

ABSTRACT

Title of Document: FROM CHINA TO THE US: NUTRITION,
DIET AND ACCULTURATION OF CHINESE
EMPLOYED IN HIGH-TECH INDUSTRIES –
RESULTS FROM A WEB-BASED SURVEY.

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Background: Due to the fast development of economies in China and the great needs of professionals in the US, the population of highly educated young Chinese professionals working in high-tech industries has grown very fast in both countries. This population was suggested to have risk of consuming high energy and fat diet in both countries.

Objectives: This study aimed to investigate the associations of dietary intake with nutrition knowledge, attitude, dietary self-efficacy and acculturation among Chinese working in high-tech industries in China and in the US.

Methods: This study was a cross-sectional self-administered online survey. We studied 925 Chinese aged 20-45 years, who worked in high-tech industries and had at least a bachelor degree in four sub-groups: employees of Chinese companies in China; employees of American companies in China; Chinese-born immigrant in the US; and American-born Chinese in the US. A web-based questionnaire including a

food frequency questionnaire (FFQ) was developed to assess total energy and fat intakes, nutrition knowledge, attitudes, dietary self-efficacy. Four domains of acculturation were assessed among Chinese in the US. Using these data, we compared the four sub-groups and tested the prediction model of dietary intake and BMI.

Results: Our results showed that American-born Chinese participants consumed significantly higher energy and fat than the other three groups. Participants in the US had higher nutrition knowledge, attitude and self- efficacy than participants in China. Chinese-born immigrant men in the US had the highest nutrition knowledge and attitude and the lowest prevalence of overweight among the four study groups of men. The study results suggested that preferring Chinese food and Chinese leisure activity are predictors of lower energy and fat intake in Chinese-born immigrants.

Conclusions: The Chinese-born immigrants showed significant advantages in nutrition knowledge, attitude, and dietary self-efficacy and had the lowest prevalence of overweight in men. American-born Chinese consumed the highest energy and fat among the four study groups even though their nutrition knowledge, attitude and self-efficacy were high. Future nutrition promotion programs should make use of these cultural and environmental differences when designing these programs. The web-based survey method can be utilized in future nutrition research.

FROM CHINA TO THE US:
NUTRITION, DIET AND ACCULTURATION OF CHINESE EMPLOYED IN
HIGH-TECH INDUSTRIES – RESULTS FROM A WEB-BASED SURVEY

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This dissertation is dedicated to young professionals in all fields who are working hard and contributing their intelligence to our society everyday.

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Chapter 1: Introduction

Introduction

Diet-related chronic diseases have become preventable causes of death worldwide (1). Since the 1950s the link between diet and chronic diseases such as obesity, type II diabetes, cardiovascular disease and cancer had been increasingly well recognized world-wide (2). Of the many dietary factors that have been suggested to cause obesity and chronic disease, total energy intake and fat intake have received particular attention (3-7). To improve long term health and prevent chronic diseases, it is essential to acquire a better understanding of dietary intakes and the relationship between dietary intakes and factors of affecting dietary intakes.

Study population

With the fast economic growth of China over the past decades, under-nutrition is no longer the biggest problem, instead, over-nutrition and diet related chronic diseases, such as chronic heart disease (CHD), obesity and diabetes, have become major problems (8). A longitudinal study on nutrition and chronic diseases in China showed that rapid shifts are occurring towards an unhealthy lifestyle featuring sedentariness and energy-dense diets.(9, 10) The study results showed that over a third of all Chinese adults and 60% of those in urban areas consumed over 30% of their energy from fat in 1997. According to this longitudinal study and the 2002 China national and health survey, urban young Chinese who have higher incomes are

at higher risk of consuming an unhealthy diet, which is related to the development of chronic diseases (1, 9-13) .

The United States is a country of immigrants. Immigrants adopt American culture and change their behaviors towards those practiced within the American society; that process involves changing dietary behavior as well as social ones. Previous studies showed that acculturation for Chinese immigrants induce an increase in consumption of western foods such as hamburgers, other meats, and French fries (14-17). Some studies also reported that an adoption of a western eating pattern involves decreased consumption of vegetable, grains and soybean product (14, 16, 17). As a result, acculturation has been linked to coronary heart disease (CHD), obesity and diabetes(18, 19).

Very few studies examined energy intake and fat intake of Chinese immigrants in the US. The available cross-cultured research studies have focused on food selections and dietary behaviors, instead of nutrient intakes. Lv and Cason found that, in Chinese immigrants, higher educational attainment and higher income levels were associated with a large increase in the frequency of consumption of grains, vegetables, and fruits, while persons who resided in the US for a longer period of time and with better English proficiency had a greater increase in their consumption frequency of meat, fat and sweets (20). Satia *et al.* reported that Chinese American women who were younger, had higher educational attainment, and employed outside the home were more acculturated to the American culture; and high acculturation was associated with higher fat consumption and daily fruit/vegetable servings (21-23). Therefore, according to the previous studies, younger ages, higher educational

attainment, employment outside the home and residence in the US for an extended period of time are associated with higher acculturation; and higher acculturation to the American culture is associated with increased consumption of fat, meat, and sweets, which are energy-dense foods. On the other hand, higher income level and higher educational attainment was associated with a larger increase in consumption frequency of grains, vegetables, and fruits, which are less energy-dense foods. How acculturation is associated with changes in dietary intakes within highly educated young Chinese Americans population remains unclear.

Most of the earlier cross-cultural research has focused on lower social economic status (SES) immigrants with lower literacy or on college students of Chinese immigrants in the US (20). However, educational attainment and the SES of the Chinese American population have not only been heterogeneous but also have been changing with time. Since the 1980s, the demographic characteristics of Chinese-Americans have been changing rapidly with the arrival of numerous Chinese scholars, students, and professional employees. According to a report of the U.S Immigration and Naturalization Service (INS), in 2006, Chinese were the largest groups applying for professional working visa (H1-B) petition, followed by Indian, Filipinos, and Vietnamese. Among the new working visa petitions, over 70% (H1-B) petitions approved by the U.S. government are in high-tech industries including electrical/electronics, computers and information technology (24). The INS report also mentioned that 96.5% of the H1-B holders are in the age range of 20 to 45 years. These statistics show a fast growing Chinese immigrant population consisting of young and highly educated people working in high-tech industries. However, no

studies to date have reported the status of knowledge, attitude, and dietary behavior within this fast growing immigrant group. It remains unknown whether retention of Chinese culture or the adoption of American culture influences the dietary intakes of Chinese in the US.

Taken together, with the fast economic development of China and the great needs of technological professionals in the US, the population of urban young Chinese working in high-tech industries has been growing very fast in both countries. However, dietary intake and its related factors remained un-studied among this population. But the known facts are that urban young Chinese who have higher incomes are at higher risk of consuming an unhealthy diet in China and well educated young Chinese immigrants are more acculturated to American culture. High acculturation has been associated with an increase in consumption of high energy dense foods (22, 25, 26).

The current research examined and compared nutrition knowledge, attitude and self-efficacy and their association with total energy and fat intake of highly educated urban Chinese aged 20-45 in both China and the US.

Nutritional knowledge, nutritional attitudes, and dietary self-efficacy

Among the numerous factors affecting dietary choices, nutritional knowledge and attitudes about foods and health - or “diet-health information” in short - is the most amenable to change. (27) Theoretically, awareness of diet-health relationships, favorable attitudes about healthy eating, and better knowledge of the nutrient content of foods lead to healthier food choices. Very few studies have been done among either Chinese or Chinese Americans about the relationship between nutrition

knowledge, attitude and dietary behavior. A cross-sectional survey about nutritional knowledge, attitudes, and dietary practices in Beijing, Shanghai, and Guangzhou China showed that the level of general nutritional knowledge of Chinese urban citizens was low (28). Educational level and age were significantly and positively correlated with the knowledge score. However, the relationship between nutrition knowledge and dietary behavior was not reported. Very few studies investigated the relationship between nutritional knowledge, nutritional attitude and dietary behavior among Chinese or Chinese Americans.

Self-efficacy refers to the conviction that one can successfully execute the behavior required to produce a desirable outcome.(29) Efficacy evaluations appear to be useful predictors of health behavior. Results of previous studies showed that substantial saturated fat reductions can be obtained by intervention programs developed to increase dietary self-efficacy (30). A study on the differences of dietary self-efficacy and behavior among US-born, foreign-born Chinese-American, and native Chinese students found that native Chinese students had the lowest scores in total fat, saturated fat, and cholesterol intake followed by foreign-born and US-born Chinese-American students in that order (31). Very few studies on dietary self-efficacy are available among Chinese either in China or in the US. A better understanding of the relationship between dietary intake and self-efficacy, nutrition knowledge and attitudes are required to provide effective health promotion program.

Objectives and research questions

Objectives

The primary goal of the current study was to examine acculturation, dietary self-efficacy, nutritional knowledge and attitude and its impact on dietary intake focusing on total energy and fat intakes of highly educated urban young Chinese who work in high-tech industries in China and in the US. The nutritional knowledge questionnaire emphasized the fat content of foods and the relationship between diet and chronic disease; and the nutritional attitude and its association with one's potential to influence dietary behavior. The level of dietary self-efficacy in this study focused on avoidance of consumption of high energy dense and high fat foods. Acculturation level was only measured across Chinese participants in the US.

In order to address the influence of the current globalization and acculturation of Chinese population, this research studied four groups of Chinese in China and in the US, which included individuals who least identified with the American culture to those who most identified with the American culture:

Ch-1: Individuals working for Chinese companies in China

Ch-2: Individuals working for American companies in China

Am-1: Chinese-born immigrants working in the US

Am-2: American-born Chinese working in the US

The long term goal of the current study aimed to understand the interactions between dietary intakes and cultural and nutrition factors. The research findings

should be incorporated into the design and implementation of cultural appropriate health promotion programs for Chinese in China and in the US.

Research questions

1. Is there a significant difference among the four study groups?
 - 1) Is there a significant difference in dietary intakes among the four study groups?
 - 2) Is there a significant difference in nutritional knowledge among the four study groups?
 - 3) Is there a significant difference in nutritional attitude among the four study groups?
 - 4) Is there a significant difference in dietary self-efficacy among the four study groups?
2. Which variables are associated with BMI and energy and fat intakes? What is the prediction model describe this relationship?

Candidate variables are age, gender, education, marital status, children, family type, nutritional knowledge, and nutritional attitude.
3. Is acculturation status of Chinese in the US heterogeneous or homogeneous?

Acculturation status includes four domains: food choices, language usage, social activity, and leisure time activity. Acculturation status only applies to the two groups of Chinese in the US.
4. Is level of acculturation associated with BMI and energy and fat per kg body weight? Which domain of acculturation interacts with BMI and Energy/ kg body weight?

5. Can Chinese immigrants in the US born Chinese be re-grouped using different acculturation level based on bi-dimensional multi-domain acculturation model?
6. If we can find different acculturation groups, are there significant differences among acculturation groups in:
 - 1) BMI
 - 2) Energy intake/ kg body weight
 - 3) Fat intake/kg
 - 4) Knowledge
 - 5) Attitude
 - 6) Self-efficacy

Chapter 2: Literature Review

Acculturation

Immigration to a new country is usually accompanied by environmental and lifestyle changes. According to Graves psychological model, acculturation refers to changes in an individual who is a participant in a culture-contact situation – a person who is being influenced directly by the external culture and by the changing culture of which the individual is a member (32). In other words, acculturation is the process whereby immigrants change their behavior and attitudes toward those of the host society. Acculturation had been recognized as being related to general well-being of immigrants.

John Berry (2002) indicated that not every individual enters into, participates in, or changes in the same way; vast individual differences exist in psychological acculturation, even among individuals who live in the same acculturative arena. (33)

There are three major models in the studies of acculturation, uni-dimensional model, bi-dimensional model, and multi-dimensional model. A uni-dimensional model assumes immigrants eventually accept all aspects of a new society as they lose aspects of their old society. Immigrants may be located anywhere along a continuum from un-accultured to acculturated, and full acculturation is not inevitable. Bicultural individuals give up some of their original characteristics to obtain counterparts from a new culture in a zero-sum trade-off. The weakness of the

unidimensional model is that it cannot separate bicultural individuals having high familiarity with both societies from those having low familiarity with both societies.(34, 35)

Berry's bi-dimensional model incorporated the concept of pluralism that immigrants accept new culture from the dominant society but also retain some of their own ethnic culture as well.(33, 36, 37) In other words, each culture is conceived of as a single continuum, and individuals may vary in their acceptance and adherence to both their original and new culture. Taking on a new culture does not necessarily lead to a relinquishing of their ethnic culture. According to their acceptance and adherence, four types of acculturation can occur: integration, assimilation, segregation, and marginalization. Integration occurs when immigrants have a positive relationship to the host society as well as to their own ethnic society. Assimilation explains the process of relinquishing ethnic identity and moving into the dominant society. Segregation happens if immigrants cling to their ethnic culture without a relationship with the dominant society. Marginalization is the result of having no relationships with either the ethnic or the dominant society. (34) Based on this theory, an immigrant can be highly acculturated to a new culture while maintaining identity and comfort with his or her culture of origin.

Recent studies suggested that an immigrant can be highly acculturated in one domain of life (e.g. language use) but not acculturated in other domains (e.g. food preference). This is referred to a multi-domain model. Bi-dimensional multi-domain model scaling has been widely recognized as valid and can explain acculturation patterns (34). The current study applied the bi-dimensional multi-domain model and

assessed four domains (language preference, food choices, leisure time activity, and social affiliation) of behaviors to analyze the acculturation status of Chinese immigrants in the US.

Dietary Self-efficacy

Self-efficacy

Self-efficacy refers to the conviction that one can successfully execute the behavior required to produce a desirable outcome. In 1986, Bandura defined self-efficacy as the belief in one's capabilities to organize and execute the actions required to manage prospective situations (29).

Self-efficacy beliefs provide the foundation for human motivation, well-being, and personal accomplishment. Self-efficacy makes a difference in how people feel, think, and act. In terms of feeling, a low sense of self-efficacy for a particular situation is positively related to depression and anxiety. High self-efficacy for a specific situation allows one to deal better with uncertainty, distress, and conflict. Self-efficacy levels can enhance or impede motivation. People with high self-efficacy in a particular domain of human functioning choose to perform more challenging tasks. They set higher goals and stick to them. Actions are pre-shaped in thought, and people anticipate either optimistic or pessimistic expected outcomes of a specific task in line with their level of self-efficacy. Once an action has been taken, high self-efficacious persons invest more effort and persist longer than those low in self-efficacy to accomplish a specific task. When setbacks occur, those with high self-efficacy recover more quickly and maintain commitment to their goals.(38) Much

empirical evidence now supports Bandura's contention that self-efficacy beliefs touch virtually every aspect of people's lives whether they think productively, self-debilitatingly, pessimistically or optimistically; how well they motivate themselves and persevere in the face of adversities; their vulnerability to stress and depression, and the life choices they make. Efficacy evaluations appear to be useful and unique predictors of health behavior.

Self-efficacy, unlike dimensions of personality, must be considered in terms of a specific situation (39). Therefore, different measures are used to assess self-efficacy for each particular behavior studied. The current study focused on self-efficacy on diet.

Dietary Self-efficacy

Dietary self-efficacy in this study was defined as the confidence in one's ability to perform risk reducing dietary behavior in specific situations. The current study assessed dietary self-efficacy on avoidance of a high-fat and high energy density diet.

One study by Plotnikoff and Higginbotham found significant positive association between self-efficacy for following a low-fat diet (dietary self-efficacy) and outcome measures related to a low-fat diet (30). Results of these studies showed us that substantial saturated fat reductions can be obtained by treatment programs developed to increase dietary self-efficacy.

A study on the differences of dietary self-efficacy and behavior among US-born, foreign-born Chinese-American, and native Chinese students found that native

Chinese students had the lowest scores in total fat, saturated fat, and cholesterol intake followed by foreign-born and US-born Chinese-American students in that order(31). Native Chinese students also had the highest scores in complex carbohydrate and fiber intake as well as dietary self-efficacy followed by foreign-born and US-born Chinese-American students. Self-efficacy was positively correlated with dietary behavior, and the age of immigration of foreign-born Chinese-American students was positively correlated with the scores of dietary behavior and self-efficacy of dietary behavior. The results indicated that environmental and cultural influences are important factors affecting dietary behavior and self-efficacy of dietary behavior among these students. Another study about the usefulness of psychosocial theory variables in explaining fat-related dietary behavior in Chinese American in New York City found that attitude, overall health concern, and self-efficacy accounted for 58% of the variance in behavioral intention for the entire sample. Attitude, perceived barriers, and self-efficacy accounted for 19% of the variance in the prediction of dietary fat reduction behavior. There were limited data reported about dietary self-efficacy of Chinese in China.

Research on dietary self-efficacy provides practical guidance toward healthy dietary behavior change. The current study examined the level of dietary self-efficacy on avoidance of a high-fat diet among young Chinese working in high-tech industries in China and in the US.

There is no standard measurement for self-efficacy. Self-efficacy, unlike dimensions of personality, must be considered in terms of a specific situation (39).

Therefore, different measures are used to assess self-efficacy for each particular health-related behavior studied.

Nutrition Knowledge and Attitude

While the role of diet-health information in promoting dietary improvements is clear in theory, little is known about the consumer's practical use of the information. Does nutrition information translate into better diets? For the case of dietary fats, the answer is controversial. (40)

In many studies, the correlation between nutritional knowledge and dietary behavior have failed to reach statistical significance, leading researchers to question the relevance of nutritional knowledge to food choice and the strategy of nutrition education campaigns. Some researchers have pronounced that knowledge about diet and health is of little relevance to food choices; therefore simply changing knowledge is unlikely to have desired effects on dietary behaviors. (41-44)

On the other hand, some researchers supported the concept of a significant relationship between nutrition knowledge and dietary practice. Variyam et al investigated the relationship between dietary fat intake and nutritional knowledge and attitude by analyzing the USDA's 1989-91 Continuing Survey of Food Intakes by Individuals (CSFII) and its associated Diet and Health Knowledge Survey (DHKS).(45) The study used the 1989-91 CSFII-DHKS data and focuses on three dietary components: fat, saturated fat, and cholesterol. The report found that people with more healthful diets generally have a greater store of nutrition information and are more aware of the links between poor diet and certain diseases.

Kristal et al investigated nutritional knowledge, attitudes about diet and perceived norms associated with selecting low-fat diets.(46) The research studied 97 women, aged 45–59, with a broad range of dietary fat intakes. Results suggested that factors most strongly associated with low-fat diets were related to perceived norms and knowledge about fat in foods. In multiple regression models, norms and knowledge contributed significantly and independently to both measures of diet behavior, but the variance explained by attitudes was small. Wardle *et al* (47) believes that the significance of knowledge as one of the determinants of food choices may have been under-estimated due to unreliable instruments which were used to assess nutrition knowledge. Parmenter and Wardle (1999, 2000) investigated the relationship between nutrition knowledge and intake of fat, fruit and vegetables using a well-validated measure of nutrition knowledge with a random sample in England. They found that nutrition knowledge was a partial mediator of the socio-demographic variation in intake, especially for fruit and vegetables.

A cross-sectional survey about nutrition knowledge, attitude and dietary practice in Beijing, Shanghai, and Guangzhou China showed that the level of general nutritional knowledge of Chinese urban citizens was low (28). Educational level and age were significantly and positively correlated with the knowledge score. However, the relationship between nutrition knowledge and dietary behavior was not reported. Very few studies have been done among either Chinese or Chinese Americans about the relationship between nutrition knowledge, attitude and dietary behavior.

A persistent positive correlation between education and health suggests that a person with more education is better able to maintain his or her own health than a

person with less education. (48) Education may create a better awareness of the costs and benefits of various health habits may increase an individual's ability to obtain health information, and may better enable a person to process or act upon that information. However, the recent epidemiological studies suggest that Chinese young people, who have high educational attainment, have higher risk of consuming high fat diet in China. Currently there are no studies examining the association between nutrition knowledge and attitude of this population.

The current study investigated nutritional knowledge on different fat contents of foods and the relationship between diet and diet-related chronic diseases, such as obesity, type II diabetes and cardiovascular diseases. Meanwhile, this study examined the nutritional attitude and beliefs of individuals and their associations with dietary behavior. Dietary fat was used as an indicator of nutritional knowledge and nutritional attitude in this study, because dietary fat has received widespread publicity for 3 decades for its adverse health impact.

Methods of Dietary Intake Assessment

A special dietary intake assessment tool was needed for the present study because the study samples were recruited from two different countries. The study population included Chinese living in China, Chinese-born immigrants living in the US, and American-born Chinese in the US. Individuals are presumed to consume traditional Chinese foods, western foods, and mixed style foods. Traditional Chinese diet is characterized by a notable flexibility, adaptability and variety. Chinese usually eat mixed dishes and share food. Chinese people do not have standard food measurement such as measuring cups. Therefore Chinese people may have difficulty

estimating serving sizes (49). The current study needed a method that could appropriately assess energy and fat intakes of this cross cultural population.

Currently, there are three major methods in dietary intake assessment, the weighed method, 24-hour dietary recalls, and food frequency questionnaire (FFQ). No single method is perfect. The selection of the dietary intake measure is dependent on the research questions and aim of the study (50).

In the weighed record technique, the subject is taught to weigh and record the food and its weight immediately before eating and to weigh any leftovers. The strengths of this method include that the time period is defined, portions are to be measured or weighed to increase accuracy, and respondents do not have to rely on memory (51). But, the weaknesses of dietary record or weighed method include: food consumed away from home may be reported less accurately; the usual eating pattern may be influenced or changed by the recording process; record keeping increases respondent burden, which may adversely affect response rates; moderate underreporting often occurs and substantial underreporting may occur in segments groups of the population (e.g. obese persons) (51, 52). Also, this method is very costly compared to other methods. This method may not be the most appropriate one for Chinese people who tend to frequently eat away from home and eat from communal dishes.

