
65.【Soybean, raw】（SB）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1=¼ SB ☐ 2=½ SB ☐ 3=1 SB ☐ 4=2 SB ☐ _____SB	P15AF P15BF P15CF P15DF P15EF
66.【Soy paste】（TBL） Soybean paste, broad bean paste (Fermented), black soybean (fermented)	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1=¼ TBSP ☐ 2=½ TBSP ☐ 3=1 TBSP ☐ 4=2 TBSP ☐ _____TBSP	P18CAF P18CBF P18CCF P18CDF P18CEF

67. 【Fresh soybean】（SB）	＿＿.＿＿times ＿＿.＿＿ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝2 SB ☐ ＿＿＿＿＿SB	P53AF P53BF P53CF P53DF P53EF
68. 【Soybean sprout】（SB）	＿＿.＿＿times ＿＿.＿＿ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝2 SB ☐ ＿＿＿＿＿SB	P14AF P14BF P14CF P14DF P14EF
69. 【Vermicelli, soybean-made】（SB）	＿＿.＿＿times ＿＿.＿＿ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝2 SB ☐ ＿＿＿＿＿SB	P55AF P55BF P55CF P55DF P55EF
70. 【Thousand sheets, soybean-made】(SB)	＿＿.＿＿times ＿＿.＿＿ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝2 SB ☐ ＿＿＿＿＿SB	P56AF P56BF P56CF P56DF P56EF
71. 【Miso soup】（LB）	＿＿.＿＿times ＿＿.＿＿ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1＝¼ LB ☐ 2＝½ LB ☐ 3＝1 LB ☐ 4＝2 LB ☐ ＿＿＿＿＿LB	P57AF P57BF P57CF P57DF P57EF
72. 【Soybean film (Fujok)】（SB）	＿＿.＿＿times ＿＿.＿＿ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝1 ½ SB ☐ ＿＿＿＿＿SB	P13AAF P13ABF P13ACF P13ADF P13AEF
73. 【Soybean stick, deep-fried】（SB）	＿＿.＿＿times ＿＿.＿＿ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝1 ½ SB ☐ ＿＿＿＿＿SB	P13BAF P13BBF P13BCF P13BDF P13BEF
74. 【Soybean stick, plain】（SB）	＿＿.＿＿times ＿＿.＿＿ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝1 ½ SB ☐ ＿＿＿＿＿SB	P13CAF P13CBF P13CCF P13CDF P13CEF

75. 【Soybean sheet】（SB）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝1 ½ SB ☐ _____SB	P13DAF P13DBF P13DCF P13DDF P13DEF
76. 【Soybean film, sweetened】（SB）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝1 ½ SB ☐ _____SB	P13EAF P13EBF P13ECF P13EDF P13EEF
77. 【Vegetarian chicken/pork】（SB） Soybean-made	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝2 SB ☐ _____SB	P12AAF P12ABF P12ACF P12ADF P12AEF
78.【Vegetarian duck】（SB） Soybean-made	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1＝¼ SB ☐ 2＝½ SB ☐ 3＝1 SB ☐ 4＝2 SB ☐ _____SB	P12BAF P12BBF P12BCF P12BDF P12BEF
79.【Tofu dessert】（LB）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1＝¼ LB ☐ 2＝½ LB ☐ 3＝1 LB ☐ 4＝2 LB ☐ _____LB	P10AF P10BF P10CF P10DF P10EF
80. 【Soymilk, home-made】（cup）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1＝ ¼ cup ☐ 2＝ ½ cup ☐ 3＝ 1 cup ☐ 4＝ 2 cups ☐ _____cups	P16BAF P16BBF P16BCF P16BDF P16BEF
81.【Soymilk, pre-packed】（cup）	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1＝ ¼ cup ☐ 2＝ ½ cup ☐ 3＝ 1 cup ☐ 4＝ 2 cups ☐ _____cups	P16CAF P16CBF P16CCF P16CDF P16CEF
82.【Low-fat soymilk, pre-packed】（cup） Skimmed, low-sugar	___.___times ☐ 1 = day ___.___ ☐ 2 = week ☐ 3 = month	☐ 1＝ ¼ cup ☐ 2＝ ½ cup ☐ 3＝ 1 cup ☐ 4＝ 2 cups ☐ _____cups	P16DAF P16DBF P16DCF P16DDF P16DEF

83.【Soymilk powder】（sachet）
1 pack = 20g

__ __.__ __times
__ __.__
☐ 1 = day
☐ 2 = week
☐ 3 = month
☐ 1＝¼ sachet
☐ 2＝½ sachet
☐ 3＝1 sachet
☐ 4＝2 sachets
☐ _____sachets