In the twenty-four-hour food recall method, subjects are asked to recall the exact food intake during the previous twenty-four hour period or preceding day. Detailed descriptions of all foods and beverages consumed, including cooking methods and brand names (if possible), are recorded by the interviewer. Vitamin and

mineral supplement use is also noted (53). The accuracy of the dietary intake data depends on the subject's memory, the ability of the respondent to convey accurate estimates of portion sizes consumed, the degree of motivation of the respondent, and the persistence of the interviewer (54, 55). This method is appropriate for describing the mean intake of a group. The advantage of a 24-hour recall include: open interviews provide data on less frequently eaten foods, administration time is short, the time period is well defined, literacy is not required, and the open form is not culture specific. The respondent burden is small for a 24-hour recall, so that compliance is generally high (53). Response rates are usually high for recalls (56). The weaknesses of this method are that respondent recall depends on short-term memory; portion size is difficult to estimate accurately; and compared with other methods, intake tend to be underreported, and the method is vulnerable to variability between interviewers (51).

A Food Frequency Questionnaires (FFQ) is "a questionnaire in which the respondent is presented with a list of foods and is required to say how often each is eaten in broad terms such as x times per day/ per week/ per month, etc. Foods chosen are usually chosen for the specific purposes of a study and may not assess total diet" (57). FFQs vary in the foods listed, the length of the reference period, the response intervals for specifying frequency of use, the procedure for estimating portion size, and the method of administration. This method provides dietary data that can be used to rank individuals according to their intake of diet and chronic disease. Weaknesses of this method include that memory of food use in the past is required and that the respondents' burden is governed by number and complexity of foods listed and

quantification procedure. The quantification of portion sizes might be less accurate than the other methods, such as weighed method and 24 hour dietary record (58, 59). The biggest challenge of FFQ method is in the design of an instrument that is culturally appropriate. Food frequency questionnaires, which were developed in a specific population, cannot be administered to another population without adjustment to eating habits. Unlike other macronutrients such as protein, the amounts and types of fat in the human diet vary tremendously across cultures and over time and have changed significantly within Westernized countries. Studies examining the relationship between fat intake and chronic disease using traditional dietary assessment methods are very challenging because of the variability in use of dietary fat in cooking, the variability of fat in foods and the potential burden of using a long FFQ. This is also true for changes in the same population over different time period (60).

The 24-hour dietary recall and food record method are based on foods and amounts actually consumed by an individual on one or more specific days. Thus these methods differ from FFQs, which are based on an individual's perceptions of usual intake over a less precisely defined period of time (54). A study by Sawaya *et al.* evaluated and compared three dietary intake assessment methods using doubly labeled water measurements of total energy expenditure (TEE) (61). That study found that the energy intake by FFQ were the only intake data that correlated significantly with individual values for TEE. The results suggested that for some type of studies, simple methods for assessing group mean dietary intake may actually give more accurate information than weighed dietary intakes.

The present study aimed to investigate the total energy intake and fat intake of Chinese work in high-tech industries, therefore, FFQ was chosen as the assessment tool and 24-hour recall was used to evaluate the FFQ for validity.

Web-based survey and response rate

Web-base survey

The newest innovations in self-administered questionnaires make use of the computer. An on-line survey is one of the computerized self-administered questionnaire (CSAQ) methods. Nicholls and Babbie reported that electronic techniques are more efficient than conventional techniques, and they do not appear to result in a reduction of data quality. (62, 63)

An on-line survey has several advantages over a traditional self-administered survey. An on-line survey saves the cost of printing, postage, and the interview. An electronic questionnaire forces interviewers to follow protocols and cannot skip questions, and this significantly decreases item non-response rate. Also, an on-line survey can be interrupted and resumed at any time. It provides maximum flexibility for subjects. Studies have shown that participants responding to an internet survey are less prone to social desirability than those responding to a mailed survey. This suggests that people might feel more comfortable disclosing true answers on the Internet (64). Web-based surveys also allow grouping of questions and modularization. Partially completed survey data can be saved even if the survey taker abandons the survey before all questions are answered so attrition rates can be calculated. Email and web response are faster than postal survey response without

significant impact on survey results. An electronic survey is able to do online coding, so data can be generated and downloaded to Microsoft access, excel or any other format of data filing automatically and this process can minimize error of data entry. Computer assisted questionnaire is more user friendly than paper questionnaire, especially to computer savvy people. A well-developed computer tool may substitute in-person interview in some way, especially for advanced computer users.

The major weakness of electronic survey is that it can be used only with respondents who have access to a PC with the appropriate configuration and operating system (65). This greatly inhibits its use for general population samples.

Given the strength and weakness of web-based survey, Yun and Trumbo recommended that if only one method can be used and the population is an online population, the web-based survey with various forms of pre-notification is advisable (66). The current research involved people working in high-tech industries, and it can be assumed that every eligible subject is a sophisticate internet user and has internet access. Therefore, using a web survey is a way that can get a reliable response at an economical cost for this study.

Response rate

Obtaining adequate response rates with conventional surveys has always been a challenge, and this situation has not changed for web-based survey. Email response rate of 20% or lower are not uncommon (67) and response rates of web-based surveys are lower (68). Some studies have undertaken an in-depth analysis of the response rates achieved in many studies using different techniques. Their findings are complex, because there are many confounding factors that can affect the results, such as

incentive, respondents' performance, and sensitive questions (69). Response characteristics differ between postal, email and websites (66). A study comparing web and mail survey response rates suggested that, in a population in which each member has Web access, a Web survey application can achieve a comparable response rate to a questionnaire delivered by surface mail if the Web version is preceded by a surface mail notification (70).

Bosnjak and Tuten identified categories of response types that include: complete responders, unit responders (do not participate at all), answering drop-outs, lurkers (view but do not answer questions), lurking drop outs (view some but not all of the survey), item non-responders (only answer some of the questions, but complete the survey), and item non-responding drop-outs (answer some question, but drop out before completing) (71).

Studies have found that several factors influence response to web-based survey. Technical difficulties alone may keep response rates low (68). A lack of survey salience can also reduce responses (72, 73). Survey design and distribution features also affect response/non-response and attrition rates. Cash incentives and chances to win prizes in a sweepstake have been shown to increase the number of responses twice as much as altruistic motives (74-76). In multi-year repeating survey studies, incentives were shown to increase the number of completed questionnaires, but not the total number of respondents from year to year (74). Another design feature that seems to affect attrition rates is the location of the request for personal (demographic) data in the survey. Attrition rates were significantly lower when personal data was requested at the beginning of Web-based survey rather than at the

end of the survey (77). Placing the data request at the end of the survey presents a surprise to the respondent to which he/she reacts negatively by dropping the survey before completing it. Placing the data request at the beginning may be perceived as honesty on the part of the researcher. This helps to create an atmosphere of greater trust and to build a quality relationship. How survey subjects are invited to participate in the survey, and how survey completion is encouraged through reminders, can affect response rates as well. The perceptions of burden can be manipulated and affect non-response and attrition rates (78). For example, those who were told the survey would take less time, those who received an automated (embedded) password, and those who received more frequent reminders, were all more likely to accept the invitation. However, these factors did not have significant effects on signing up for the survey. Follow-up reminder emails after the first publication also appear to spike participation (79, 80), but, varying the interval time periods between reminders does not appear to make a difference in response rates (81).

Sheehan found that e-mail survey response rates have been following the pattern of survey response rates overall in the United States. In the early years of email surveys, a high level of high response may be achieved due to the novelty aspect of using e-mail to respond to surveys. This period is likely to have passed. Thus, as time progresses, it seems likely that response rates to e-mail surveys will continue to decrease. The increase in surveying in the United States may be another part of the explanation of lower response rates, along with the increase in unsolicited e-mail to Internet users (82). The language in the subject line, the email address of the sender and the sender's name may all influence whether or not the invitation to

participate is read. Multiple contact methods are be useful for Web-based surveys as well. In addition, as discussed earlier, different groups may have dramatically different response rates based on survey salience.

In summary, achieving high response rates to an electronic survey depends very much upon how people are asked to participate and how people perceive the burden and importance of the topic. The language used in the invitation, the type of notification media and the follow-up process (e.g., the type, and number, of reminders) should be customized to the target population. All the affecting factors should be addressed in the survey design.

Chapter 3: Methods

Study Design

The current research was a cross-sectional self-administered on-line survey, and it was approved by the University of Maryland Institute Review Board (IRB). This research was designed to measure nutritional knowledge, attitudes, total energy and fat intakes, dietary self-efficacy on avoiding a high-fat diet, and acculturation and the association of these variables with dietary fat intake and body weight. All subjects met the following five criteria:

- 1) Aged between 20 to 45 years;
- 2) Working and living in a metropolitan area either in China or in the U.S.;
- 3) Hold at least a bachelor degree;
- 4) Employees of hi-tech companies, not including bio-tech, medicine, pharmaceuticals or health industries.

High technology refers to the latest developments in technology, including aerospace/defense, computer electronic, computer hardware, software, and peripherals, computers networking, internet, semiconductors, telecommunications, and biotechnology. This research studied people in development or manufacturing industries related to computer, network, and telecommunications. As mentioned above, the study sample contained 4 groups:

Ch-1: People working for Chinese companies in China

Ch-2: People working for American companies in China

Am-1: Chinese-born Chinese working in the US

Am-2: American-born Chinese working in the US

Since the target population worked in high-tech industries, it was assumed that all participants have access to the internet and are computer literate. Therefore, an online survey method was used to collect the data.

Instrument Design and Development

The questionnaire was originally developed in English and then translated into Chinese. Participants could select either the Chinese version or the English version of the survey. The accuracy of translation was evaluated by bilingual experts and a focus group. The format of the questionnaire and order of the questions in the questionnaire followed the Tailored Design Method of Dillman (83). Considerations of the design of the questionnaire included order of questions, constructions, and implementation. The final questionnaire included radio buttons, drop-down boxes, and open end boxes.

The questionnaire was composed of six sections: Food Frequency Questionnaire (FFQ), nutritional knowledge, nutritional attitudes, dietary self-efficacy, acculturation and socio-demographic questions. Each section of the questionnaire was developed separately, and additional evaluations were given to the FFQ instrument.

Food Frequency Questionnaire (FFQ)

Food list

Because the study population included Chinese living in China and Chinese living in the US, the FFQ had to include food items consumed in both countries. This FFQ was developed based on four previous questionnaires. These questionnaires were used to measure the dietary intake of Chinese in China, urban citizens in Beijing, Chinese Americans, and Americans(84-87)

Food lists of the 4 FFQs were pooled together. Same food items in the 4 FFQs were selected by default; similar food items were combined together; and unique food items in both countries were kept on the list.

Cooking methods in these two countries are different, and recipes for dishes vary dramatically across households and restaurants especially in China. Therefore, this FFQ inquired about the consumption of food items without distinguishing the cooking methods. For example, the FFQ included chicken but did not specify if it was fried or grilled.

Two major methods of Chinese cooking include stir-fried and deep-fried. Cooking oils used to stir-fry and deep-fry foods are one of the major sources of fat in Chinese diets. Therefore, two questions were created to assess the amount and frequency of cooking oil consumption by asking how much and how often people consumed stir-fried and deep fried foods, including vegetables and meat, rice, and other food categories.

The FFQ used a 12 month (1 year) time frame. The final version of the FFQ included 143 food items in 8 food categories: 1) Staple foods; 2) Meat; 3) Fruits; 4)

Vegetable; 5) Dairy products; 6) Beverages and liquors; 7) Dessert, snacks and nuts; and 8) Condiments and sauces (including 2 items on stir-fried food and deep-fried food). The FFQ also included questions on frequency of eating away from home and the consumption of dietary supplements. (Appendix 3, 4)

The food frequency questionnaire (FFQ) was first developed in a paper-based version in English. It was then directly translated into Chinese (written in simplified Chinese characters).

Portion size estimation tool

People in China and in the US have different cooking instruments, food containers, and measuring devices. Since this FFQ was designed to collect dietary intake from Chinese in both countries, 9 visual aid pictures were created to improve the accuracy of portion size estimation. Equivalent amounts of food in Chinese containers and in American containers were presented in the same pictures, so that the subjects could estimate their food consumptions using the same scale and estimate the amount of food intake from the two countries(Appendix 5). These pictures were reviewed by the expert panel and were tested during the focus-group and cognitive interview studies described below.

Nutrition Knowledge

The nutritional knowledge was measured using a twelve-item multiple choice questionnaire that focused on dietary fat. The measurement included questions on: 1) awareness of different fat; 2) knowledge of fat content of different foods; 3) experts' recommendation regarding healthy eating related to fat and; 4) relationships between

certain fat and chronic diseases. Three existing questionnaires of nutritional knowledge were modified to fit the targeted population of this research. These existing questionnaires are the Diet and Health Knowledge Survey (DHKS) 1994-96 questionnaire (88), the nutrition knowledge questionnaire of Wardle and Parmender (47) and a Chinese nutrition knowledge questionnaire used for Chinese urban citizens in China (28), which has been used in China for the residents in Beijing, Shanghai, and Guangzhou.

Nutrition Attitude

An attitude scale was developed to measure people's attitude about the relationship of daily food intake and long-term health. Based on the attitude scales of the Diet and Health Knowledge Survey (DHKS) 1994-96 of US Department of Agriculture (88), a specific attitude scale (six items) was developed for the targeted population. Items are scored on a seven-point Likert-type response format (strongly disagree, disagree, somewhat disagree, neutral, somewhat agree, agree, strongly agree). The total score is derived by summing the scores on all the items.

Dietary Self-efficacy

A dietary self-efficacy scale was developed based on a questionnaire created by Ounpuu and Horacek (89, 90). The dietary self-efficacy scale focused on how much people believe they can avoid or reduce high fat and high-energy food intake. This questionnaire used a 6-item scale, with an 11-point (0 to 10) Likert scale ranging from "I know I cannot" (=0) to "I know I can" (=10). The dietary self-efficacy scale was evaluated and tested using expert panel, a focus group, and cognitive interviews.

Acculturation

The acculturation scale used a bi-dimensional multi-domain model and was developed based on four available tools: the Suinn-Lew Asian self-identify acculturation scale(91), Tsai's Chinese acculturation scale (92), Satia's Chinese acculturation scale (15), and Lee's acculturation questionnaire for Korean Americans (14). This questionnaire assessed four domains of acculturation: language usage, social activity, leisure time activity, and food choices (preference for Chinese food and American food). The construct of acculturation includes involvement in American culture, involvement in the Chinese culture, and involvement in both cultures. Four demographic variables were also included in the questionnaire: age of immigrants, length of stay in the US, place of birth, and birth places of their parents and grandparents. The acculturation scale included 30 items, and it was evaluated and tested by an expert panel, a focus group and cognitive interviews. Only respondents in the US were required to answer questions of this section.

Demographic Information

The last section of the survey was a demographic questionnaire. This section collected the following information: age, gender, educational attainment, marital status, state of residence, and income. Income information was collected by asking: What is your own present annual income level before tax (total income including bonus, commission, stock... and salary)? Self reported body height and body weight were also collected in this section.

Website Development

Two websites were designed and developed. The recruitment website (<http://www.ienutrition.com>) was developed to recruit participants, provide information about the background and objectives of the research, and collect feedback from participants (Appendices 1 and 2). This site was designed to introduce the study to the functionaries of high-tech companies that were selected for the sample frame, and was made available to the individual respondents only after they completed the online survey to avoid influencing responses.

The other website (<http://www.ienutrition.net>) contained a consent form and the questionnaire (Appendices 3 and 4). Unlike the first website, this site was designed in a plain and non-distracting fashion and contained no URL links that directed to other websites. This design was used to force the participants to focus on the questionnaire and enhance the quality of the answers. The homepage of this site contained a survey cover letter and a consent form. Criteria for participants were also listed on the homepage. Once a user accepted the research agreement by clicking the “I accept” button, the system directed them to the questionnaire. Participants could withdraw from and resume the questionnaire at any time. The entire web-based questionnaire was 16 pages long, including one page of instructions. Graphical instructions were given to help subjects to fill in the FFQ. The web-based questionnaire contained radio button, drop-down lists, and open-ended questions. The bottom of each page displayed a progress indicator.

Both websites contained both English and Chinese versions of the questionnaire. The two versions were identical in content. Participants could choose

either version. Both websites were hosted on a server in Beijing at the beginning of the study and were then added a second host on the server of the College of Agriculture and Nature Resources, University of Maryland in October 2005. A networking company in Beijing developed and tested this program, and the company also provided technical support throughout the entire process of the research.

Questionnaire Evaluation and Pre-testing

The initial questionnaire was evaluated and pre-tested using an expert panel, a focus group, and cognitive interviews. An additional pilot study (24-hour recall) was conducted to evaluate the FFQ.

Expert reviews

An expert panel was recruited to review the questionnaire twice, once for the paper-based questionnaire and once for the web-based questionnaire. The panel included fourteen experts from China and the US in nutritional epidemiology, dietary intake assessment, public health, survey methodology, questionnaire design, and questionnaire translation. The experts reviewed the questions for face validity and quality of translation. Comments and recommendations made by the expert panel were used to revise the questionnaire.

Focus Group

A focus group interview is a qualitative research technique in which, most often, a relatively homogenous group of 6-10 persons are brought to a centralized location to discuss a particular topic for one to two hours. (93)

After the first review of the expert panel, a focus group was held to evaluate the questionnaire and further ensure its face validity and appropriate translation (protocol see appendix 6). Seven volunteers participated in the focus group interview in April 2004 at the University of Maryland. All the participants were working for high-tech companies in Washington DC metropolitan area. Four men and three women participated, including one American-born Chinese man, and they discussed the research topic using the draft paper-based questionnaire. Every participant completed the questionnaire before the discussion. During the discussion, all participants were encouraged to express their viewpoints and to feel comfortable disagreeing with the perspectives of others. The focus group was two hours long. The pictures of portion-sizes were reported to be easy to use. Based on feedback from the focus group, modifications were made to the survey tool, such as reorganizing the order of some questions and adjusting terms misunderstood by the focus group members.

Revisions were made based on information collected from the focus group. The draft questionnaire was then converted to the web version and uploaded on the Internet in April 2004.

Cognitive interviews

The web version of the questionnaire was further tested in April 2004 using cognitive interviewing. Cognitive interviews were conducted using concurrent “think-aloud” technique. The development of the think-aloud protocol is usually attributed to Ericsson and Simon and it has been widely used in cognitive study and pre-testing of questionnaire (94). The think-aloud approach enables access to the thought processes

or decision-making of someone performing a specific task. In this study, we encouraged the participants to verbalize their thoughts or feelings as they filled out the questionnaire on the web in their usual manner, in order to comprehend their thinking and understanding of questionnaire.

Five people in China completed the interview by phone and five people in the US completed the interview in person. During the interviews, subjects were asked to verbalize their thoughts as they answered each question using their own computer. Three subjects in the US completed the cognitive interview and survey in English, while the other seven participants completed it in Chinese. Eight participants used the Microsoft Internet Explore (IE) to access the websites, and two participants used the Netscape Browser. The cognitive interviews obtained feedback on the flow of the website, on ease of use, and on the interpretation of each question. Based on the feedback received, changes were made to the questionnaire (Protocol see appendix 7).

Revision of the Questionnaire

Feedback from the expert panel, the focus group, and the cognitive interviews was summarized and addressed in the final pre-testing version. Some items were deleted and some items were added. The wording and formatting were revised for clarity. Some questions were re-organized to help respondents understand those questions. In the FFQ section, more specific items were placed before regular food items. For example, diet soda before regular soda; cottage cheese before cheese; and 'other green leafy vegetables' after popular and specific vegetable items, and so on. Some food items were combined as one, and some food items were re-grouped.

Major formatting changes were made such as: using single choice instead of matrix questions, using plain and less colorful format on the web to reduce possible influence of colors to respondents, and changing fill-in box questions into drop down box questions. An eye-catching heading of “over the past 12 month” was placed at the top of each page of the FFQ to help improve the cognitive process of memory over the definite time frame.

Loading the questionnaire was a major difficulty encountered by respondents. The FFQ contains 80% of the questions; therefore, after consulting experts at the National Cancer Institute, we changed the frequency format from 2 questions with 16 possible responses to 1 question with 8 possible responses per screen. The format was identical to the format of the Diet History Questionnaire of NCI.

Pilot study: validity of the FFQ compared to 24-h recalls

To further evaluate the FFQ, we conducted a one-day 24-hour recall. Twenty-four subjects from 4 study groups composed of 6 subjects in each group filled out the FFQ on the web at first, and then they completed a 24-hour recall interview by telephone 7 to 10 days later. All the participants also reported their experience with the on-line questionnaire and how much time they spent in completing the web survey. All participants received \$40 gift certificate for their participation.

A modified 5-step multi-pass 24- hour recall method was used in the telephone dietary recall interview (95, 96). (For the 24-hour recalls script, see appendix 8).

Detailed information is provided in Chapter 4.1.

Sampling and Data Collection

Sampling

This research applied the Tailored Design Survey Method and used cluster sampling method. Participants were recruited through their employers, high-tech companies. Three factors were considered in sampling design: business population, physical location, and business field.

According to the standard of Statistics of U.S. Businesses, US Census of Bureau (97), all the companies targeted were categorized by employee size into large (>500 employees), medium (100~ 500 employees) or small business (<100 employees). The sample frame covered high-tech industries in networking, software, hardware, telecom, and technology support.

Seven middle or large industrialized cities in China were selected for the sampling frames: Beijing, Shanghai, Shenzhen, Guangzhou, Chongqing, and Changchun. These cities are well scattered in China and cover 4 major geographical areas. Based on the same criteria, 8 metropolitan areas were selected in the US: Seattle, San Francisco, San Diego, Chicago, New York City, Washington D.C., Houston, and Boulder.

The construction of the sampling started with American companies in China. The Business Council of the American Embassy in China provided a directory of American business in China with a full list of the American investors and their brief introductions. A hundred and twenty eight high-tech companies were identified. Among these companies, 50% are large companies, 30% are medium sized companies and 20% are small business. We contacted 60 American companies in

China that included 30 large companies, 20 middle sized companies and 10 small companies. Of the 60 companies, 16 of them agreed to participate in this research; meanwhile, these companies located in the US also participated in this study. Fifteen additional small American companies, which have no Chinese affiliation, were also invited. Six of them participated in this research. Sixty Chinese high-tech companies were invited, and 21 of them participated in this study (Table 3.2). The participating companies agreed to send out the study invitation letter through their internal email system to all Chinese employees in selected cities. The invitation emails were sent by the companies to potential subjects three times, one week apart, as requested. All these participating companies provided total number of employees who were on the list of the email invitations so that response rate could be estimated.