P59AF
P59BF
P59CF
P59DF
P59EF

84.【Other dried bean】（SB）
Red bean, mung bean, broad bean, fava bean, kidney bean, cowpeas

__ __.__ __times
__ __.__
☐ 1 = day
☐ 2 = week
☐ 3 = month
☐ 1＝1/8 SB
☐ 2＝¼ SB
☐ 3＝½ SB
☐ 4＝1 SB
☐ _____SB

P19AF
P19BF
P19CF
P19DF
P19EF

85.【Peanuts】（SB）

__ __.__ __times
__ __.__
☐ 1 = day
☐ 2 = week
☐ 3 = month
☐ 1＝1/8 SB
☐ 2＝¼ SB
☐ 3＝½ SB
☐ 4＝1 SB
☐ _____SB

P60AF
P60BF
P60CF
P60DF
P60EF

*86.【Peanut butter】（TBSP）

__ __.__ __times
__ __.__
☐ 1 = day
☐ 2 = week
☐ 3 = month
☐ 1＝¼ TBSP
☐ 2＝½ TBSP
☐ 3＝1 TBSP
☐ 4＝2 TBSP
☐ _____TBSP

P60aAF
P60aBF
P60aCF
P60aDF
P60aEF

*87.【Other nuts】（SB）
Almond, walnut, hazelnut, pistachio

__ __.__ __times
__ __.__
☐ 1 = day
☐ 2 = week
☐ 3 = month
☐ 1＝1/8 SB
☐ 2＝¼ SB
☐ 3＝½ SB
☐ 4＝1 SB
☐ _____SB

P60bAF
P60bBF
P60bCF
P60bDF
P60bEF

88.【Cooking vegetable oil】（TBSP）
Corn oil, olive oil, peanut oil, safflower oil etc

__ __.__ __times
__ __.__
☐ 1 = day
☐ 2 = week
☐ 3 = month
☐ 1＝¼ TBSP
☐ 2＝½ TBSP
☐ 3＝1 TBSP
☐ 4＝2 TBSP
☐ _____TBSP

P61AF
P61BF
P61CF
P61DF
P61EF

89.【Margarine】（TSP）

__ __.__ __times
__ __.__
☐ 1 = day
☐ 2 = week
☐ 3 = month
☐ 1＝¼ TSP
☐ 2＝½ TSP
☐ 3＝1 TSP
☐ 4＝2 TSP
☐ _____TSP

P61aAF
P61aBF
P61aCF
P61aDF
P61aEF

90.【Butter】（TSP）

__ __.__ __times
__ __.__
☐ 1 = day
☐ 2 = week
☐ 3 = month
☐ 1＝¼ TSP
☐ 2＝½ TSP
☐ 3＝1 TSP
☐ 4＝2 TSP
☐ _____TSP

P62AF
P62BF
P62CF
P62DF
P62EF

*91.【Mayonnaise】（TBSP）
In sandwich, sushi, salad, thousand island, ranch etc

___.___times
___.___ ☐ 1 = day ☐ 2 = week ☐ 3 = month
☐ 1=½ TBSP ☐ 2= 1 TBSP ☐ 3= 2 TBSP ☐ 4= 4 TBSP ☐ _____TBSP

P62aAF P62aBF P62aCF P62aDF P62aEF

*92.【Cream soup】(LB)
Cream chowder, cream of chicken etc

___.___times
___.___ ☐ 1 = day ☐ 2 = week ☐ 3 = month
☐ 1=½ LB ☐ 2=1 LB ☐ 3=1½ LB ☐ 4=2 LB ☐ _____LB

P301AF P301BF P301CF P301DF P301EF

93.【Tea】（cup）
Chinese tea, western tea, lemon tea

___.___times
___.___ ☐ 1 = day ☐ 2 = week ☐ 3 = month
☐ 1= ¼ cup ☐ 2= ½ cup ☐ 3= 1 cup ☐ 4= 2 cups ☐ _____cups

P63AF P63BF P63CF P63DF P63EF

94.【Coffee】（cup）

___.___times
___.___ ☐ 1 = day ☐ 2 = week ☐ 3 = month
☐ 1= ¼ cup ☐ 2= ½ cup ☐ 3= 1 cup ☐ 4= 2 cups ☐ _____cups

P201AF P201BF P201CF P201DF P201EF

*95.【Carbonated drink】（cup）
Non-diet

___.___times
___.___ ☐ 1 = day ☐ 2 = week ☐ 3 = month
☐ 1=½ cup ☐ 2=1 cup ☐ 3=2 cups ☐ 4=4 cups ☐ _____cups

P202AF P202BF P202CF P202DF P202EF

*96.【Fruit-flavoured drink】（cup）

___.___times
___.___ ☐ 1 = day ☐ 2 = week ☐ 3 = month
☐ 1=½ cup ☐ 2=1 cup ☐ 3=2 cups ☐ 4=4 cups ☐ _____cups

P202aAF P202aBF P202aCF P202aDF P202aEF

*97.【French fries】(1SB)
Potato wedges, hash brown

___.___times
___.___ ☐ 1 = day ☐ 2 = week ☐ 3 = month
☐ 1=½ SB ☐ 2=1 SB ☐ 3=2 SB ☐ 4=4 SB ☐ _____SB

P203AF P203BF P203CF P203DF P203EF

*98.【Chocolate】（pc）

___.___times
___.___ ☐ 1 = day ☐ 2 = week ☐ 3 = month
☐ 1= 2 pcs ☐ 2= 4 pcs ☐ 3= 6 pcs ☐ 4= 8 pcs ☐ _____pcs

P204AF P204BF P204CF P204DF P204EF

*99.【Potato chips】(pack) 1 pack = 30g	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1 = ½ pack ☐ 2 = 1 pack ☐ 3 = 1½ pack ☐ 4 = 2 packs ☐ _____packs	P300aAF P300aBF P300aCF P300aDF P300aEF
*100.【Other chips/crisps】(pack) 1 pack = 30g	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1 = ½ pack ☐ 2 = 1 pack ☐ 3 = 1½ pack ☐ 4 = 2 packs ☐ _____packs	P300bAF P300bBF P300bCF P300bDF P300bEF
101.【Salted fish】(TBSP)	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1 = ½ TBSP ☐ 2 = 1 TBSP ☐ 3 = 2 TBSP ☐ 4 = 4 TBSP ☐ _____TBSP	P205AF P205BF P205CF P205DF P205EF
102.【Pickles】(TBSP)	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	☐ 1 = ½ TBSP ☐ 2 = 1 TBSP ☐ 3 = 2 TBSP ☐ 4 = 4 TBSP ☐ _____TBSP	P206AF P206BF P206CF P206DF P206EF

Other than the food mentioned above, what other foods that you consume frequently (at least 12times/yr) has not been mentioned?

☐ 0 = No other food FQF
☐ 1 = Yes

1. Food 1 _____ (check its food code before data entry)	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	_____
2. Food 2 _____(check its food code before data entry)	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	_____
3. Food 3 _____(check its food code before data entry)	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	_____
4. Food 4 _____(check its food code before data entry)	__.__ __times __.__ ☐ 1 = day ☐ 2 = week ☐ 3 = month	_____

5. Food 5 _____(check its food code before data entry)	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	_____
6. Food 6 _____(check its food code before data entry)	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	_____
7. Food 7 _____(check its food code before data entry)	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	_____
8. Food 8 _____(check its food code before data entry)	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	_____
9. Food 9 _____(check its food code before data entry)	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	_____
10. Food 10 _____(check its food code before data entry)	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	_____
11. Food 11 _____(check its food code before data entry)	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	_____
12. Food 12 _____(check its food code before data entry)	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	_____
13. Food 13 _____(check its food code before data entry)	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	_____
14. Food 14 _____(check its food code before data entry)	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	_____
15. Food 15 _____(check its food code before data entry)	__.__ __times ☐ 1 = day __.__ ☐ 2 = week ☐ 3 = month	_____

Appendix C

Media exposure questionnaire (MDQ)

Media Exposure Questionnaire (MDQ)

To: _____ (**Ref no.** ____ ____ ____ ____)

We would like to understand your media exposure in the past 12 months (from_____ to _____), including **newspaper reading, magazine reading, TV viewing, radio listening, and leisure-time internet use**. Please answer the following questions. The questionnaire may take about 10-15mins.

If you have any questions, please inform our research staff.

Please check "✓" the appropriate box if necessary (☐) .