Recruitment and data collection

Data were collected through the Internet between July 2004 and April 2005. The first three recruiting emails were sent through the department of human resources or the Chinese association of each company. The recruiting e-mail (Appendix 9) introduced this research and its importance; stated that participation would be kept confidential; introduced the sweepstake program; also provided the link to the website of the questionnaire (described below). Follow-up emails were sent directly to participants who had incomplete responses. To encourage participation, we planned to send out follow-up five emails. A thank you note was sent to each person who logged onto the survey website.

Table 3.1 lists the timeline of the recruitment process for each participating company. To increase the response rate, a sweepstake was included. All participants

who completed the survey were eligible to enter the program and had a chance to receive \$50 gift certificate from Amazon.com (in the US), or receive 400 RMB in cash by mail (in China). Ten prizewinners were selected at random from among all eligible entries (5 in China and 5 in the US).

E-mail addresses of participants were obtained while they initially logged onto the web-based questionnaire. The e-mail addresses were used for sweepstake and follow-up reminders. All the e-mail addresses were omitted from the final dataset for confidentiality.

Data Analysis

Data were automatically generated into a database using Structured Query Language (SQL) server. Complete raw data set were downloaded into Microsoft Excel files. The data were coded in Excel, and then exported and analyzed using Statistical Package for the Social Sciences (SPSS) and Mplus (Muthén & Muthén, Los Angeles, CA) (98, 99).

Post-collection Processing of Survey Data

The data collected was cleaned for data processing. Data cleaning process included: deletion of duplicate records, deletion of blank records, recoding out-of-range values to missing, omission of personal identification and assigning new ID variable. After the data were sorted by group, gender and age, the login email addresses were removed from the final dataset for privacy.

Four steps of post-collection processing were then conducted. Data processing included (100):

1. Coded text data: the process of turning word answers into numeric answers.

2. Editing Checks: the examination of recorded answers to detect errors and inconsistencies.

3. Imputing data: the repair of item-missing data by placing an answer in a data field. For example, in the nutritional knowledge section, “not sure/don’t know” was coded as 9.

4. Estimated Sampling variance, the computation of estimates of the instability of survey statistics (from any statistical errors that are measurable under the design)

A coding manual was developed and used to code the data. Food frequency codes were developed for calculating daily consumption of frequency (Table 3.2). For example, 3-4 times a week equals to 0.5 times a day, 2-3 times per day equals 2.5 times per day. However, consumption of rice and stir-fry were coded differently, according to the Chinese eating behavior pattern. Consumption of 2-3 times per day was coded as 2. Traditionally, most Chinese people consume rice and stir-fries for lunch and dinner, but rice and stir-fries are rarely consumed for breakfast. Considering that rice and stir-fried foods are the most common foods consumed by Chinese, this adjustment was necessary for the estimation of total energy and total fat intakes.

Contingency checks were utilized to remove inconsistent observations from the data. Decisions concerning extreme values which remain in the files are left to the discretion of individual researchers. For example, some respondents reported never

been married but have 5 children, therefore, marital status and number of children were both recoded as missing value. Some respondents reported age of 21 years but have completed a PhD degree and worked in a high-tech company. This record was excluded from the dataset because this observation can be either extreme or not true.

Missing values were treated in different way in each section. For the demographic information section, cases with missing age, gender, body height and weight were excluded. Cases with more than 10% missing values for other questions were included and the missing values were coded as ‘.’. For example, marital status, number of children, and annual incomes.

For the acculturation section, 10% missing values were allowed for descriptive questions; for example, “I am currently living in ...”, and “was your father born in the US”, and so on. The missing values were coded as ‘.’. No missing values were allowed for variables used to calculate the scores, such as “what language do you speak at home”, and “what type of food do you eat at home”.

The section on dietary intake included frequency and amount of consumption. Cases with more than 10% missing data were excluded. Sixty one cases with less than 10% missing data (14 food items) were examined. These 61 cases were compared on all study variables with all participants and no differences were found. Missing values were given a mean score for the missing food item based on same gender and from same subgroup of participants. Cases with more than 10% missing values were excluded from the final dataset. Descriptions of the non-responses at company level, individual level and, item level is summarized in Table 3.3.

Nutrient Database

A nutrient composition database was developed for this study using the USDA nutrient composition database for standard reference 19 (101), the Chinese National Food Consumption Nutrient Database 2002 (102), and HealthTech Inc. property software, Asian Assist (103).

The USDA SR19 was used to derive the nutrient composition of common FFQ food items, such as fruits, vegetables, and chicken. The Chinese composition database 2002 was used for unique Chinese food items, such as congee, steamed bun, fried dough stick, and pea sprouts. For the combined items, such as dark green leafy vegetables, the averaged energy and fat contents of all the food items in the food categories were calculated and used as the nutrient composition data for the corresponding FFQ item. Data for cooking oil contents from stir-fried dishes and deep-fried dishes were from the HealthTech Inc. property software, Asian Assist, and its nutrient content database.

Data Analysis

Statistical analyses were performed by using SPSS and MPlus. Descriptive data are presented as means \pm SD unless otherwise indicated. In all cases, a P-value of 0.05 or less was considered to be statistically significant. Special research questions and statistical methods are as follows:

1. Are there significant differences in means among the four study groups on: energy intake, fat intake, knowledge, attitude and self-efficacy?

Means of these variables were compared using ANOVA. After a significant F ratio was found, the Tukey method, a multiple-comparison procedure, was carried out to identify which pair of means differ. This step was performed by using SPSS.

2. Which variables are associated with BMI and energy and fat intakes? what is the prediction model that describes this relationships?

Relationships among BMI, energy and fat intakes, and candidate affecting variables were assessed by calculating Pearson's correlation coefficients and performing General Linear Model regression (conducted by using SPSS). Age, gender and group number were included as control variables. The BMI was predicted by assuming everyone in the sample engaged in same physical activity level.

Because some variables are highly inter-related, e.g. total energy intake and total fat intake, a theoretical model was constructed and tested using Path analysis. Path analyses were conducted by using SAS.

3. Is acculturation status of Chinese in the US heterogeneous or homogeneous?

Acculturation status includes four domains: food choices, language usage, social activity and leisure time activity. Acculturation status only applies to the two groups of Chinese in the US.

4. If acculturation status associated with BMI and energy and fat per kg body weight? Which domain of acculturation interacts with BMI and Energy/ kg better?

Relationships among the variables were also assessed by calculating Pearson correlation coefficients and performing General Linear Model regression (conducted using SPSS).

5. Whether these immigrants can be re-grouped based on different acculturation level?

This analysis was conducted applying latent structure modeling by using Mplus.

Tables

Table 3.1 Timing of recruitment and data collection in each participating company

Task No.	Task Description	Action steps and Timing
1	Initial email from the company	Day 1
2	Thank notes	Upon response
3	1st Follow-up to partial-complete user	Upon response
4	2nd email from the company	Day 7
5	2nd follow-up email to partially-completed user	Day 7 after log-in date
6	3rd email from the company	Day 14
7	3rd follow-up email to partially-completed user	7 days after the 2 nd follow-up email
8	Sweepstakes	Day 20
9	4th follow-up email to partially-completed user	10 days after the 3 rd follow-up email
10	5th follow-up email to partially-completed user	10 days after the 4 th follow-up email

Table 3.2 Food frequency code

Frequency Format	Code
Never	0
1 time per month or less	0.02
2-3 times per month	0.08
1-2 times per week	0.2
3-4 times per week	0.5
5-6 times per week	0.8
1 time per day	1.0
2-3 times per day	2.5
4-5 times per day	4.5
6 or more times per day	6.0
Missing	.
Error	*

Table 3.3 Companies contacted and response rate

	Number of companies	Accepted (n)	%
American Company			
Large	30	10	33%
Medium	20	3	15%
Small	10	3	30%
Chinese Company			
Large	30	9	30%
Medium	20	6	30%
Small	10	6	60%

Table 3.4 Individuals contacted and response rate

	Number of individuals	%
Contacted	16,000	
Logged in	4,400	27.5
Drop out at the 1 st page	2,251	14.1
Drop out in the middle of FFQ	978	6.1
Drop out by the end of FFQ	1,064	6.7
Drop out at the last page of the questionnaire	107	0.7
Completed respondents	936	5.9
Eligible data entry	925	5.8

Chapter 4: Results

4.1 Development and calibration of web-based food frequency question for Chinese in China and in the US

Abstract

Objective: To develop and evaluate a web-based food frequency questionnaire (FFQ) for total energy and fat intakes among Chinese individuals working in high-tech industries in China and in the US.

Design: A bilingual web-based FFQ was developed based on 4 existing FFQs. A set of pictures of portions of food was created to help with portion estimates. The pictures show portion sizes using Chinese and American containers or measuring tools of equivalent sizes. The web-based FFQ was revised based on the feedback from an expert panel, a focus group, and from cognitive interviews. Total energy and fat intakes obtained using the FFQ were compared to those determined using a 24-hour recall.

Subjects/Setting: Participants were recruited from 4 targeted groups of Chinese employees in high-tech industries (aged 21-44 y) including employees of Chinese companies in China and employees of American companies in China, Chinese-born immigrants in the US, and American-born Chinese in the U.S. A focus group, cognitive interviews and 24-hour recalls included 7, 10 and 24 subjects, respectively.

Main outcome measures: Total energy and fat intakes.

Results: Pearson's correlation coefficient of intakes from the web-based FFQ and the 24-hour recalls for total energy and fat intakes were 0.46 and 0.49, respectively ($P < 0.05$). Pearson's correlation coefficients for energy between Dietary Recommended Intake (DRI) and the FFQ was 0.58 ($P < 0.01$), and Pearson's correlation between the DRI for energy and 24-hour recalls was 0.55 ($P < 0.01$).

Conclusions: The web-based FFQ performs well, the portion aid pictures were reported to be helpful with portion estimations. The web-based FFQ can be used to assess the energy and fat intakes of Chinese individuals working in high-tech industries in China and in the US and should be tested with other Chinese population groups.

Introduction

The China Health and Nutrition Survey showed that, with the fast economic growth, rapid shifts are occurring in China towards an unhealthy lifestyle including sedentary behavior and energy-dense diets and dietary transitions starting with increased consumption of cooking oils. Urban young Chinese who have higher incomes are at higher risk of consuming an unhealthy diet (9, 10, 104). Similarly, in the US, cross-cultural studies suggested that younger age, higher educational attainment, better English proficiency, being employed outside the home and residing in the US for a longer period of time are associated with higher acculturation; and acculturation to the American culture has been shown to be associated with increased consumption of fat, meat, and sweets that are high-energy dense food (16, 21, 22, 26, 49).

Therefore, previous studies in China and in the US both suggest that urban young Chinese or Chinese American individuals who have higher income and higher educational attainment are at higher risk of consuming a high fat diet. Due to the fast development of the economics in China and the great needs of professional in the US, the population of highly educated young (aged 20 to 45) professionals of Chinese working in high-tech industries has grown very fast in both countries over the past 10 years (24). However, no studies to date have been reported on the status of dietary behavior and related nutritional factors in this fast growing population of Chinese.

We conducted a web-based study to examine and compare dietary behavior across four population groups in China and in the US and to investigate factors that are related to dietary intake of Chinese in these two countries. The targeted

population was young (aged 20 to 45 years) Chinese or Chinese Americans who worked in high-tech industries and had at least a bachelor degree.

To assess the diet of these populations, a dietary collection instrument had to be developed. Chinese diet is characterized by its variety. In fact, Chinese people usually eat mixed dishes and share servings with each other when dining. And Chinese person do not typically measure food and may therefore have had difficulty estimating serving sizes(49). Chinese Americans consume both traditional Chinese foods, western foods, and mixed style foods. Therefore, an online FFQ method was chosen to collect energy and fat intake in this study after considering the method of survey administration, the logistics of the survey and the efficacy of the FFQ.

The current paper presents the development of a web-based FFQ for Chinese in China and the US and compares it to information collected from a 24-hour recall among a similar population.

Methods

The main study was a cross-sectional self-administered on-line survey, and it was approved by the University of Maryland Institute Review Board (IRB). This research was designed to measure, nutritional knowledge, attitude, dietary self-efficacy regarding avoiding high-fat diet, acculturation and, the association of these variables with dietary energy and fat intakes and body weight. The target sample met the following five criteria: 1) Ages between 20 to 45 years; 2) Working and living in a metropolitan area either in China or in the U.S.; 3) Holding at least a bachelor degree; 4) Working in high-tech companies, not including bio-tech, medicine, pharmaceuticals or health industries. High technology refers to the latest

developments in technology, including aerospace/defense, computer electronic, computer hardware, software, and peripherals, computers networking, internet, semiconductors, telecommunications. The study sample contained 4 groups: people working for Chinese companies in China; people working for American companies in China; Chinese-born Chinese working in the US, and American-born Chinese working in the US.

Since the target population worked in high-tech industries, it was assumed that all participants have access to the internet and are computer literate. Therefore, an online survey method was designed to collect data. This web-based questionnaire was developed and pre-tested.

Development of the web-based FFQ:

Food list: Because the study population included Chinese living in China and Chinese living in the US, the FFQ had to include food consumed in both countries. The FFQ was developed based on four valid questionnaires, which were used to measure the dietary intake of Chinese in China, urban citizens in Beijing China, Chinese Americans, and Americans (84-87). Food lists of the 4 FFQ were pooled together. Same food items in the 4 FFQ were selected by default; similar food items were combined together; and food items unique to the other country were kept in the list.

Cooking methods in these two countries are different, and recipes for dishes vary dramatically across households and restaurants especially in China. Therefore, this FFQ inquired about the consumption of food items without distinguishing the

cooking methods. For example, the FFQ included chicken but did not specify if it was fried or grilled.

Two major methods of Chinese cooking included stir-fry and deep-fry using cooking oil. Cooking oil used in stir-fry and deep-fry are one of the major sources of fat in Chinese diets. Therefore, two questions were created to assess the amount and frequency of cooking oil consumption by asking how much and how often people consumed stir-fried and deep fried foods, including vegetables and meat, rice, and any other food categories.

The FFQ used a 12 month (1 year) time frame. The final version of the FFQ included 143 food items in 8 food categories: 1) Staple foods (grains or cereals); 2) Meat, poultry and seafood; 3) Fruits; 4) Vegetables; 5) Dairy products; 6) Beverages and liquors; 7) Dessert, snacks and nuts; and 8) Condiments and sauces (including 2 items on stir-fried food and deep-fried food).

The food frequency questionnaire (FFQ) was first developed as a paper-based version in English. It was then directly translated into Chinese (written in simplified Chinese characters).

Portion size estimation tool: People in China and in the US have different cooking instruments, food containers, and measuring devices. Since this FFQ was designed to collect dietary intake from Chinese in both countries, 9 pictures were created to improve the accuracy of portion size estimation. Equivalent amounts of food in Chinese containers and in American containers were presented in the same pictures, so that the subjects could estimate their food consumptions using the same scale and estimate the amount of food intake from the 2 countries (appendix 5). These

pictures were reviewed by the expert panel and were tested during the focus-group and cognitive interview studies described below.

Website development

Two websites were designed and developed for different purposes. A recruitment website (<http://www.ienutrition.com>) was developed to recruit participants, provide information on the background and objectives of the research, and collect feedback from participants. This site was designed to introduce the study to the functionaries of high-tech companies selected for the sample frame, and was made available to the participants only after they completed the online survey. This setting was made to avoid the influence of the background information on the participants' responses.

The other website (<http://www.ienutrition.net>) contained a consent form and the questionnaire. Unlike the first website, this site was designed in a plain and non-distracting fashion and contained no URL links that directed to other websites. This design was used to force the participants to focus on the questionnaire and enhance the quality of the answers. The homepage of this site contained a survey cover letter and a consent form. Criteria for participants were also listed on the homepage. Once a user accepted the research agreement by clicking the "I accept" button, the system directed them to the questionnaire. Participants could withdraw from and resume the questionnaire at any time. The entire web-based questionnaire was 16 pages long, including one page of instruction. Graphical instructions were given to help subjects to fill the FFQ. The web-based questionnaire contained single choice questions, drop-

down lists, and open-ended questions. At the bottom of each page, an update was provided to indicate progress, as to the portion of the questionnaire completed.

Both websites contained two versions, English and Chinese. The two versions were identical in content. Participants could choose either version. Both websites were hosted on a server in Beijing at the beginning of the study and were then moved to the server of the College of Agriculture and Nature Resources, University of Maryland in October 2005. A networking company in Beijing developed and technically tested this system, and the company also provided technical support throughout the entire process of the research.

The process of pre-testing

Expert Panel: An expert panel was recruited to review the questionnaire twice, once for the paper-based questionnaire and once for the web-based questionnaire. The panel included fourteen experts from China and the US in nutritional epidemiology, dietary intake assessment, public health, survey methodology, questionnaire design, and questionnaire translation. The experts reviewed the questions for face validity and quality of translation. Comments and recommendations made by the expert panel were used to revise the questionnaire.

Focus group: A focus group interview is a qualitative research technique in which, most often, a relatively homogenous group of 6-10 persons are brought to a centralized location to discuss a particular topic for one to two hours. (93) After the first review of the expert panel, a focus group was created to evaluate the questionnaire and further ensure its face validity and appropriate translation. Seven

volunteers participated in the focus group at the University of Maryland. All the participants were working for high-tech companies in Washington DC metropolitan area. Four men and three women participated, including one American-born Chinese man and they discussed the research topic using the draft paper-based questionnaire. Every participant completed the questionnaire before the discussion. During the discussion, all participants were encouraged to express their viewpoints and to feel comfortable disagreeing with the perspective of others. The focus group meeting was two hours long. Based on feedback from the focus group, modifications were made to the survey tool, such as reorganizing the order of some questions and adjusting terms misunderstood by the focus group members.

The pictures of portion-sizes were reported to be easy to use. Revisions were made based on information collected from the focus group. The draft questionnaire was then converted to the web version and uploaded to the Internet in April 2004.

Cognitive interview: The web version of the questionnaire was further tested using cognitive interviewing. Cognitive interviews were conducted using concurrent “think-aloud” technique. The development of the think-aloud protocol is usually attributed to Ericsson and Simon and it has been widely used in cognitive study and pre-testing of questionnaire (94). The think-aloud approach enables access to the thought processes or decision-making of someone performing a specific task. In this study, we encouraged the participants to verbalize their thoughts or feelings as they fill out the questionnaire on the web in their usual manner, in order to comprehend their thinking and understanding of the questionnaire.

Five people in China completed the interview by phone and five people in the US completed the interview in person. During the interviews, subjects were asked to verbalize their thoughts as they answered each question using their own computer. Three subjects in the US completed the cognitive interview and survey in English, while the other seven participants completed it in Chinese. Eight participants used the Microsoft Internet Explorer (IE) to access the websites, and two participants used the Netscape Browser. The cognitive interviews obtained feedback on the flow of the website, on ease of use, and on the interpretation of each question. Based on the feedback received, changes were made to the questionnaire.

Revision of the web-based FFQ: Feedback from the expert panel, focus group and cognitive interviews was summarized and addressed in the final pre-testing version. Some items were deleted while other were added. The wording and formatting were revised for clarity. Some questions were re-organized to help respondents understand those questions. In the FFQ section, more specific items were placed before regular food items. For example, diet soda before regular soda; cottage cheese before cheese; and ‘other green leafy vegetables’ after popular and specific vegetable items, and so on. Some food items were combined as one, and some food items were re-grouped.

Major formatting changes were made such as: using single choice instead of matrix questions, using plain and less colorful format on the web to reduce possible influence of colors to respondents, and changing fill-in box questions into drop down bar choice questions. An eye-catching heading of “over the past 12 month” was

placed at the top of each page of the FFQ to help improve the cognitive process of memory over the definite time frame.

Loading of the questionnaire was a major difficulty encountered by respondents. After consulting experts, we changed the frequency format from 2 questions with 16 possible responses to 1 question with 8 possible responses. The format was identical to the format of the Diet History Questionnaire of NCI (87).

Nutrient Composition Database

A nutrient composition database was developed for this study using the USDA NHANES 5-digit food code nutrient database(101) and the Chinese National Food Consumption Nutrient Database (102). The USDA nutrient composition database was used to derive the nutrient composition of common FFQ food items, such as fruits, common vegetables, and chicken. The Chinese composition database 2002 was used for unique Chinese food items, such as congee, steamed bun, fried dough stick, and pea sprouts. For the combined items, such as dark green leafy vegetables, the averaged energy and fat contents of all the food items in those food categories were calculated and used as the nutrient composition data for the corresponding FFQ item.

Nutrient data for cooking oil contents from stir-fried dishes and deep-fried dishes were from the HealthTech Inc. property software, Asian AssistTM, and its nutrient content database(105).

Twenty-four-hour recall method

A 24-hour recall was conducted to further evaluate the FFQ. Twenty-four subjects from 4 study groups composed of 6 subjects in each group filled out the FFQ on the web at first. Seven to ten days later, participants completed a 24-hour recall through a telephone interview. All the participants also reported their experience with the on-line questionnaire and the time spent completing the web survey. All participants received \$40 gift certificate for their participation.

The 24-hour recall was conducted by phone. All interviews were conducted by the same trained researcher using a modified 5-step multi-pass method according to the USDA published standard protocol (95, 96). The interviews recorded intake of food, beverage and supplements during the preceding 24 hours. The pictures of the portion sizes were emailed to the participants prior to the phone interview and participants were required to use the portion-aid pictures on their own computer during the recall. Standard household measures, such as gram and liang (equals 50g), were used for estimating portion sizes of food items not included in the portion-aid pictures, such as Chinese fried dough stick.

Statistical Analyses

Total energy and fat intakes of participants obtained from the FFQ and 24-hour recalls were calculated by summing consumption across all food items. Dietary Recommended Intakes (DRI) for energy (adults 19 years or older) was calculated using the total energy expenditure (TEE) predictive equations published by the Food and Nutrition Board, Institute of Medicine. Physical activity was not collected in this

study and, therefore, low activity was applied to all the participants to apply in the TEE equations (99).

Pearson's correlation was used to assess the association between the absolute intakes of total energy and fat as collected by the two methods. Person's correlation was also used to evaluate associations between DRI of energy and energy intake collected using the two methods. Paired-samples *t* tests were conducted to examine the difference in dietary intake between 24-hour recalls and FFQ.

Results

Of the 24 participants in the pilot study, half were men and half of the individuals resided in China while the rest resided in the US. Mean age of the entire sample was 28.6 years. BMI values range from 17 to 25 with mean value of 21 ± 2 (Table 4.1.1)

The food list from the FFQ captured all foods reported in the 24-hour recalls except for one item, the tapioca soup, which was reported in the recall but not included in the food list. Mean intakes of total energy and total fat from the web-based FFQ and 24-hr recall were listed in Table 4.1.2. Mean Dietary Recommended Intakes for energy was also displayed in the table 4.1.2.

Total energy and fat intakes based on the web-based FFQ were slightly higher than data collected by 24-hour recalls, but the differences were not significant. Paired-sample *t* test results showed that *t* values were -0.92 and -1.11 for energy intake and fat intake, respectively. The relationship of total energy intake based on 24-hour recall, DRI and, the web-based FFQ is illustrated in Figure 1 and 2.

Pearson's correlation coefficients of energy and fat intake between the FFQ and 24-h recalls or DRI are listed in Table 4.1.3.

Participants reported that they spent 40 to 70 minutes to filling out this web-based questionnaire.

Discussion

A web-based FFQ (emphasis on total energy and fat) was developed and evaluated for a study that targeted a Chinese population working in high-tech industries in China and in the US. This is the first known web-based FFQ developed for this target population. In the present study, the web-based FFQ was compared to dietary data collected through 24-hour recalls. Results suggest energy and fat intakes from the FFQ correlated reasonably well with data from a 24-hour recall.

Pearson correlation coefficients between FFQ and 24-hr recall for total energy and fat intakes were 0.46 and 0.49 and are comparable to those reported in the literature which also used 24-hour recalls to test the validity of FFQ (25, 61, 106-112). Table 4.1.4 summarized the correlation coefficients between FFQ and 24-hr recalls/ food records in recent published FFQ validation studies. Willett (113) reported that energy-adjusted correlation coefficients comparing nutrients assessed those measured by food records or recall have generally been in the range of 0.4-0.7 for a wide variety of populations and with use of questionnaires that have varied greatly in length and detail. The correlation coefficients achieved in the present study were within the reported range. The length of the web-based FFQ was also comparable to other FFQ reported in the literatures (114).

A limitation of this pilot study is that the sample size was small (n=24). However, the sample included equal numbers of individuals within each subgroup and these individuals were drawn from the same study population and so were representative of young Chinese working in high-tech industries.

Another limitation is that the FFQ was compared to only one 24-hour recall. Multiple 24-hour recalls is recommended to obtain individual intakes. However, the current study emphasized macro-nutrients, total energy and total fat intakes, which are usually more stable than micro-nutrients.

Strength of this study is that a FFQ designed and tested to be used in this study targeting is the first web-based questionnaire that targets Chinese in China and in the US. Its design contains pictures of utensils used both in China and in the US. It performed well compared to a 24-hour recall and was well researched. Two questions for cooking oil consumption through stir-fried and deep-fried foods were created and tested to estimate cooking oil consumption that was usually missed by previous FFQ method (25).

Former studies have suggested that previously developed FFQs are a useful starting point for developing a new FFQ (115-118). This FFQ was based on 4 valid FFQ used by Chinese in China and in the US. Expert panel, focus group, cognitive interview and the methodology used to collect detailed 24-hour recalls provided valuable information on food consumption of Chinese in China and in the US.

Conclusion

The current study developed the first on-line FFQ for Chinese working in high-tech industries in China and in the US. A set of pictures of portion sizes were

created to improve the accuracy of portion estimation. The web-based FFQ has been evaluated using a 24-hour recall. Daily intake of total energy and total fat from the results of the online FFQ and 24-hour recall showed moderate correlation. The newly developed web-based FFQ can be used in future studies of educated, computer-literate Chinese in China and in the US. Additional studies are needed to test the performance of the FFQ among other populations of Chinese.

Tables and figures

Table.4.1.1 Mean Age and BMI of the sample of the pilot study

	China (n=12)	US (n=12)	Total (n=24)
Age	(Mean \pm S.D.)		
Men	30.67 \pm 4.68	27.00 \pm 4.94	28.83 \pm 4.97
Women	27.50 \pm 5.51	29.17 \pm 3.25	28.33 \pm 4.40
^a BMI (kg/m ²)	(Mean \pm S.D.)		
Men	22.69 \pm 1.47	21.17 \pm 1.47	21.93 \pm 1.61
Women	18.66 \pm 1.74	19.58 \pm 0.93	20.53 \pm 2.06

^aBMI was calculated using self-reported body height and weight.

Table 4.1.2. Total energy and fat intakes and percentage of energy intake from fat of 24 subjects in the pilot study based on 24-hr recalls and FFQ the Daily Recommended Intake (DRI) of energy for adults 19+ years and older.

		Energy intake kcal/day)	Fat intake (g/day)	% energy from fat (%)	EN/kg BW (kcal/kg)	Fat/kgBW (g/kg)
Men	FFQ	2771 \pm 443	96.9 \pm 15.2	31.6 \pm 2.1	42.9 \pm 6.9	1.50 \pm 0.27
	Recalls	2658 \pm 429	93.1 \pm 12.0	31.8 \pm 2.6	40.7 \pm 6.8	1.44 \pm 0.23
	DRI	2487 \pm 112				
Women	FFQ	2222 \pm 364	74.9 \pm 14.3	30.2 \pm 1.1	44.3 \pm 6.6	1.49 \pm 0.26
	Recalls	2151 \pm 352	70.5 \pm 13.6	29.5 \pm 2.8	42.0 \pm 7.3	1.41 \pm 0.33
	DRI	1879 \pm 69				

Table 4.1.3. Pearson correlation coefficients of energy intakes among FFQ and 24-hr recalls and Pearson correlation coefficients of fat intake between FFQ and 24-hr recalls

	Pearson's correlation		
	^a <i>r</i> _{QR}	^b <i>r</i> _{QD}	^c <i>r</i> _{RD}
Energy intake (kcal/day)	0.46*	0.58**	0.55**
Fat intake (g/day)	0.49*		

^a Pearson correlation coefficient between intakes measured by FFQ and 24-hr recalls

^b Pearson correlation coefficient between intakes measured by FFQ and DRI

^c Pearson correlation coefficient between intakes measured by 24-hr recalls and DRI

* P< 0.05

** P<0.01

Table 4.1.4 Summary of previous FFQ validation studies: correlation coefficient for energy intake and total fat intake of FFQ against to dietary recalls and food records

Year	Author	Population	compare against to	Correlation Coefficients	
				Energy	Total fat
1993	Kemppainen (119)	Finland	3-day food record	-	0.8
1997	Bonifacj (120)	French	4-day weighed dietary record and 7-day estimated-diet record	0.75	0.66
2000	Yaroch (106)	African-American adolescent girls	3-day dietary recalls	0.54	0.46
2001	Brunner	London, UK	7-day diet dairy	0.30(M) 0.38(F)	0.32(M) 0.41(F)
2002	Lee KY (107)	Japan	7-day dietary records	0.23	0.36
2002	Rodriguez (121)	Adults in Guatemala	3-day dietary recalls	0.64	0.63
2002	Andersen	Norwegian	14-day food dairy		0.36
2002	Johansson	Northern Sweden	10-day 24h recalls	0.67	0.62
2003	Yao, MJ (122)	Chinese, Beijing citizen	Doubly labeled water	0.45	
2003	Xu L (123)	Chinese postmenopausal women	4-day food records	0.72	0.67
2004	Chen Y (124)	Bangladeshi	7-day food dairy	-	0.27
2004	Sevak L (109)	South Asians in UK	12 24-h recalls	0.45	0.53
2005	Tokudome (125)	Japanese	3-day weighed diet record	0.36	0.38
2005	Shatenstein (126)	Candian	4-day food records	0.32-0.58	
2005	Spencer (127)	US, Medical students	5-day diet record	-	0.36
2005	Date (128)	Japanese	12-day weighed dietary records	0.2	0.28
2005	Bautusta (129)	Colombian	7-day weighed intake registry	0.61	0.57
2005	Tseng (25)	Chinese American	3-day 24h recalls	0.3	0.21
2005	Nath (130)	Cuban American	3-day food record	0.67	0.59
2006	Lee (131)	Taiwanese	5-day diet record	0.44	0.38
2006	Boucher (110)	Canada	2-day 24h recalls	0.34	0.29
2006	Bathalon	American	3-day 24h recalls	0.06	
2006	Sawaya (61)	American	2-day 24h recalls	0.66 ^a	

		women		0.63 ^b	
2006	Malekshah (111)	Northern Iran	12 24-h recalls	0.75	0.65
2007	Segovia-Siapco (112)	American	6-day 24h recalls	0.34	0.51

^a compare to Block FFQ

^b compare to Willet FFQ

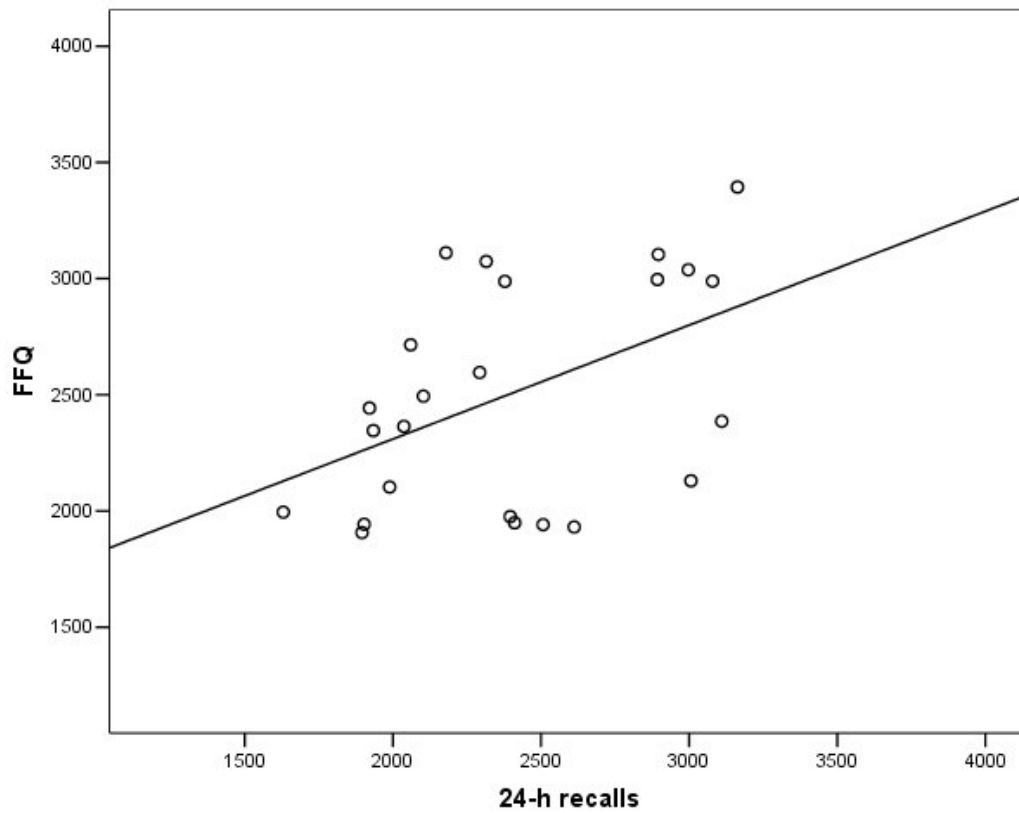


Figure 1. Relationship between total energy intakes obtained from 24-hour recalls and the web-based FFQ.

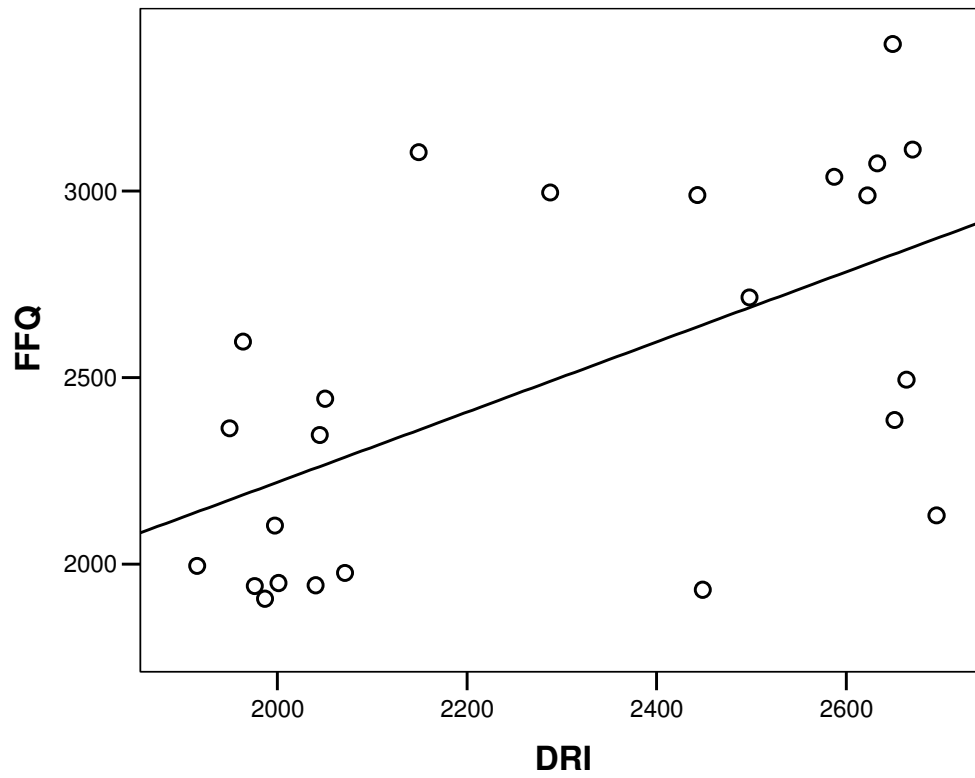


Figure 2. Relationship between total energy intakes obtained from DRI and the web-based FFQ.

4.2 Nutrition knowledge, attitude, and self-efficacy in relation to dietary intakes and BMI among Chinese employed in high-tech industries in China and in the US

Abstract

Background: The differences of dietary intakes, nutrition knowledge, attitudes, and self-efficacy of Chinese in China and in the US remain unknown.

Objective: The objective of this study was to examine nutritional knowledge, attitude and dietary self-efficacy in relation to energy and fat intakes and body mass index (BMI) among Chinese individuals who work in hi-tech industries in China and in the US.

Study Design: A self-administered web based survey was conducted among 4 groups of Chinese employees (aged 21-45 y, mean 31y) in high-tech industries. Two of these groups were in the US including Chinese born immigrants and American born Chinese and two groups in China: employees of Chinese companies and employees of American companies. Dietary intake was assessed by an online food frequency questionnaire (FFQ) developed for this study. Nutritional knowledge, attitude and dietary self-efficacy were examined using the online questionnaire, and BMI was calculated using self reported body height and weight.

Results: Chinese participants in the US had higher dietary self- efficacy (42.5), more nutritional knowledge (9.5) and better nutritional attitude (4.5) than Chinese in China (self-efficacy 37.9, knowledge 8.6, and attitude 3.7); while Chinese-born immigrants in the US had the highest nutritional knowledge and nutritional attitude compare to the other groups. Both American born Chinese men and women reported significantly

higher energy and fat intakes than the other groups. Dietary self-efficacy was a strong predictor of BMI.

Conclusions: Even with higher knowledge, attitude and self-efficacy, American born Chinese consumed the highest amount of energy and fat. This may be due to the acceptable cultural environment, whereby Americans tend to have higher dietary energy intakes than in Chinese. Future research may need to use the same research technique to compare the same variables among Chinese in the US to other cultural groups.

Introduction

With the fast development of the economics over the past decades, under-nutrition is no longer the biggest problem, instead, over-nutrition and diet related chronic diseases, such as chronic heart disease (CHD), obesity, diabetes, and cancer, have become severe problems (8, 132, 133). A longitudinal study on nutrition and chronic diseases in China showed that rapid shifts are occurring towards an unhealthy lifestyle featuring sedentary lifestyle and energy-dense diets.(9, 10) According to this longitudinal study and the 2002 China National Nutrition and Health Survey, urban young Chinese who have higher incomes are at higher risk of consuming an unhealthy diet, which is related to developing chronic diseases (1, 9-13, 134). However, few studies have reported the specific needs of this population in improving dietary intake patterns.

In the US, immigrants adopt American culture and change their behaviors and attitudes towards American society, also known as acculturate. The acculturation process involves changing dietary behavior. Some studies showed that acculturation for Chinese immigrants result in an increase in consumption of western foods such as hamburgers, other meat, and French fries, and will reduce consumption of vegetable, grains and soybean products. Previous cross-cultural studies showed that educational attainment and socioeconomic status (SES) are strong predictors of acculturation to the American culture(14, 15, 135, 136). The US census reports suggest that demographic characteristics of Chinese Americans have been changing rapidly over the past two decades with the arrival of numerous Chinese scholars, students and professional employees (24). The US Immigration and Naturalization Service (INS)

show a fast growth of a Chinese immigration group made up of a highly educated young (specifically between the ages of 20 to 45) professionals working in high-tech industries (24). However, to our knowledge, no study to date has reported the status of dietary behavior and related nutritional factors in this fast growing immigrant group.

To design intervention programs that effectively target behavioral changes, we need to understand the factors that predispose a person to engage in the desired behavior. Public health researchers suggested that among the factors affecting dietary intakes, nutrition knowledge and attitude about foods and health are amenable to change (44). However, the relationships between nutrition knowledge and dietary intakes are often weak, which suggest that other factors may mediate the relationship (27, 44, 46, 48, 137, 138). Self-efficacy is a component of Bandura's Social Cognitive Theory and is defined as an individual's perceived ability to perform a behavior (29, 39, 139-141). Self-efficacy has been shown to be an independent contributor to eating behavior (141). Despite considerable discussion in the literature, few studies have quantified the independent contributions of nutritional and socio-cognitive factors to dietary intakes among this Chinese population that has been found to be growing fast and at higher risk of consuming unhealthy diets. For the current study dietary fat was used as an indicator of nutritional knowledge, attitude and self-efficacy in this study, because dietary fat has received widespread publicity for 3 decades for its adverse health impact.

The current study aimed to determine the associations of nutritional knowledge, attitude, and dietary self-efficacy with dietary intake and body mass

index (BMI) in Chinese individuals working in high-tech industries in China and in the US.

Subjects and methods

The current study was a cross-sectional self-administered on-line survey approved by the University of Maryland Institute Review Board (IRB). All participants were Chinese or American-born Chinese individuals between the ages of 20 and 45 years, who lived and worked in metropolitan areas, and had at least a bachelor degree. All subjects were working in high-tech industries, excluding biotech, medicine, pharmaceuticals, and health industries. The study sample included 4 sub-groups: employees of Chinese companies in China (Ch-1); employees of American companies in China (Ch-2); Chinese-born immigrants in the US (Am-1); and American-born Chinese in the US (Am-2). Participants were recruited from high-tech companies. The sample frame covered high-tech industries in networking, software, hardware, telecom, and technical support.

A bilingual web-based questionnaire was developed for this study. Participants could choose either Chinese or English versions to complete the survey. A web-based food frequency questionnaire (FFQ) was developed to collect data of total energy and fat intakes. The FFQ was developed based on four valid questionnaires, which were used to measure the dietary intake of Chinese in China, urban citizens in Beijing China, Chinese Americans, and Americans (84-87). The FFQ was a 143-item questionnaire that assessed food consumed over the past year. A set of visual aids was developed to assist respondents estimate portion sizes. Development and validation of the web-based FFQ was described in Chapter 4.1. A

nutrient composition database was developed for this study using the USDA nutrient composition database for standard reference 19 (USDA SR19), the Chinese National Food Consumption Nutrient Database 2002 (102), and HealthTech Inc. property software, Asian Assist. The FFQ was pre-tested by utilizing expert panel reviewers, focus groups, and cognitive interviews. The FFQ was validated using a 24-hr recalls. The validation study was described in Chapter 4.1.

Nutritional knowledge was measured using a twelve-item multiple-choice questionnaire on dietary fat. The questionnaire included items on: 1) awareness of different fats; 2) knowledge of the fat content of various foods; 3) experts' recommendation regarding healthy eating related to fat; and 4) relationships between certain fats and chronic diseases. Three existing questionnaires of nutritional knowledge were modified to fit the targeted population of this research. These existing questionnaires are the Diet and Health Knowledge Survey (DHKS) 1994-96 questionnaire (142), nutrition knowledge questionnaire of Wardle and Parmender (47) and a Chinese nutrition knowledge questionnaire used for Chinese urban citizens in China (28), which had been used in China for the residents in Beijing, Shanghai, and Guangzhou.

An attitude scale was developed to measure people's attitudes about daily food intake and long-term health. Based on the USDA's DHKS (142), an attitude scale (six items) was developed for the targeted population. The items used a seven-point Likert-type response format. The total score was derived by summing the scores of individual items.

A dietary self-efficacy scale was developed based on a validated questionnaire created by Ounpuu and Horacek *et al.* (89, 90). The dietary self-efficacy scale focuses on how much people believed that they can avoid or reduce intake of high fat and high-energy food intake. This questionnaire used a 6-item scale, with an 11-point (0 to 10) Likert scale ranging from “I know I cannot” to “I know I can”. The nutritional knowledge and nutritional attitude and dietary self-efficacy scale were evaluated for use in this study by testing it using an expert panel, focus group and cognitive interview.

Self-reported body weight and height information were collected. Also collected were Socio-demographic status measures including age, gender, income, educational attainment, marital status and household size (single family, married couple or extended family which includes children and/or parents).