1. In the past 12 months, on average, how many day(s) in a week did you read newspapers (EXCEPT online newspapers)?	0☐ Do not read newspapers->**Go to Q.3** 1☐ 1 day 2☐ 2 days 3☐ 3 days 4☐ 4 days 5☐ 5 days 6☐ 6 days 7☐ 7 days	New1
2. Following on from the previous question, how many hour(s) or minute(s) did you spend per day on average on newspaper reading?	____ ____ Hr ____ ____ min	New2, New3
3. In the past 12 months, on average, how many day(s) in a month did you read magazines (EXCEPT online magazines)?	1☐ Do not read magazines->**Go to Q.6** 2☐ less than 1 per month->**Go to Q.6** 3☐ 1-3 times per month 4☐ 1 time per week or more	Mag1
4. Which magazine topic(s) is/ are your favourite? **(Please check no more than 2 boxes)**	1☐ Women/fashion 2☐ Food/Dining 3☐ Health 4☐ Celebrities 5☐ Travel 6☐ Sport 7☐ News 8☐ Others, please specify:_____	Mag2, Mag3
5. In the past 12 months, how many hour(s) or minute(s) did you spend per week on average on magazine reading ?	____ ____ Hr ____ ____ Min	Mag4, Mag5

6. In the past 12 months, how many time(s) did you go to the cinema?	1☐ Did not go to the cinema 2☐ 3 per year or less 3☐ 4 – 6 per year 4☐ 7 – 9 per year 5☐ 10 -12 per year 6☐ 1 per month or more	Movie1
Questions 7 to 10 aim to inquire about your time spent on <u>TV viewing</u> (including DVD/VCDs) in the past 12 months.		
7. [In the past 12 months] During the weekdays (Monday to Friday), on average, how many day(s) did you watch TV or DVD/VCDs ?	0☐ Did not watch TV ->**Go to Q.9** 1☐ 1 day 2☐ 2 days 3☐ 3 days 4☐ 4 days 5☐ 5 days	TV1
8. Following on from the previous question, how many hour(s) or minute(s) did you spend <u>per day</u> on average on TV watching?	____ ____ Hr ____ ____ min	TV2,TV3
9. [In the past 12 months] During the weekend (Saturday and Sunday), on average, how many hour(s) or minute(s) <u>in total</u> did you spend on TV watching?	____ ____ Hr____ ____ min 0☐ Did not watch TV	TV4,TV5
10. [In the past 12 months] Did you have a television set in your bedroom ?	1☐ No 2☐ Yes 3☐ No bedroom	TV6

Questions 11 and 12 aim to inquire about your time spent on <u>radio listening</u> in the past 12 months.		
11. In the past 12 months, on average, how many day(s) <u>per week</u> did you listen to the radio (EXCEPT online radio listening)?	0☐ No radio listening->**Go to Q.13** 1☐ 1 day 2☐ 2 days 3☐ 3 days 4☐ 4 days 5☐ 5 days 6☐ 6 days 7☐ 7 days	Radio1
12. Following on from the previous question, how many hour(s) or minute(s) did you spend <u>per day</u> on average on radio listening (EXCEPT online radio listening)?	_____ _____ Hr ____ ____ min	Radio2, radio3
Questions 13 to 18 aim to inquire about your time spent on <u>leisure-time internet use</u> in the past 12 months. **(Includes internet service via <u>mobile or non-mobile</u> web device)**		
13. In the past 12 months, how often did you use internet service?	1☐ Did not use internet -> **Go to Q.18** 2☐ less than once a month-> **Go to Q.18** 3☐ 1–3 times per month-> **Go to Q.18** 4☐ 1–3 times per week 5☐ 4–6 times per week 6☐ 1 per day or more	Net1
14. [In the past 12 months] During the weekdays (from Monday to Friday), on average, how many day(s) did you use internet service for leisure, or non-job or study-related purposes? (e.g. online newspaper, online magazine, email/MSN、online radio etc)	0☐ Did not use internet ->**Go to Q.16** 1☐ 1 day 2☐ 2 days 3☐ 3 days 4☐ 4 days 5☐ 5 days	Net2

15. Following on from the previous question, how many hour(s) or minute(s) did you spend per day on average on leisure-time internet use?	____ ____ Hr ____ ____ Min	Net3, Net4
16. During the weekend (Saturday and Sunday), how many hour(s) or minute(s) <u>in total</u> did you spend on leisure-time internet use?	____ ____ Hr ____ ____ Min 0☐ Did not use internet	Net5, Net6
17. Based on the frequency of using internet service at least once a week, how many year(s) or month(s) of experience do you have in using internet service?	_____ years (or _____ months)	Net7
18. In the past 12 months, did you have internet access at home?	1☐ Did not have computer 2☐ Computer has no web device 3☐ Yes 4☐ Don't know	Net8

Thank you very much for your time!
Please return your questionnaire to our research staff.

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