Statistical Analyses

Descriptive and exploratory data analyses were performed with SPSS and Mplus (Muthén & Muthén, Los Angeles, CA) (98). Self-reported BMI was calculated as weight in kg divided by height in meter square. Based on a report by the Working Group on Obesity in China of the International Life Science Institute (ILSI), a BMI of 24 was used as the cut-off point for overweight and a BMI of 28 was used as the cut-off point of obesity for Chinese adults (143). Three dietary intake variables were analyzed as indicators of energy and fat intakes: total energy intake per kilogram body weight (Kcal/kg), fat intake per kilogram body weight (g/kg), and percentage energy intake from fat. Tukey post hoc multiple comparisons test (one-way ANOVA)

was applied to compare the four study groups' dietary intakes, dietary self-efficacy, nutrition knowledge and attitude.

Multiple linear regression was performed to examine the associations between nutritional knowledge, nutritional attitude and dietary self-efficacy with BMI and dietary intake adjusted for gender, age, education attainment, and population group. Statistical significance was set at $\alpha=0.05$. Energy intake per kg body weight was highly related to fat intake per kg body weight ($r = 0.948$), therefore, in the final model, only fat intake per kg BW was used to avoid high collinear effect. Men and women were analyzed separately.

Path analysis is an extension of the regression model, used to test the fit of the correlation matrix against two or more causal models which are being compared. (144). Using Mplus, Path analyses was conducted to model associations and interactions in the data. The Path analyses tested how other factors affect the relationship between dietary intakes and BMI. Definitional and analytical issues regarding mediation interactions followed the principles outlined by Baron and Kenny (145). The final model shows only path coefficient significance at $\alpha=0.05$. These coefficients from path analyses can be interpreted similarly as beta coefficient from multiple linear regression. Comparative Fit Index (CFI) was used to evaluate the overall goodness-of-fit of the model.

Results

The initial recruiting email was sent to 16,000 Chinese employees in high-tech industries in China and in the US. In total, over 4,400 people registered with the

research website between July 2004 and August 2005 and 967 were identified as useable subjects. Excluded from the analyses were individuals who worked in life sciences/ epidemiology field (n=39), some were not in the target age range (n=2), or others did not have a college degree (n=3). The final sample consisted of 925 subjects from four study groups, and the overall response rate was 5.8%. All participants from China and 97% of the Chinese-born immigrants in the US chose the Chinese version and all the American-born Chinese chose the English version. It took on average 58.9 minutes (range 21-253) to complete the questionnaire.

Characteristics of the population

About half (55.4%) of the participants were men. The mean age of the sample was 31 years, with a range of 21 to 45. Male Chinese-born immigrants (Am-1) were significantly older (mean age 32.9) than the other three groups of men; however, there was no significant difference in age between the four groups of women. The group of Chinese-born immigrants (Am-1) had a higher educational attainment than the other groups. The majority of the study sample was currently married (62%), while 31% were never married. Over half of the participants (58%) did not have children, and 30% had only 1 child. Thirty five percent of the participants lived alone or did not live with immediate family, 38% lived with a spouse or partner, and 27% participants lived with extended families (with spouse, children, and/or parents). (Table 4.2.1)

Nutrition knowledge, attitude and dietary self-efficacy

In this study, men in the US had significantly higher nutritional knowledge than men in China ($P < 0.05$). Neither the two groups of men in China nor those in the US showed significant differences in nutritional knowledge. Both groups of men in the US (Am-1 and Am-2) had significantly better nutritional attitudes than the group of Chinese men working in China (Ch-1) but not better than the group of Chinese men worked in American companies in China (Ch-2). Men of Am-1 group had significantly better attitude than Ch-2 ($P < 0.05$), but did not differ from Am-2 group. In general, men in the US (groups Am-1 and Am-2) had higher self-efficacy than participants in China (groups Ch-1 and Ch-2) ($P < 0.001$). Dietary self-efficacy was not significantly different between the two groups of men in China or two groups of men in the US. (Table 4.2.5)

Women had more nutritional knowledge and better nutritional attitude than men across all four study groups; however, the differences were not significant. Dietary self-efficacy and nutritional attitude did not significantly differ among the four groups of women. Female Chinese born US immigrants (Am-1) had significantly higher nutritional knowledge than the two groups of women in China; but not differ from American born Chinese women (Am-2). No significant differences in nutritional knowledge were found among the women in China (Ch-1, Ch-2) and the American born Chinese women in the US (Am-2).

Dietary self-efficacy, knowledge and attitude scores were analyzed separately for underweight, normal weight and overweight participants of the four study groups.

Dietary self-efficacy was significantly higher among underweight and normal weight groups than the overweight and obesity group (Table 4.2.6).

For normal weight subjects, Tukey post hoc ANOVA analysis results showed that nutritional attitude did not differ across the four groups of men and women. Normal weighted Chinese men in the US (Am-1 and Am-2) had significantly higher dietary self-efficacy than normal weighted Chinese men in China ($P < 0.001$). Among the four groups of men, American-born Chinese men (group Am-2) had the highest self-efficacy than the rest groups of men ($p < 0.05$). Among the four groups of women, those working in American companies in China (Ch-2) had higher self-efficacy than the other groups of women ($p < 0.05$). Both male and female Chinese-born US immigrants (Am-1) had higher nutritional knowledge and better attitude towards healthy diet than the rest of the study groups (Table 4.2.7).

Body Mass Index (BMI)

BMI was analyzed separately by gender. Chinese-born immigrant men (Am-1) had significantly lower mean BMI (23 ± 2) than the other groups of men. No significant difference in BMI was found between the two groups of men in China and the American-born Chinese. The American born Chinese women had the highest mean BMI (21.5 ± 2.2) of the four groups of women. Overweight and obesity were very rare among women of all study groups (3.9%).

Male Chinese born immigrants (Am-1) were less likely to be overweight (26.2%) compared to Chinese in China and American-born Chinese in the US.

Almost half of male participants in China had BMI of 24 or more. Obesity (BMI \geq 28) in this sample was rare (1.9%) across the four groups. Table 4.2.2

Dietary intakes

As expected, energy and absolute fat intakes were significantly higher among men than women (P<0.001). However, mean percentage energy intake from fat was not significantly different between genders. Both American born Chinese men and women reported significantly more energy and fat per kilogram body than the groups in China (P<0.05). (Table 4.2.3)

Table 4.2.4 indicated that overweight participants had significantly higher energy and fat intakes compared to normal and underweight individuals (P<0.001). On average, underweight participants had significantly lower energy and fat intakes as compared to those in the normal weight and overweight groups (P<0.001).

A comparison of the energy and fat intakes among normal weight samples of the four study groups showed that male American-born Chinese participants (Am-2) reported significantly higher energy and fat intakes per kg BW than the other three groups of men. (P=0.005 and P=0.02 for energy intake and fat intake, respectively). Percentage energy from fat was also reported as significantly higher among American-born Chinese men (Am-2) than the other groups of men (P<0.001). However, among women in the normal weight category, no significant differences were found for energy and fat intakes per kg body weight, and percent energy from fat in diet (Table 4.2.4). For normal weight samples, BMI was significantly associated with energy intake and fat intake per kilogram body weight ($r = 0.276$ and $r = 0.291$,

$P < 0.001$); but BMI was not significantly related to percentage energy from fat ($P > 0.05$), neither for men nor women.

Prediction models of dietary intakes and BMI

Pearson's correlation was used to investigate the relationships between BMI, dietary intakes, dietary self-efficacy, nutritional knowledge and attitude. After controlling for age and gender, energy and fat intakes were negatively and significantly related to self-efficacy but not to nutritional knowledge and attitude. BMI was negatively related to self-efficacy and nutritional but, BMI was not significantly related to nutritional knowledge. Self-efficacy was positively related to nutritional knowledge and attitude (Table 4.2.8).

Linear multiple regression analysis was used to explore the relationships between dietary intakes and demographic and nutritional factors. Male gender, being married, bigger household size, and dietary self-efficacy are predictors of energy and fat intakes per kg BW. Sub-group, education level, age, having children, nutritional knowledge and attitude were not significant predictors and were removed from the final model. Outputs of the final models are given in Table 4.2.9 and 4.2.10.

Path analysis was performed to determine the relations between BMI and dietary intakes, demographic and nutrition variables. Based on results of Pearson's correlation and multiple regression analysis, the final model included paths from energy and fat intakes, age, efficacy, nutritional knowledge and nutritional attitude to BMI (Figure 2 and 3). The path model showed both direct and indirect effects of self-efficacy and age upon BMI. Higher energy and fat intakes, older age, lower self-efficacy, low nutritional knowledge score, and lower nutritional attitude are predictors

of having higher BMI. The comparative fit index (CFI) of the two path analysis models was 0.918 and 0.926 for energy intake and fat intake models, respectively. CFI>0.90 is considered in an acceptable range. (146, 147)

Discussion

For both men and women, the current study suggested that Chinese participants in the US had higher dietary self-efficacy, more nutritional knowledge and better nutritional attitude than Chinese participants in China; while Chinese-born immigrants in the US had highest nutritional knowledge and nutritional attitude than the rest groups. Our results suggested a clear advantage of the cross-cultural group, Chinese born immigrants in the US. The Chinese-born immigrants group had the lowest prevalence of overweight, lowest prevalence of underweight, highest nutrition knowledge, good nutrition attitude, high self-efficacy and good dietary intakes. More research is needed to investigate the reasons of the advantages of this group, including whether they are cultural or environmental factors.

The current study was a cross-sectional web based survey that aimed to determine the associations of nutritional knowledge, attitude and dietary self-efficacy with dietary intake and body mass index (BMI) among four groups of Chinese individuals working in high-tech industries in China and in the US. The present study sample contained four groups that showed the cross-cultural transition from China to the US: from Chinese individuals working in Chinese companies in China, to the groups of Chinese individuals working in American companies in China, then Chinese-born individuals who immigrated to the US, and eventually American born Chinese. The four study groups are comparable in age, gender, incomes, and

occupation, while the Chinese-born immigrants had relatively higher educational attainment than the rest groups, and Chinese-born male immigrants were relatively older than the other groups of men.

The results of the current study agree with national survey data on the trends in distribution of BMI among Chinese adults aged 20 to 45 years. A national nutrition and health survey of China suggested that Chinese BMI dynamics show much greater rates of change among men, aged 20-45 years, than among women, with the increase among women concentrated between ages 35 and 45 years from 1989 to 2000 (148). Results of the current study suggested that almost half of the men in Chinese samples were overweight, 49.2% Chinese men in China working for Chinese companies had BMI of 24 or over, while 43.1% Chinese men in China working for American companies in China had BMI of 24 or over. Meanwhile, Chinese men in China became overweight at a younger age compared to Chinese in the US. Our findings that overweight is associated with higher fat and higher energy intakes are consistent with results from previous studies (10, 84, 149). A survey of Beijing citizens (all ages and all incomes) suggested that the prevalence of overweight was 37.1% and the prevalence of obesity was 22.4% in 2002, that is, over half (59.5%) of Beijing citizens have BMI 24 or over (150). Along with the recent dietary transition studies, overweight and unhealthy diet is emerging as a significant problem in large cities in China, as well as in high-tech industries in China, especially for men.

The major findings of this study in Chinese working in hi-tech industries in China and in the US were that fat intake per kg BW is the strongest predictor of BMI and self-efficacy is a strong predictor of energy and fat intakes. Age, male gender,

and nutritional attitude were also predictors of BMI. However, percentage energy from fat and nutritional knowledge was not significantly associated with BMI. The results were consistent with previous studies in Chinese population as well as US populations(151). These results indicate that the amount of fat and energy other than percent energy from fat are strong predictors of BMI. However, percentage energy from fat was significantly higher in overweight and obese subjects than normal weight and underweight subjects. This result agrees with previous research (152). To help this Chinese population controlling body weight, we should consider the amount of energy and fat intakes as a more important factor instead of the percentage energy from fat.

Known predictors of BMI have been confirmed. The results of this study are consistent with the commonly recognized conclusion that self-efficacy is a strong predictor of behavior (141). However, the current study results showed that American born Chinese men had high self-efficacy but also had high intakes of total energy and fat. More research is needed to discover the differences between levels of dietary self-efficacy in American-born Chinese and non American-born Chinese groups.

Nutrition knowledge was not shown to be a predictor of dietary behavior, which is consistent with previous studies. Controlling of dietary fat intake has been studied and discussed often. Most well educated people have been exposed to the health information about dietary fat intake, in relation both to prevention of chronic disease and weight control. Nutrition knowledge may not be a significant barrier to healthy dietary change. Future studies are needed to discover other aspects of knowledge in dietary intakes that has not been publicized as much, yet need to

improve. We need much more research into the ways people learn and use food-related knowledge in the form of systematic reviews, experimental interventions, path modeling studies, decision process studies and longitudinal studies.

Our study has several limitations. Physical Activity Level (PAL) was not collected and yet may have explained why BMI and the prevalence of overweight were significantly lower in the group of Chinese born immigrants than the other groups of men but there were no significant difference found in dietary intakes.

Subjects were self-selected and this sample was not a random sample, and therefore, they were not necessarily representative of the overall Chinese employees in high-tech industries, although stratified sampling technique was used. There is currently no published national data of the study population (citizens in large cities, working in hi-tech industries, and with college degree or higher). The mean BMIs of the men in China of the current study were considered comparable with the data of China national nutrition and health survey 2002 for citizens in large cities in China (11). The mean BMIs of the women in China in current study were slightly lower than the national data for younger aged participants (included all occupations). More research is needed to discover the accuracy of self-reported body weight and height of young women on the web.

Another limitation of this study was the relatively low response rate. Response rates of web-based surveys varied largely by topics and design(68, 100). The initial invitation letters were sent to 16,000 potential participants. Over 4,400 (28%) participants logged into our research website, and 925 (5.8%) responses were useable data. According to a meta-analysis of response rates in web or internet-based surveys,

questionnaire length, personalized letters, regular follow-ups, and incentives are factors which affect response rates (153). Participants spent about 1 hour on average to complete the current web-based survey which is considered long. Due to the difficulty of approaching eligible subjects, we were not able to send personalized invitation letters. Invitation emails were sent directly from the employer or co-workers, which could have had a positive impact on response. However, invitation emails were sent to a place of employment during work days, which may be a factor that hindered the response. To improve response rate, two follow-up invitation emails were sent to every individual in the sample frame and five follow-up emails were sent to incomplete respondents in order to increase the response rate. Incentives (\$50 sweepstakes) were also provided to increase the response rate, because incentives were suggested to improve response rates.

To our knowledge, the current study was the first known web-based survey that investigated the dietary intakes and nutritional knowledge, attitude, and dietary self-efficacy among Chinese individuals working in high-tech industries. The current study also suggested that an online survey performed as well as a conventional paper-and-pencil study. Our study revealed advantages of conducting a web-based survey among the known to be Internet savvy population. The method developed for this study was shown to be cost-effective and time saving with the respect to data entry. The method used for this study and the web-based questionnaire created for this study (including a web-based FFQ) can be applied in future studies among different populations.

Conclusion

In conclusion, our findings reveal that Chinese participants in the US had higher dietary self-efficacy, more nutritional knowledge and better nutritional attitude than Chinese participants in China; while Chinese-born immigrants to the US had highest nutritional knowledge and nutritional attitude than the rest of the study groups. Energy and fat intakes and self-efficacy were strong predictors of BMI, but percentage energy from fat was not associated with BMI. Future nutrition promotion programs in this population should focus on controlling the amount of energy and fat intakes and improving self-efficacy. More nutrition education effort need to be given to Chinese men who work in high-tech industries in China in order to increase their nutritional knowledge.

Tables and figures

Table 4.2.1 Socio-demographic Characteristics and body mass index of the study sample by group and gender

	Men (n=512)				Women (n=413)			
	¹ Ch-1 (n = 130)	² Ch-2 (n =116)	³ Am-1 (n = 202)	⁴ Am-2 (n = 64)	Ch-1 (n = 103)	Ch-2 (n = 89)	Am-1 (n = 184)	Am-2 (n = 37)
	(mean ± S.D.)							
Age (y)	30.2 ± 5.0	30.4 ± 4.7	*32.9 ± 4.3	31.3 ± 6.1	31.1 ± 5.8	30.7 ± 5.2	29.9 ± 2.8	29.7 ± 4.9
BMI (kg/m ²)	23.8 ± 2.9	23.7 ± 2.8	*22.7 ± 1.9 ^a	23.2 ± 2.7	20.3 ± 2.0	20.0 ± 1.8	20.4 ± 1.7	*21.5 ± 2.2 ^b
Education	N (%)							
Bachelors	74 (56.9)	63 (54.3)	13 (6.6)	27 (42.2)	68 (66.0)	55 (61.8)	23 (12.5)	16 (43.2)
Masters	37(28.5)	35 (30.2)	119 (60.7)	30 (46.9)	22 (21.4)	22 (24.7)	131(71.2)	20 (54.1)
PhD	19 (14.6)	18 (15.5)	64 (32.7)	7 (10.9)	13 (12.6)	12 (13.5)	30 (16.3)	1 (2.7)
Marital Status	N (%)							
Single	44 (34.4)	36 (31.3)	60 (30.9)	22 (34.9)	30 (29.1)	28 (31.5)	59 (32.1)	8 (23.5)
Married	78 (60.9)	72 (62.6)	121(62.4)	39 (61.9)	64 (62.1)	55 (61.8)	113 (61.4)	26 (76.5)
Divorced	6 (4.7)	7 (6.1)	13 (6.7)	2 (3.2)	9 (8.7)	6 (6.7)	12 (6.5)	0 (0.0)
Household type	N (%)							
Single family	42 (33.3)	42 (36.2)	73 (36.1)	21 (32.8)	36 (35.3)	32 (36.0)	67 (36.4)	5 (13.5)
Household of 2	39 (31.0)	37 (31.9)	71 (35.1)	20 (31.3)	47 (46.1)	28 (31.5)	81 (44.0)	26 (70.3)
> 2 members	45 (35.7)	37 (31.9)	58 (28.7)	23 (35.9)	19 (18.6)	29 (32.6)	36 (19.6)	6 (16.2)
Has Children	N (%)							
No	72 (60.5)	45 (41.7)	131 (65.8)	38 (59.4)	67 (67.7)	55 (64.7)	140 (76.1)	23 (62.2)
Yes	47 (39.5)	63 (58.3)	68 (34.2)	26 (40.6)	32 (32.3)	30 (35.3)	44 (23.9)	14 (37.8)

¹Ch-1: Chinese working in Chinese high-tech companies in China

²Ch-2: Chinese working in American high-tech companies in China

³Am-1: Chinese-born immigrants in the US

⁴Am-2: American-born Chinese in the US

a. Mean BMI of men of the Am-1 group was significantly lower than the other three groups of men

b. Mean BMI of women of the Am-2 group was significantly higher than the other three groups of women

* $p < 0.05$

Table 4.2.2 Distribution of underweight, normal weight and over-weight participants by gender and group

	Group				N(%)
	¹ Ch-1	² Ch-2	³ Am-1	⁴ Am-2	
Men					
⁵ Underweight	3 (2.3)	2 (1.7)	0 (0)	2 (3.1)	
⁶ Normal weight	63 (48.5)	64 (55.2)	149 (73.8)	33 (51.6)	
⁷ Overweight	64 (49.2)	50 (43.1)	53 (26.2)	29 (45.3)	
Women					
Underweight	16 (15.5)	22 (24.7)	31 (16.8)	4 (10.8)	
Normal weight	80 (77.7)	65 (73.0)	149 (81.0)	30 (81.1)	
Overweight	7 (6.8)	2 (2.2)	4 (2.2)	3 (8.1)	

¹Ch-1: Chinese working in Chinese high-tech companies in China
²Ch-2: Chinese working in American high-tech companies in China
³Am-1: Chinese-born immigrants in the US
⁴Am-2: American-born Chinese in the US
⁵Underweight: BMI<18.5
⁶Normal weight: 18.5<=BMI<24
⁷Overweight: BMI>=24

Table 4.2.3 Total energy and total fat intake by gender and group

Group	Kcal/kg BW /day	Fat (g)/kg BW/ day	% Energy from Fat (%)
Men			
¹ Ch-1	34.9±8.5	1.3±0.3	34.0±3.2
² Ch-2	34.5±9.1	1.3±0.4	34.1±3.2
³ Am-1	34.9±10.4	1.3±0.4	34.0±3.1
⁴ Am-2	37.9± 8.0*	1.4±0.3*	34.1±2.1
Women			
Ch-1	28.5±7.6	1.1±0.3	34.3±3.1
Ch-2	27.5±8.4	1.1±.04	34.3±3.6
Am-1	28.0±7.0	1.1±0.3	34.1±2.8
Am-2	30.7±5.5*	1.2±0.6*	34.7±2.8

* $P < 0.05$

¹Ch-1: Chinese working in Chinese high-tech companies in China

²Ch-2: Chinese working in American high-tech companies in China

³Am-1: Chinese-born immigrants in the US

⁴Am-2: American-born Chinese in the US

Table 4.2.4 Energy and fat intake of underweight, normal weight and overweight sample

	Group by BMI		Mean	S.D.
Energy intake (kcal/day)	Underweight	(n=80)	1703*	317
	Normal weight	(n=633)	1865*	390
	Over weight	(n=212)	2374*	375
Fat Intake (g/day)	Underweight	(n=80)	63.6*	13.7
	Normal weight	(n=633)	70.1*	16.7
	Over weight	(n=212)	93.6*	18.1
% Energy from Fat (%)	Underweight	(n=80)	33.5	3.0
	Normal weight	(n=633)	33.8	3.0
	Over weight	(n=212)	35.4	2.9
Energy per Kg BW (kcal/kg BW)	Underweight	(n=80)	29.4*	6.9
	Normal weight	(n=633)	30.1*	8.2
	Over weight	(n=212)	39.1*	9.2
Fat per Kg BW (g/kg BW)	Underweight	(n=80)	1.1*	0.3
	Normal weight	(n=633)	1.1*	0.3
	Over weight	(n=212)	1.5*	0.4

* $p < 0.001$

Table 4.2.5 Self-efficacy, nutrition knowledge and nutrition attitude of the four study groups

Group	Knowledge	Attitude	Self-Efficacy
Men			
¹ Ch-1	7.9 ± 2.4	2.9 ± 3.3	33.0 ± 9.1
² Ch-2	8.1 ± 2.3	3.3 ± 3.4	35.5 ± 11.2
³ Am-1	9.3 ± 1.6 ^a	4.4 ± 3.6 ^a	42.8 ± 11.2 ^a
⁴ Am-2	9.1 ± 1.7	4.4 ± 2.3	44.3 ± 8.5
Women			
Ch-1	9.3 ± 2.2	4.4 ± 3.3	41.3 ± 10.0
Ch-2	9.2 ± 1.9	4.4 ± 3.0	44.2 ± 9.7
Am-1	9.9 ± 1.3*	4.6 ± 3.1	41.5 ± 11.7
Am-2	9.2 ± 1.4	4.4 ± 3.1	43.0 ± 10.6

¹Ch-1: Chinese working in Chinese high-tech companies in China

²Ch-2: Chinese working in American high-tech companies in China

³Am-1: Chinese-born immigrants in the US

⁴Am-2: American-born Chinese in the US

^a Two groups in the US had significant higher mean score than the two groups in China ($P < 0.001$)

* Significantly higher than the rest groups ($P < 0.05$)

Table 4.2.6 Dietary self-efficacy, nutritional knowledge and attitude of underweight, normal weight and overweight subjects.

	Mean	S.D.
Efficacy		
¹ Underweight	46.0	7.4
² Normal weight	42.1	10.6
³ Overweight	32.8*	10.6
Knowledge		
Underweight	9.1	1.5
Normal weight	9.2	1.9
Overweight	8.6**	2.2
Attitude		
Underweight	4.3	3.0
Normal weight	4.3	3.4
Overweight	4.1**	3.3

* $P < 0.001$

** $P < 0.05$

¹Underweight: BMI < 18.5

²Normal weight: $18.5 \leq \text{BMI} < 24$

³Overweight: BMI ≥ 24

Table 4.2.7 Self-efficacy, nutrition knowledge and nutrition attitude of the normal weighted sample ($18.5 \leq \text{BMI} < 24$)

Group	Knowledge	Attitude	Self-Efficacy
Men			
¹ Ch-1	8.1 ± 2.5	3.6 ± 3.4	37.1 ± 7.6
² Ch-2	8.1 ± 2.3	3.7 ± 3.2	38.3 ± 9.5
³ Am-1	9.3 ± 1.7 ^a	4.4 ± 3.8 ^a	46.1 ± 9.5 ^a
⁴ Am-2	9.1 ± 1.4	4.3 ± 2.0	48.2 ± 5.7
Women			
Ch-1	9.3 ± 2.3	4.4 ± 3.3	40.6 ± 10.7
Ch-2	9.4 ± 1.9	4.3 ± 3.2	43.3 ± 10.8*
Am-1	9.9 ± 1.3*	4.6 ± 3.2	41.1 ± 11.9
Am-2	9.4 ± 1.4	4.7 ± 3.1	42.9 ± 10.5

¹Ch-1: Chinese working in Chinese high-tech companies in China

²Ch-2: Chinese working in American high-tech companies in China

³Am-1: Chinese-born immigrants in the US

⁴Am-2: American-born Chinese in the US

^a Two groups in the US had significant higher mean score than the two groups in China ($p < 0.001$)

* Significantly higher than the rest groups ($P < 0.001$)

Table 4.2.8 Significant Pearson's correlations among energy and fat intakes, dietary self-efficacy, nutritional knowledge, nutritional attitude and BMI.

	BMI	Education	Self-efficacy	Knowledge	% EN from Fat	Kcal per Kg BW
Self- efficacy	-0.46 ^a					
Knowledge		0.18 ^a	0.09 ^b			
Attitude	-0.18 ^a		0.20 ^a	0.17 ^a		
% energy from Fat	0.29 ^a		-0.15 ^a			
Energy intake /kg bw	0.26 ^a		-0.18 ^a		0.14 ^a	
Fat intake /kg bw	0.33 ^a		-0.20 ^a		0.43 ^a	0.95 ^a

^a $p < 0.001$

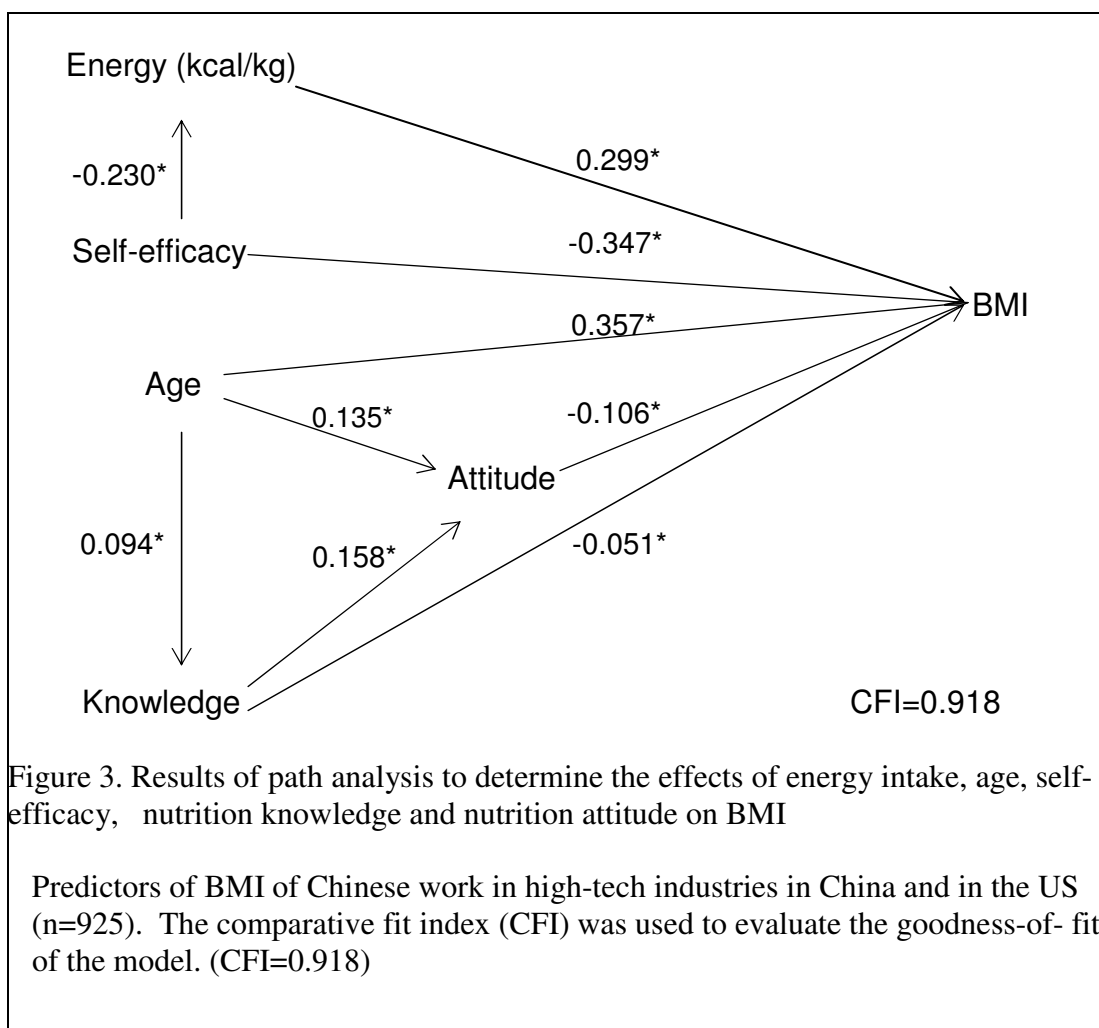
^b $p < 0.01$

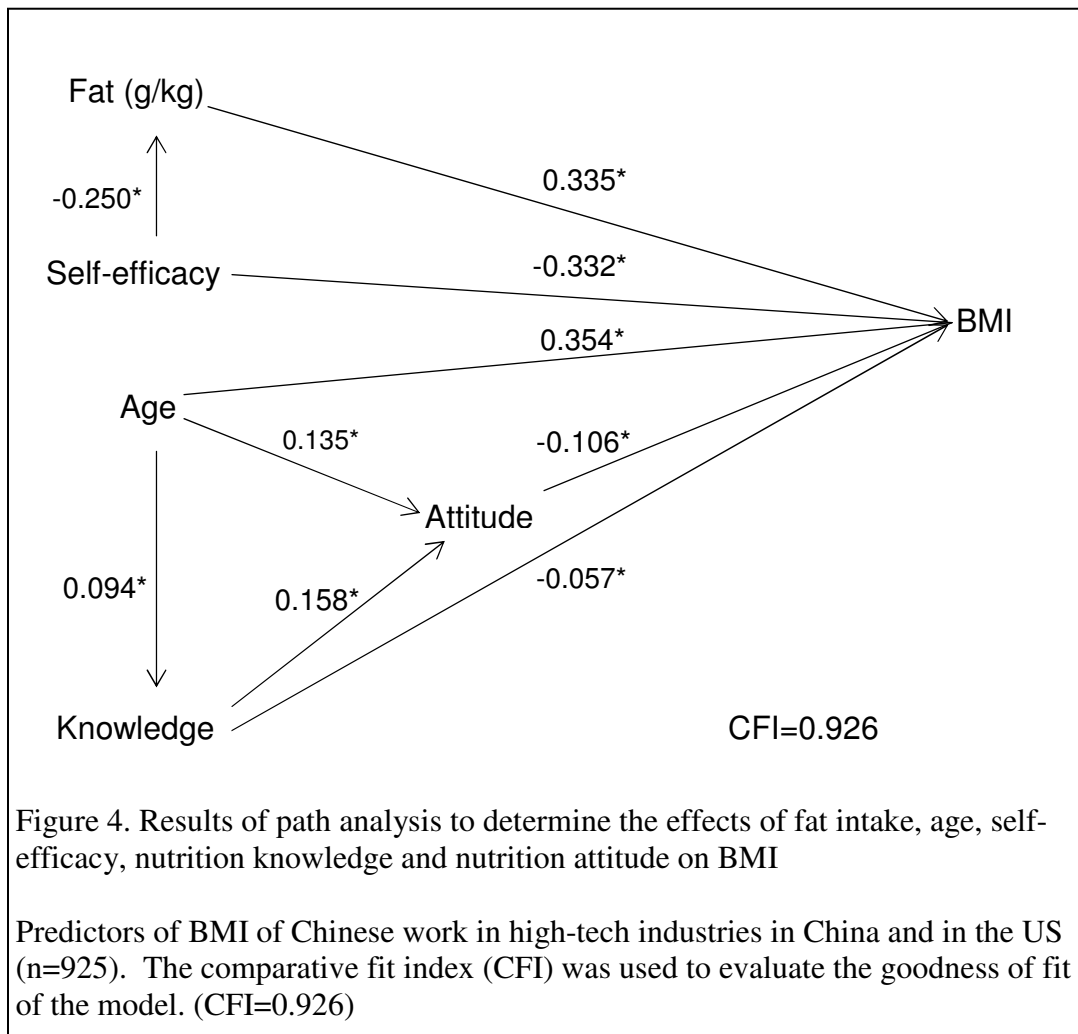
Table 4.2.9. Predictors of fat intake per kg body weight among Chinese individuals work in high-tech industries in China and in the US

Model	Unstandardized		Standardized	<i>t</i>	<i>p</i>
	Coefficient	S.E.	Coefficient		
	β		β		
1 (Constant)	1.608	.037		43.918	.000
Gender	-.266	.024	-.348	-11.147	.000
2 (Constant)	1.605	.052		30.700	.000
Gender	-.258	.024	-.337	-10.809	.000
Marital status	-.077	.028	-.113	-2.733	.006
Household size	.065	.020	.135	3.260	.001
3 (Constant)	1.841	.064		28.678	.000
Gender	-.237	.024	-.310	-10.039	.000
Marital status	-.068	.028	-.100	-2.454	.014
Household size	.054	.020	.111	2.736	.006
Efficacy	-.006	.001	-.189	-6.108	.000

Table 4.2.10. Predictors of energy intake per kg body weight among Chinese individuals work in high-tech industries in China and in the US

Model	Unstandardized Coefficient		Standardized Coefficient	<i>t</i>	<i>p</i>
	β	S.E	β		
1 (Constant)	42.441	.868		48.890	.000
Gender	-7.100	.566	-.385	-12.554	.000
2 (Constant)	42.311	1.239		34.163	.000
Gender	-6.895	.565	-.374	-12.202	.000
Marital status	-1.947	.670	-.118	-2.907	.004
Household size	1.675	.475	.144	3.530	.000
3 (Constant)	47.189	1.528		30.875	.000
Gender	-6.468	.562	-.351	-11.500	.000
Marital status	-1.758	.661	-.107	-2.660	.008
Household size	1.442	.470	.124	3.069	.002
Efficacy	-.133	.025	-.162	-5.301	.000





**4.3 Acculturation and diet of Chinese employed in high-tech industries in the US:
results from a web-based survey**

Abstract

Objective: To determine the association of acculturation with total energy and total fat intakes among the Chinese born (1st generation) and US born (2nd generation) Chinese who work in the high-tech industries in the US.

Study Design: cross-sectional self-administered on-line survey.

Setting: Eight metropolitan areas in the US.

Subjects: The study sample included a total of 487 Chinese-Americans aged 20-45 y, who were born in China (n=386) or in the US (n=101), who lived in a metropolitan area in the US, and were employed in a high-tech industry.

Results: The 2nd generation Chinese-American respondents had significantly higher intake of total energy and fat than the 1st generation Chinese immigrants ($p<0.001$), but percentage energy intake from fat did not differ between the two groups. Preference for Chinese food was associated with lower energy and lower fat intake in the 1st generation Chinese immigrants; however, preference for Chinese food was shown related to higher fat intakes in the 2nd generation group. Preference for Chinese leisure activity was shown related to lower fat intakes and preference for American social activity was shown related to higher fat intakes in the 1st generation group.

Conclusions: Our study showed significant difference between the 1st and 2nd generation Chinese immigrants in dietary intakes, acculturation and their relationships. Future nutrition research should recognize the different aspects of

acculturation and its effects on dietary intakes. Culturally appropriate nutrition intervention program should minimize the undesired impacts of acculturation on health and maximize the desirable impacts of acculturation.

Key words: acculturation; energy intake; fat intake; web-based survey; FFQ; Chinese American; immigrants, American-born Chinese;

Introduction

Immigration to a new country is usually accompanied by environmental and lifestyle changes. This process involves changes that take place as a result of continuous and direct contact between individuals having different cultural origins, that is, acculturation (32, 33, 154, 155). Such changes affect attitudes, behaviors, values, and sense of cultural identity (155). The acculturation process affects behavioral changes including dietary behavior, which can impact health.

Chinese immigrants in the US can retain a Chinese diet, adopt an American diet, or follow a mixture of the two dietary patterns. Regardless of dietary pattern, Chinese or American, nutrient intakes through food have an impact on long term health. Of the many dietary factors that have been suggested to cause obesity and chronic diseases, total energy intake and dietary fat have received particular attention (3-6). Very few studies have reported the association of total energy and fat intakes with acculturation among Chinese Americans. Previous cross-cultural studies suggested that younger age, higher educational attainment, better English proficiency, being employed outside the home and having resided in the US for a longer period of time are associated with higher acculturation; and acculturation to the American culture is associated with increased consumption of fat, meat, and sweets that are high-energy dense foods (16, 21-23, 26). Most of these studies have examined the acculturation and dietary intakes among college students, Chinese immigrants of lower income and lower educational attainment (15, 26). Since the 1980s, the demographic characteristics of Chinese Americans have been changing rapidly with the arrival of numerous Chinese scholars, students and professional employees.

Recent national statistics show the fast growth of Chinese immigrants who are highly educated young (aged 20 to 45) professionals working in high-tech industries (24). However, no studies have been reported on the status of dietary behavior and related nutritional factors in this fast growing immigrant population of Chinese.

The objective of this research was to examine the relationship between acculturation and total energy and fat intakes among Chinese immigrants in the US using a web-based survey. The study sample included both the 1st generation immigrants (Chinese-born immigrants) and the 2nd generation immigrants including American-born Chinese and immigrants who moved to the US before the age of 12 years. The targeted population was young (aged 20 to 45 years) Chinese Americans who worked in high-tech industries and had at least a bachelor's degree.

Subjects and Methods

Study design

The current study is a component of a larger study described in detail in Chapter 3. Briefly, this study is a cross-sectional self-administered on-line survey of Chinese employed in high-tech industries in China and in the US. This survey was conducted to examine the dietary intakes, nutrition knowledge, nutrition attitude, dietary self-efficacy and acculturation level. A bilingual web-based questionnaire was developed and pre-tested on the internet for this study. Participants could choose either a Chinese or an English version to complete the survey. Data were collected through the Internet between July 2004 and August 2005. This section of the study of

acculturation included only participants in the US. The present study was approved by the University of Maryland Institute Review Board (IRB).

Subjects

The study sample comprised 386 first generation immigrants (born in China or moved to the US after 12 years or older) and 101 second generation immigrants (born in the US or moved to the US before 12 years of age). All participants were between ages of 20 to 45 years old who lived and worked in metropolitan areas and who had at least a bachelor's degree. Participants were recruited from high tech industries through the Department of Human Resource. Three factors were considered in the sampling design: business population size, physical location and business field. The sample frame covered high-tech industries specializing in networking, software, hardware, telecommunications and information technology support. Eight metropolitan areas were selected in the US to recruit subjects: Seattle, San Francisco, San Diego, Chicago, New York City, Washington D.C., Houston, and Boulder. The invitation emails were sent to the potential subjects three times, one week apart, by the Chinese association of each company. All these participating companies provided total number of Chinese employees who were on the email invitation list to allow calculation of response rates.

Assessment of acculturation

An acculturation scale was developed using bi-dimensional multi-domain model and was based on four available tools: Suinn-Lew Asian self identify acculturation scale (91), Tsai's Chinese acculturation scale (92), Satia's Chinese

acculturation scale (15), and Lee's acculturation questionnaire for Korean Americans (14). The acculturation scale was evaluated and pre-tested using an expert panel, a focus group and cognitive interviews. The final version was a 18-item multiple-choice questionnaire that covered four domains: language preference and proficiency, social affiliation, leisure-time activity, and food preference. Language preference and proficiency surveyed preferred language (Chinese or English) spoken at home, outside of home, and reading/written language proficiency. Social affiliation assessed the individual's participation in four different social activities in Chinese and American communities: sports groups, civic groups, professional groups, and religious groups. Leisure time activities included preferences in casual entertainment, such as music, movies, internet surfing, television watching, etc. Food preference included preferred foods at home, outside of home and grocery shopping. Each item of the acculturation scale has four possible responses that indicated preferences for Chinese culture, American culture, both cultures equally, or neither culture.

Each item of acculturation scale was dummy coded, where 1 means this item was checked and 0 means it was not checked. For example, the Chinese score will be one if a person checked to prefer Chinese more, and all other scores (bi-culture, American culture, and neither) will be zero for this item. Scores of acculturation items were summed to produce total scores for four domains in Chinese culture, American culture, bi-culture and neither.

Five demographic variables of acculturation were also collected in the questionnaire: the age at the time of immigration to the US, length of residence, place of birth, and birth places of the parents and grandparents.

Assessment of total energy and fat intakes

Dietary intake was assessed using a web-based Food Frequency Questionnaire (FFQ). The FFQ was developed based on four questionnaires, which were used to measure the dietary intake of Chinese in China, urban citizens in Beijing China, Chinese Americans, and Americans in the US (84-87). The FFQ was a 143-item questionnaire that assessed food consumed over the past one year. Visual aid graphics were provided to improve the accuracy of portion estimation. Development and validation of the web-based FFQ was described in details chapter 4.1. A nutrient composition database was developed for this study using the USDA nutrient composition database for standard reference 19 (USDA SR19), the Chinese National Food Consumption Nutrient Database 2002, and HealthTech Inc. property software, Asian Assist. Total energy and total fat intakes were calculated for each individual.

Socio-demographic status measures collected include age, gender, income, education, marital status and household size (single family, couple family or extended family that includes children and/or parents). Body height and weight were self-reported.

Statistical Analyses

Data were automatically generated into a database using Structured Query Language (SQL) server. Complete raw data sets were downloaded into Microsoft Excel files. The data were coded in Excel, and then exported into Statistical Package for the Social Sciences (SPSS) data set. Descriptive and exploratory data analyses were performed with the use of SPSS 13.0 for WINDOWS (SPSS Inc, Chicago) (99)

and Mplus (Muthén & Muthén, Los Angeles, CA) (98). BMI was calculated using self reported body weight (BW) and body height of each individual. Energy and fat intakes were estimated using three indicators: total energy intake per kg BW (Kcal/kg), fat intake per kg BW (g/kg), and percentage energy intake from fat. Pearson's correlation was used to examine the degree of associations between four domains of acculturation and energy and fat intakes. Student *t*-test and one-way ANOVA were conducted to compare means of different groups. Significance level was set to 0.05.

K-means cluster analysis and Latent Class Analysis (LCA) were used to identify homogeneous subgroups of participants by acculturation. The K-means cluster analysis procedure assumes that the data fall into a known number of clusters. Given this number, the procedure will assign cases to clusters. Variables should be quantitative at the interval or ratio level (99). K-means Cluster Analysis was used on comparison to acculturation at the domain level: food preference, social affiliation, leisure time activity and language preference. Acculturation scores of four domains were weighed to make the scores compatible. The K-means cluster analysis was conducted using SPSS.

Furthermore, participants' response to each individual question was used in Latent class analysis (LCA) modeling to identify potential acculturation subgroups. LCA is a multivariate technique which can be applied to cluster analysis, factor analysis, or regression analysis. Latent constructs are created from indicator variables, as in structural equation modeling, and then used to construct clusters, factors, or to predict dependents in regression mode (156). LCA is a statistical method for finding

subtypes of related cases (latent classes) from multivariate categorical data. LCA was conducted using Mplus.

General Linear Model (GLM) was used to estimate the joint significance of predictors of various acculturation measures and other factors on total energy and fat intakes. Age and gender were controlled in these models. The type III sums of squares were used to evaluate the significance of each measure in the model. The 1st and 2nd generation groups were analyzed separately because the constructs of the two groups were different. All the acculturation measures were entered into GLM models simultaneously for the 1st generation and only the food preference was entered into regression model for the 2nd generation group. Acculturation score was used as categorical variable. Based on exploratory analysis of GLM, the candidate predictors for energy and fat intakes were selected. To avoid variables with large values overwhelming variables with small values, fat intake per kg BW and percentage energy from fat were rescaled to match the other dietary variables. Significance level was set to 0.05 in these analyses.

Results

Socio-demographic characteristics and BMI

A total of 487 Chinese participants were included in the final analysis. The 1st generation Chinese immigrants moved to the US between the ages of 19 and 31, average age of 24.7 ± 2.6 years. Eighty four out of 101 (83%) 2nd generation participants were born in the US, 14 respondents were born in mainland China and 2 respondents were born in Taiwan. Mean age of these immigrants when moved to the

US was 6.0 ± 3.5 years. Over 95% of the participants reported that their parents were born in China, and the rest reported one of their parents was born in the US. The mean age of the study sample was 31.5 ± 4.0 years for the 1st generation and 30.7 ± 5.7 years for the 2nd generation respondents. The two groups showed no significant difference with age. The entire sample had a college education or higher. Ninety one percent of the 1st generation Chinese immigrants obtained a master degree or higher in the US, and 32.7% of men and 16.3 % of women obtained a PhD degree. Over half of the 2nd generation Chinese-Americans had a graduate degree (57.8% for men, and 56.8% for women). (Table 4.3.1)

Acculturation

There were significant differences in four domains of acculturation between the 1st and 2nd generation Chinese-Americans ($p < 0.001$), while food choices showed least difference among the four domains. Pearson's correlation analysis showed weak but significant relationships between acculturation level and the age at the time of immigration to the US from China for the 1st generation participants. The age at the time of immigration to the US had a positive relationship with social affiliation in the Chinese community ($r = 0.22$, $P < 0.001$) and negative relationship with the social affiliation in American community ($r = -0.25$, $p < 0.001$), but the age at the time of immigration was not significantly related to food or language preferences in the 1st generation group. The length of residence in the US was negatively associated with acculturation level to Chinese culture ($r = -0.32$, $p < 0.001$) and positively associated with bi-culture and American culture ($r = 0.24$ and 0.21 , $p < 0.001$). That means the

longer the immigrants lived in the US, the lower their Chinese cultural scores and the higher their bi-culture scores and American culture score. Language preference was the domain of acculturation most affected by the length of stay in the US, followed by social affiliation and leisure time activity. The food preference towards American food was influenced the least by the length of stay in the US. (Table 4.3.2) The 2nd generation showed great homogeneity towards American culture with three domains: language preference, social affiliation, and leisure time activity. The food preference showed some variance. (Table 4.3.2)

Relationship between acculturation and dietary intakes

Regression analysis showed that being male, residing longer in the US, preferring Chinese food, preferring Chinese leisure activity, and preferring American social affiliation were all significant predictors of energy and fat intakes among the 1st generation group. Affiliation to American social activities was a strong predictor for consuming higher energy and fat intakes. Preferences for Chinese food and Chinese leisure activity were associated with lower intake of energy and fat. Preference for “both cultures” was not a significant predictor of dietary intakes. (Table 4.3.3)

Results also indicated that preference for Chinese food was significantly associated with fat intake per kg BW ($R^2 = 0.21$, $p = 0.04$), but not with energy intake ($R^2 = 0.24$, $p = 0.14$). Preference for American food or both Chinese and American food was not statistically associated with energy intake ($R^2 = 0.24$, $p = 0.18$) or fat intake ($R^2 = 0.20$, $p = 0.21$).

Discussion

Using a web-based survey, we examined how acculturation was associated with the total energy and fat intakes among the Chinese-born immigrants and American-born Chinese who worked in high-tech industries. In both men and women, energy and fat intakes were significantly higher among the American-born Chinese (2nd generation). However, percentage energy from fat was not significantly different between the two groups. This study is consistent with previous studies whereby the self-reported energy and fat intakes of the 1st generation group were significantly lower than self-reported consumptions of the 2nd generation group (16, 157).

The 1st generation Chinese American participants who had BMI lower than 24 (normal weight) consumed less energy and fat per kg BW than the 2nd generation Chinese immigrants in the same BMI category ($P < 0.001$). On the contrary, for the overweight participants ($BMI > 24$), the 1st generation participants consumed slightly but significantly higher energy and fat than the 2nd generation participants who had BMI of 24 or over ($P < 0.05$). The results suggested that the high prevalence of overweight in the 2nd generation group could be due to the relatively high intake of energy and fat of the entire population including normal weight participants.

Higher energy and fat intakes were paralleled by a higher prevalence of overweight among the 2nd generation group (45.3%), which was also greater than the prevalence among the 1st generation (26.2%). This result is consistent with previous cross-cultural studies (16, 18, 158). Popkin and Udry analyzed the National Adolescent Health Survey and found that Asian American adolescents born in the US

are more than twice as likely to be obese than the first generation immigrants of the 50 states (18).

Significant differences between the two groups in acculturation were found between the 1st and 2nd generation Chinese American participants in this study. The 1st generation groups showed great homogeneity in language and food preference towards Chinese foods; but the acculturation measures in social activity and leisure-time activity varied between individuals. Affiliation to American social activities was associated with higher energy and fat intake, while preference for Chinese leisure-time activities was associated with lower energy and fat intakes among the 1st generation group. The 2nd generation Chinese Americans showed great homogeneity towards American culture in language preferences, social activity involvement, and leisure time activities. In addition, the 2nd generation Chinese Americans was more inclined to eat Chinese foods. Cluster analyses results suggested that both the 1st and 2nd generation groups were homogenous in acculturation within groups.

Differences between the two groups were also found in the relationship between food preference and dietary intakes among the study sample. For the 1st generation group, the stronger the preference for Chinese food, the lower the energy and fat consumption. However, the relationship between food preference and dietary intakes was the opposite among the 2nd generation group: the more a person preferred Chinese food, the higher their fat intake. The results indicated that despite acculturation, Chinese still eat Chinese foods and at the same time eat more calories and fat. The inverse relationship between the 2 study groups might be explained in that the 2nd generation Chinese Americans consumes bigger portions of foods than the

1st generation. Another possibility is that the two groups of Chinese American consume different types of Chinese foods. Many previous studies have found that large food portions contributed to the increasing in obesity in the US (159-161). This may also explain why the normal weight participants of the 2nd generation consumed more energy and fat than the 1st generation participants who were also normal weight. More research is needed to investigate the food portions consumed by the two groups of Chinese Americans. Chinese food is one of the most popular ethnic foods in the US. It will also be worthwhile to examine the differences between Chinese foods consumed by Chinese-born immigrants and American born Chinese or other ethnicities in the US. Also, a comparison with a control group of Chinese in China will help to understand the impacts of exposure to the American culture on food portions and different types of Chinese foods.

A limitation of this study is that it was not a systematic, random sample of the entire Chinese-American population in high-tech industries. Instead, a stratified and cluster sampling technique was used and the subjects were recruited through their employers. To overcome this limitation, we recruited companies in different sizes and locations and fields. According to the standard of Statistics of U.S. Businesses, US Census of Bureau (97), all the companies targeted were categorized according to employee size into large (>500 employees), medium (100~500 employees) or small business (<100 employees). The sample frame covered high-tech industries in networking, software, hardware, telecom and technology support. The sample frame covered a wide range of businesses in varied locations. In addition, the recruitment

letter was sent by each of the participating companies. This setting reduced some negative aspects of unsolicited invitation emails.

Another limitation was that BMI was calculated using self-reported body height and body weight. Overweight people in the US especially women age 20 to 59, tend to under report their body weight (162, 163). In this study, the prevalence of overweight in women was very low in both the 1st and 2nd generation (2.2% and 8.1%, respectively). The accuracy of the self-reported body height and body weight was unknown. However, Yates et al. reported that, compared to other Asian and Pacific Islanders, Chinese females were small and highly satisfied with their body images (164). Meanwhile, studies have shown that participants responding to an internet survey are less likely to be influenced by social desirability than those responding to a mailed survey. This suggests that people might feel more comfortable disclosing true answers on the Internet (64). Future studies are needed to examine the accuracy of self reported body weight and height over the Internet by comparing with anthropometric assessment.

Due to the length of the survey questionnaire, this study did not collect physical activity data. Low physical activity and sedentary life styles are risk factors of overweight and some chronic diseases, such as chronic heart diseases. Future research is needed to examine the relationship between acculturation and physical activity level.

To our knowledge, this is the first known web-based research using FFQ to assess energy and fat intakes of Chinese Americans and relate the results to acculturation. The current study compared the Chinese born and American born

Chinese and was able to analyze differences of the two population groups. In contrast to previous studies among Chinese Americans that tended to collect information on general food selections, the present study collected energy and fat intakes and can better understand the actual dietary intakes of the target population. The methods and research tool developed for this study can be used for future studies and applied to other populations.

In addition, acculturation measurement of previous studies in nutrition among Chinese Americans included single indicator of acculturation (26), such as language proficiency, and one aspect of acculturation, such as dietary acculturation (15). The present study applied a bi-dimensional multi-trait acculturation model and assessed four domains of acculturation and investigated the different effects of each domain.

This study included both the 1st and 2nd generation Chinese-Americans and analyzed these two groups separately. Previous studies have suggested that differences existed between the two groups, but little was known about these differences in regards to nutrition.

A unique aspect of the present study was that all of the participants were in the same educational group and socioeconomic status. This study is the first known study to our knowledge that compared two groups of Chinese Americans who have higher educational attainment and SES. This study suggested that among this sample, acculturation has an impact on dietary intakes of immigrants independent of education and.

Conclusion

In conclusion, we developed a web-based tool to assess the dietary intakes and acculturation status of educated Chinese individuals working in high-tech industries. The study results revealed important relationships between dietary intakes and different measures of acculturation including preference for Chinese foods, affiliation to American social networks, and preference for Chinese leisure activities. The results showed that the 1st and 2nd generations of Chinese-Americans differed on acculturation and dietary intakes. The Chinese born immigrants showed homogeneity towards Chinese culture while the American born Chinese showed homogeneity towards American culture in four domains of acculturation. Preference for Chinese food showed the least difference between the two generation groups. Preference for Chinese food was associated with lower fat intake in the 1st generation group. The Chinese born immigrants reported significantly lower energy and fat intakes than the American born Chinese for both men and women. The prevalence of overweight was significantly lower among the Chinese born immigrants.

Tables

Table 4.3.1. Demographic characters of two study groups in the study

	1 st generation ¹ (n=386)		2 nd generation ² (n=101)	
	N	%	N	%
Age (y)				
20~29	142	36.8	55	54.6
30~39	225	58.3	40	39.6
40~45	19	4.9	6	5.9
Gender				
Men	202	52.3	64	63.4
Women	184	47.7	37	36.6
Marital Status				
Never been married	119	30.8	30	29.7
Married/cohabitating	234	60.6	65	64.4
Divorced/separated	25	6.5	2	2.0
Education Attainment				
Bachelor	36	9.3	43	42.6
Master	250	64.8	50	49.5
Doctoral	94	24.4	8	7.9
Family Type				
Single	140	36.3	26	25.7
Live with Spouse	152	39.4	46	45.5
Extended Family	94	24.4	29	28.7
Children in House				
Yes	115	29.8	40	39.6
No	271	70.2	61	60.4
Income				
< \$50,000	20	5.6	17	16.8
\$50,000~\$79,999	185	51.8	35	36.5
\$80,000~\$100,000	93	26.1	25	26.0
>\$100,000~\$149,999	59	16.5	19	18.8
Length of stay in the US				
< 3 years	20	5.2		
3~5 years	197	51.0		
6~10 years	131	33.9		
>10 years	38	9.8		

¹. Chinese-born immigrants who moved to the US after 12 years of age.

². American-born Chinese or immigrants who moved to the US before 12 years of age.

Table 4.3.2. Mean acculturation scores of the four domains in two study groups

	Chinese ¹	Both ²	American ³	Neither ⁴
Language preference and proficiency *				
1 st generation	57.8 ± 11.1	9.7 ± 12.8	16.5 ± 8.6	0
2 nd Generation	0.6 ± 3.6	8.1 ± 11.9	75.3 ± 12.0	0
Social affiliation*				
1 st generation	8.3 ± 12.8	21.6 ± 19.7	10.9 ± 12.6	43.2 ± 19.6
2 nd Generation	0.2 ± 2.1	2.5 ± 6.8	52.0 ± 15.3	29.3 ± 15.7
Leisure-time activity*				
1 st generation	31.0 ± 18.5	29.6 ± 17.8	16.8 ± 12.7	6.6 ± 8.6
2 nd Generation	0	1.5 ± 5.0	81.6 ± 6.6	0.83 ± 3.1
Food preference*				
1 st generation	53.6 ± 26.0	22.9 ± 23.9	7.5 ± 14.8	0
2 nd Generation	19.4 ± 22.7	41.6 ± 24.9	23.8 ± 27.5	0

* Score was weighed across the four domains

¹ Prefer Chinese culture more

² Prefer both cultures equally

³ Prefer American culture more

⁴ Prefer neither Chinese nor American culture

Table 4.3.3. Significance of selected predictors of total energy and fat intake per kg BW in the 1st generation Chinese Americans¹

Source	df	Energy intake (R ² =0.430)		Fat intake (R ² =0.415)	
		F	Sig.	F	Sig.
Corrected Model	66	3.605	.000	3.400	.000
Intercept	1	34.541	.000	20.828	.000
gender	1	37.731	.000	31.734	.000
age	1	4.497	.035	1.276	.259
² Length of residence	1	3.341	.069	.848	.358
³ Food-Chinese	3	2.742	.043	1.628	.183
⁴ Leisure-Chinese	7	2.784	.008	2.292	.027
⁵ Social-American	3	6.166	.000	5.612	.001
⁶ Interactions	49	1.369	.060	1.623	.008

¹ based on Type III SS, General Linear Models procedure.

² Length of residence in the US

³ Preference for Chinese food

⁴ Preference for Chinese leisure-time activities

⁵ Preference for the affiliations to American social activities

⁶ interactions among food-Chinese, Leisure-Chinese and social-American

Chapter 5: Summary and Implications

Summary

This study examined and compared nutrition knowledge, attitude, and dietary self-efficacy across four sub-groups of urban young Chinese individuals working in high-tech industries in China and in the US. Acculturations of Chinese immigrants to the US and American-born Chinese was also explored. Nutrition knowledge, attitudes, self-efficacy and acculturation were examined in association with dietary intake using a newly developed web-based FFQ and self-reported BMI.

The major findings of this study showed that: (i) there were significant differences among the four study groups in dietary intakes, nutrition knowledge, nutrition attitude, and dietary self-efficacy; (ii) Dietary self-efficacy was a strong predictor of energy and fat intake in this population within each sub-group; (iii) Acculturation aspects of preferring Chinese food, preferring Chinese leisure activity and were negatively associated with energy and fat intakes and preferring American social activity was positively associated with energy and fat intakes.

American-born Chinese participants consumed significantly higher energy and dietary fat than the other groups. No significant difference in percentage of energy from fat was found among the four study groups.

In this study, the two groups of men in the US had higher dietary self-efficacy, more nutritional knowledge and better nutritional attitude than the two groups of men

in China. Chinese-born men and women immigrants to the US had the highest nutritional knowledge among the four groups. No significant differences were found in nutrition attitude and dietary self-efficacy among the four groups of women.

Regression models and path analyses suggested that self-efficacy was a strong predictor of dietary intakes and BMI; nutrition knowledge and attitude were associated with dietary intake and BMI within each group. Even though the American-born Chinese had relatively higher nutritional knowledge, attitude and dietary self-efficacy than the participants in China, American-born Chinese participants consumed significantly higher total energy and fat than the other groups. This result suggest that, despite the great efforts that have been made to improve knowledge and awareness of healthy eating in the US, consumption of higher amounts of energy and fat is still an issue even among well educated Chinese-Americans. In addition, although fat intake is higher among American born Chinese, the average percentage energy from fat among the American-born Chinese was not significantly higher than the other groups. Therefore, higher fat consumption is an outcome of higher reported energy intake due to bigger portion sizes. It is possible that as a consequence of acculturation, larger portions of food may be more acceptable in the American than in the Chinese community.

Of the four groups of men, Chinese-born immigrants had the lowest prevalence of overweight (26%), while participants who worked in Chinese companies in China had the highest prevalence of overweight (49%). Despite the big difference in prevalence of overweight, no significant differences in energy and fat intake were found between these two groups of men. Although mean energy and fat

intake of Chinese men in China were significantly lower than that of American-born Chinese men, no noticeable difference in the prevalence of overweight were seen in both groups (45%). This result may be a consequence of not controlling for physical activity. Due to the limited length of the survey questionnaire, this study did not collect physical activity data. Future research is needed to examine and compare the physical activity levels of the targeted population in the two countries.

The two groups of Chinese-Americans showed significant differences in four domains of acculturation. Differences between the two groups were also found in the relationship between food preference and dietary intakes among the study sample. For the 1st generation group, the stronger the preferences towards Chinese food, the lower the energy and fat consumption. However, the relationship between food preference and dietary intakes is the opposite in the 2nd generation group: the more a person preferred Chinese food, the higher their fat intake. The results suggest that despite acculturation, American-born Chinese still eat Chinese foods but with more calories and fat. Therefore, nutrition education program should provide practical guidance in selecting healthy and balanced Chinese diet and controlling energy dense foods and portion sizes.

This study had several limitations. The major limitation was that a systematic, random sample of the entire Chinese-American population in high-tech industries was not attempted, instead, a stratified and cluster sampling technique was used and the subjects were recruited through their employers. To minimize the impact of a non-random sample, we selected companies based on their sizes, locations and their business fields. Because it is not a random sample, the results cannot be generalized

to the rest of the Chinese population working in high-tech industries. In addition, to increase participation in the study, and reduce non-response rate, we recruited participants through the department of human resources, provided sweepstakes, and sent 5 follow-up reminders. There is currently no published national data of the study population (citizens in large cities, working in hi-tech industries, and with college degree or higher).

Another limitation was that BMI was calculated using self-reported body height and body weight. Overweight people, especially women at age 20 to 59, tend to under report their body weight among US population (162, 163). In this study, the prevalence of overweight in women was very low in both the 1st and 2nd generation (2.2% and 8.1%, respectively). The accuracy of the self-reported body height and body weight was unknown. However, Yates et al. reported that, comparing to other Asian and Pacific Islanders, Chinese females were small and highly satisfied with body image (164). There is currently no published national data of the study population (citizens in large cities, working in hi-tech industries, and with college degree or higher). The mean BMIs of the men in China of the current study were considered comparable with the measured data of China national nutrition and health survey 2002 for citizens in large cities in China (11). The mean BMIs of the women in China in current study were slightly lower than the national data for younger aged participants of all occupations (Table 5.1). In addition, studies have shown that participants responding to an internet survey are less likely to be influenced by social desirability than those responding to a mailed survey. This suggests that people might feel more comfortable disclosing true answers on the Internet (64). Future studies are

needed to examine the accuracy of self reported body weight and height reported in an online survey compare with in-person interviews.

This study has several strengths. A web-based FFQ was developed and validated for this study which targets food consumed by Chinese in China and in the US. It is the first such FFQ and its design contains pictures of utensils used both in China and in the US. It correlated well with 24-hour recalls ($r = 0.46$ and 0.49 for energy and fat intakes, respectively). Oil consumption was obtained by using 2 questions inquiring about cooking method (stir-fried and deep-fried foods). This FFQ was validated for use with this highly educated computer savvy population. However, this method needs not be tested for use with other population groups who may not be as computer savvy. Zhao et al reported that in-person interview is necessary to collect dietary intake data among the general Chinese population in China due to the relatively low educational achievement of the entire population (165).

Acculturation measurement of previous studies in nutrition among Chinese Americans included single indicator of acculturation (26), such as language proficiency, and one aspect of acculturation, such as dietary acculturation (15). The present study applied a bi-dimensional multi-trait acculturation model to assess four domains of acculturation and investigated the different effects of each domain.

To our knowledge, the current study is the first web-based survey of this kind. It is also the first one that investigated the nutritional knowledge, attitude, and dietary self-efficacy and dietary intakes of Chinese individuals in two continents working in high-tech industries. The current study suggested that an online survey is a feasible way to conduct research among computer savvy individuals across continents. Some

advantages of web-based survey are cost-effective, time-effective, and error free in data entry.

Implications

Low-cost personal computers and the explosive growth of the Internet over the recent years have introduced new methods of conducting surveys. Compared to surveys conducted via traditional mail, or face-to-face interview, a Web based survey does not require expensive labor (as phone calling does) or expensive materials (as mailings do) to attract respondents (166). In addition, marginal processing costs per respondent are also reduced because the data are already recorded electronically (166).

User friendly interface of a computer and Internet based survey can utilize visual aids and help the participants of a self administrated survey to understand the questions. The present study created a set of pictures for portion size estimations. We received positive feedback from the participants about utilizing the visualized portion anchors. A majority of the respondents used the portion anchors instead of typing the weight of food eaten. In the late 1990s web graphics were not recommended in web surveys, because graphics can significantly slow the downloading of a web page (83). However, with technological improvement, high speed Internet connections have become common, especially, at work sites. Therefore, attractive graphic designs have become useful in web-based surveys especially when targeting the high-tech related individuals. Future web-based survey in nutrition can take advantage of technologies and improve the accuracy of self administrated survey.

Although high speed Internet connections can satisfy the need of a web-based survey in developed countries or well developed areas in developing countries, the speed of Internet connections can be very slow across countries or continents. In the present study, the research server was at first set up in Beijing. But users in the US had very slow information flows. Hence, two servers were set up simultaneously in China and in the US, and participants in both countries had appropriate Internet flows. Therefore, it is recommended to set up a separate web server in every participating country if study samples are located in different countries.

One barrier to conducting a web-based survey is that it requires having access to the Internet and be able to use it to submit data. Therefore, web based survey cannot be used among people with no access to the internet, who have low educational attainment, or who live in developing countries where the Internet is not commonly used. The present web based survey was targeted to people who work in high-tech industries in China and the US. Other target populations include most office workers, college students, school children, and educated retired people. Future research could consider utilizing a web-based survey if the target population fits in one of the above categories.

As for other types of surveys, recruiting participants is a big challenge in web-based surveys as well. Currently there are three major methods to recruit online participants: unrestricted Internet advertisement, unsolicited (junk) emails and web survey panels. Using Web ads and unsolicited emails the researchers have no control over who gets the recruitment letter and who participates in the survey. These two methods have not been recommended in academic research. The third method,

sample panel, is a new approach. Survey panel companies recruit and manage list of members who fit in different categories, such as high school teacher, coke drinker, and Chinese college students. Depending on the size of the panel and methods of recruiting and maintaining panel lists, the online panel can be representative samples. The survey panel companies send invitation letters to targeted members who meet the research criteria. Online panel services provide a better solution in recruiting subjects for web-based survey. The present study recruited subjects through their employers, and participating companies were pre-selected. This method can minimize the issues surrounding the use of unsolicited emails but the drawback is that the sample was clustered and not representative of the entire population. If research funding allows, a professional survey panel is recommended for future web-based study in nutrition.

This study is the first, to our knowledge, web-based study that has examined dietary knowledge, attitudes, self-efficacy and acculturation across continents and their relationship to dietary intake. As such, this study can be seen as a pilot project to explore the feasibility of conducting such cross-cultural research on line and the programs required for implementing it. The information obtained from this study can be used as a springboard to develop follow-up studies to understand further those relationships, not only within the Chinese culture but also among other cultures, and utilize the information to help in the development of public health messages and interventions.

Table

Table 5.1 BMI distribution by age groups in the current sample and the national nutrition and health survey sample

Age group	Current study	National Data	
	Large cities and annual personal income >30,000RMB	Large cities	All cities and annual household income >20,000
	Men		
20~	21.6	22.5	21.3
25~	23.7	23.4	22.7
30~	24.1	24.1	24.6
35~	23.9	24.2	24.4
40~	25.6	24.4	24.5
	Women		
20~	19.4	21.5	20.4
25~	19.6	21.9	21.1
30~	19.7	22.6	21.6
35~	21.0	23.4	22.5
40~	24.2	24.2	23.5

Appendices

Appendix 1: Study introduction webpage – English version



The screenshot shows a webpage for the study. At the top left is the logo for **IE NUTRITION.com** with a green circular icon. To the right is a link for **中文版>>**. Below the logo is a navigation bar with links: **About the Research**, **Results and Conclusions**, **Acknowledgement**, **Useful Links**, **Feedback**, **Contact Us**, and **Site Index**. The main header features a banner with the Statue of Liberty on the left and a woman at a computer on the right. The title of the study is centered in yellow text: **Nutrition, Diet and Acculturation of Chinese Employed in High-Tech Industries in China and in the United States**. Below the banner is a **Welcome** section. The main content area contains three paragraphs of text. To the right of the text is a large graphic illustration featuring a globe, a winding blue path, a person at a computer, and a man in a white lab coat. At the bottom of the text area is a blue button that says **Take the survey NOW!**. The footer contains copyright information: **Copyright ©2004 ienutrition All rights reserved. Do not cite or quote without permission of the author. Web site design and hosting by Reilina 8848 Inc.**

IE NUTRITION.com 中文版>>

About the Research Results and Conclusions Acknowledgement Useful Links Feedback Contact Us Site Index

Nutrition, Diet and Acculturation of Chinese Employed in High-Tech Industries in China and in the United States

Welcome

Within any society, globalization increases social diversity because international communications, commerce and migration introduce elements of new foreign cultures. Even non-immigrants, who remain entirely within their native society, are exposed to the effects of globalization through their society's transition and through their high-tech professions. The globalization process can benefit a society, but it can also create problems. As people become aware of and adopt different cultural attributes and lifestyles, including dietary behaviors, their day-to-day decisions about diet, exercise, and other habits influence their daily health and indeed, their long-term health status. To improve the nutrition of both immigrants and non-immigrants within a society, it is essential to acquire a better understanding of the relationship between their dietary behavior and how they are affected by cultural change (i.e. their "acculturation"). An in-depth study of this relationship between dietary behavior and acculturation is all the more useful when it excludes the confounding factors of social economic status and educational attainment.

"Nutrition, Diet and Acculturation of Chinese Employed in High-Tech Industries in China and in the United States" is a Ph.D. project proposed and conducted by Chunling Wang, a doctoral student in the Department of Nutrition and Food Science, University of Maryland at College Park. This research was approved by the Institutional Review Board (IRB) of the University of Maryland.

The target population for this study is young highly-educated Chinese employed in high-tech industries in China and the United States. The study's immediate purpose is to contribute to the development of effective nutrition intervention programs regarding Chinese immigrants in the United States and people in China. Nevertheless, the methodology validated by this study can be applied to diverse other populations to design programs that take into account specific factors relating to age, education and culture. The study's results will expand our knowledge of the role that acculturation and globalization plays in determining dietary behavior.

Take the survey NOW!

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Appendix 2: Study introduction webpage – Chinese version

English>>

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中、美高科技行业的中国人之 饮食习惯与营养观念的比较研究



欢迎您

经济和文化的全球化，加大了我们社会的多样性。这种作用主要是通过文化交流、对外贸易和国际间的移民来实现的。在经济、文化全球化的进程中，各国人民的生活方式持续互动，无论是移民还是非移民，其饮食方式与生活习惯都会或多或少地随之改变。这种改变有利有弊。因为我们每天的饮食情况直接影响着我们的营养状况和身体健康，所以“全球化”正间接地影响着人们的身体健康。只有清晰地了解每一个人群在新经济形势下的实际情况与需求，才能有效地指导卫生工作者的工作。

“中、美高科技行业的中国人之饮食习惯与营养观念的比较研究”是一个博士论文课题，是由美国马里兰大学营养与食品科学系博士研究生王春玲负责的一项营养学研究。该研究由马里兰大学科研审查委员会（Institutional Review Board）审批通过并准予执行。

此项课题主要是研究两个特定人群的日常饮食习惯、营养知识、营养观念以及其对美国文化的接受程度的基本情况和相互关系。具体研究对象是在中国和美国从事高科技行业工作的、年轻的并且受高等教育的中国人。这种设计方法排除了经济地位、文化教育和年龄等干扰因素的影响，使我们能够更深入地了解该人群营养与健康饮食方面的具体情况和需求，以便我们将来更有效地为生活在不同国度及文化环境的中国人提供服务。

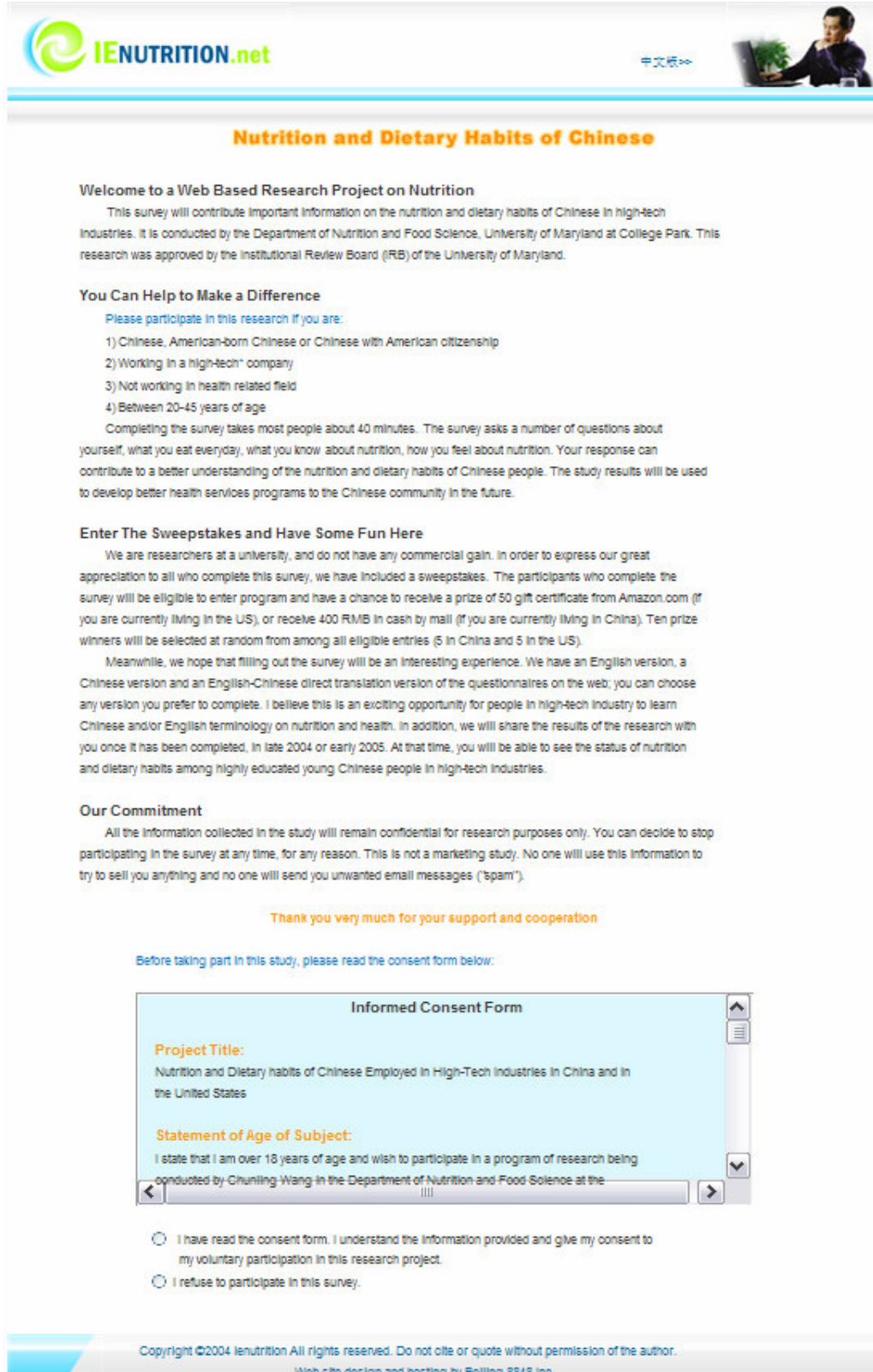
此项课题的研究方法及使用工具可以不同程度地推广并应用于针对其他具有不同民族、文化、或教育背景人群的研究。研究结果能让我们更深刻地理解全球化、移民以及同化程度对人们在营养健康方面的影响。





[参与调查!](#)

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Appendix 3: Webpage of the Web-based questionnaire – English version



 [中文版 >>](#) 

Nutrition and Dietary Habits of Chinese

Welcome to a Web Based Research Project on Nutrition

This survey will contribute important information on the nutrition and dietary habits of Chinese in high-tech industries. It is conducted by the Department of Nutrition and Food Science, University of Maryland at College Park. This research was approved by the Institutional Review Board (IRB) of the University of Maryland.

You Can Help to Make a Difference

Please participate in this research if you are:

- 1) Chinese, American-born Chinese or Chinese with American citizenship
- 2) Working in a high-tech* company
- 3) Not working in health related field
- 4) Between 20-45 years of age

Completing the survey takes most people about 40 minutes. The survey asks a number of questions about yourself, what you eat everyday, what you know about nutrition, how you feel about nutrition. Your response can contribute to a better understanding of the nutrition and dietary habits of Chinese people. The study results will be used to develop better health services programs to the Chinese community in the future.

Enter The Sweepstakes and Have Some Fun Here

We are researchers at a university, and do not have any commercial gain. In order to express our great appreciation to all who complete this survey, we have included a sweepstakes. The participants who complete the survey will be eligible to enter program and have a chance to receive a prize of 50 gift certificate from Amazon.com (if you are currently living in the US), or receive 400 RMB in cash by mail (if you are currently living in China). Ten prize winners will be selected at random from among all eligible entries (5 in China and 5 in the US).

Meanwhile, we hope that filling out the survey will be an interesting experience. We have an English version, a Chinese version and an English-Chinese direct translation version of the questionnaires on the web; you can choose any version you prefer to complete. I believe this is an exciting opportunity for people in high-tech industry to learn Chinese and/or English terminology on nutrition and health. In addition, we will share the results of the research with you once it has been completed, in late 2004 or early 2005. At that time, you will be able to see the status of nutrition and dietary habits among highly educated young Chinese people in high-tech industries.

Our Commitment

All the information collected in the study will remain confidential for research purposes only. You can decide to stop participating in the survey at any time, for any reason. This is not a marketing study. No one will use this information to try to sell you anything and no one will send you unwanted email messages ("spam").

Thank you very much for your support and cooperation

Before taking part in this study, please read the consent form below:

Informed Consent Form

Project Title:
Nutrition and Dietary habits of Chinese Employed in High-Tech Industries in China and in the United States

Statement of Age of Subject:
I state that I am over 18 years of age and wish to participate in a program of research being conducted by Chunling Wang in the Department of Nutrition and Food Science at the

I have read the consent form. I understand the information provided and give my consent to my voluntary participation in this research project.

I refuse to participate in this survey.

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Nutrition and Dietary Habits of Chinese

LOGIN

Please enter your full email address in the box below either to log into this web survey or to return to the site and finish the survey.

Your email will never be used for marketing purposes nor sold or transferred to another organization. Your email address will be used only for entering the incentives program and you will be sent an e-mail only if you are selected to win the prize.

Email:

Your email address will be used only for entering the incentives program and you will be sent an e-mail only if you are selected to win the prize.



Nutrition and Dietary Habits of Chinese

Thank you for participating in the web. Your participation is a great contribution to this research!
 Our earlier test results showed that completing the survey takes most people about 40 minutes. You don't have to complete it in one action, and you may stop and resume the survey at anytime. As long as you log-in using the same user name (your valid email address), our system will retrieve your previous document. We hope filling out the survey will be an interesting experience for you. Once you complete all the questions, you will automatically be entered into our incentive program, and you have a chance to receive a prize of 50 USD. We will notice the winners through email no later than October.

Start now and good luck!

Here are some items about your eating habits over the past year.

1. **Over the past one year, how often did you eat at restaurants or fast food restaurant usually?**
 Please specify breakfast, lunch and dinner, also specify Chinese style and western style.

1 Chinese Style Breakfast:	
Fast food, Deli	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never
Restaurant	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never
2 Western Style Breakfast:	
Fast food, Deli	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never
Restaurant	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never
3 Chinese Style Lunch:	
Fast food, Deli	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never
Restaurant	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never
4 Western Style Lunch:	
Fast food, Deli	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never
Restaurant	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never
5 Chinese Style Dinner:	
Fast food, Deli	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never
Restaurant	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never
6 Western Style Dinner:	
Fast food, Deli	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never
Restaurant	<input type="text" value=""/> time(s) <input checked="" type="radio"/> per <input type="radio"/> week <input type="radio"/> month <input type="radio"/> year <input type="radio"/> never

2. **Over the past 12 month, did you take any nutrition (or dietary) supplements? How often do you consume them? How much do you usually consume them each time?**

1 Over the past 12 months, did you take any **multi-vitamins, multi-minerals**, such as Centrum, One-a-Day, Theragran (as pills, liquids, or packets)?

Never

Item Name 1 Frequency: time(s) per day week month year

Quantity: mg/mcg/UI or pill(s)

Item Name 2 Frequency: time(s) per day week month year

Quantity: mg/mcg/UI or pill(s)

Other items:

****Please specify how often do you consume them and how much do you usually consume them each time.**

2 Over the past 12 months, did you take any **vitamins** that are NOT part of multivitamins, such as vitamin C, vitamin E, vitamin B, vitamin D, folate.

Never

Item Name 1 Frequency: time(s) per day week month year

Quantity: mg/mcg/UI or pill(s)

Item Name 2 Frequency: time(s) per day week month year

Quantity: mg/mcg/UI or pill(s)

Other items:

****Please specify how often do you consume them and how much do you usually consume them each time.**

3 Over the past 12 months, did you take any **Minerals** that NOT part of multivitamin and mineral pills, such as calcium, iron, selenium.

Never

Item Name 1 Frequency: time(s) **per** day week month year
Quantity: mg/mcg/UI **or** pill(s)

Item Name 2 Frequency: time(s) **per** day week month year
Quantity: mg/mcg/UI **or** pill(s)

Other items:

**Please specify how often do you consume them and how much do you usually consume them each time.

4 Over the past 12 months, did you take any **protein or amino acid** supplements?

Never

Item Name 1 Frequency: time(s) **per** day week month year
Quantity: mg/mcg/UI **or** pill(s)

Item Name 2 Frequency: time(s) **per** day week month year
Quantity: mg/mcg/UI **or** pill(s)

Other items:

**Please specify how often do you consume them and how much do you usually consume them each time.

5 Over the past 12 months, did you take any **herbal** supplements, such as ginseng, ginkgo biloba, aloe vera.

Never

Item Name 1 Frequency: time(s) **per** day week month year
Quantity: mg/mcg/UI **or** pill(s)

Item Name 2 Frequency: time(s) **per** day week month year
Quantity: mg/mcg/UI **or** pill(s)

Other items:

**Please specify how often do you consume them and how much do you usually consume them each time.

6 Over the past 12 months, did you take any **other** supplements, such as fish oil, bee pollen, melatonin, soy estrogen.

Never

Item Name 1 Frequency: time(s) **per** day week month year
Quantity: mg/mcg/UI **or** pill(s)

Item Name 2 Frequency: time(s) **per** day week month year
Quantity: mg/mcg/UI **or** pill(s)

Other items:

**Please specify how often do you consume them and how much do you usually consume them each time.

NEXT



Nutrition and Dietary Habits of Chinese

This section is about different foods you eat.

Please think about **how often** you have eaten these foods over the past 12 months, and also **how much** of each food you usually eat. Try to include every time you eat a food item, whether you made it at home, bought it from a restaurant, or had it as leftover. Please consider both Chinese food and American or Western style food, and please consider season differences. If you never eat some items, just choose "never".

****Please answer each question as best you can. Estimate if you are not sure. A guess is better than leaving a blank.****

Instruction:

If you usually eat rice twice a day (lunch and dinner), and you estimated that you eat as much as the picture B2 (3 liang, 150gm) each time. You would answer in 2 ways:

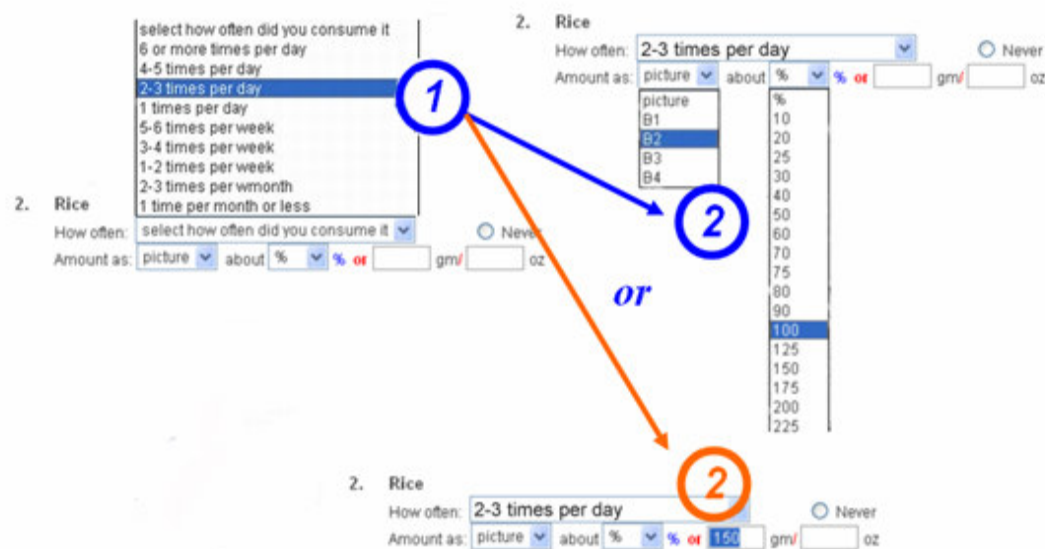
1. Select 2 times per day in the first box

Select B2 in the drop-down list of picture

Select 100% in the drop-down list of %

2. Select 2 times per day in the first box

type in 150 in the box before gm indicating 150gm each time



2. Rice

How often: Never

Amount as: about % or gm/ oz

select how often did you consume it

- 6 or more times per day
- 4-5 times per day
- 2-3 times per day**
- 1 times per day
- 5-6 times per week
- 3-4 times per week
- 1-2 times per week
- 2-3 times per month
- 1 time per month or less

picture

- B1
- B2**
- B3
- B4

%

- 10
- 20
- 25
- 30
- 40
- 50
- 60
- 70
- 75
- 80
- 90
- 100**
- 125
- 150
- 175
- 200
- 225

2. Rice

How often: Never

Amount as: about % or gm/ oz

[GO TO THE NEXT PAGE, AND START NOW!](#)



Nutrition and Dietary Habits of Chinese

How often you have eaten these dairy products? How much of each dairy food you usually eat and drink every time?

Over the past 12 months (1 year) . . .



1. **Whole milk**
How often: select how often did you consume it
Amount as: picture about % % or ml floz
2. **Low fat milk**
 2%fat 1%fat non-fat (skim milk)
How often: select how often did you consume it
Amount as: picture about % % or ml floz
3. **Milk powder**
How often: select how often did you consume it
Amount as: picture about % % or gm/ oz
4. **Yogurt**
How often: select how often did you consume it
Amount as: picture about % % or ml floz
5. **Cottage cheese**
How often: select how often did you consume it
Amount as: picture about % % or gm/ oz
6. **Cheese**
How often: select how often did you consume it
Amount as: picture about % % or gm/ oz
7. **Cheese cake**
How often: select how often did you consume it
Amount as: D4 about % % or gm/ oz
8. **Ice cream, ice cream bars**
How often: select how often did you consume it
Amount as: picture about % % or gm/ oz



Nutrition and Dietary Habits of Chinese

How often you have eaten these beverage and liquor? How much of each beverage and liquor you usually drink every time?

Over the past 12 months (1 year) . . .



- Orange juice, other fruit juice**

How often: Never

Amount as: about % or ml floz
- Diet Soda (coke, sprit, 7-up...)**

How often: Never

Amount as: about % or ml floz
- Regular Soda (coke, pepsi)**

How often: Never

Amount as: about % or ml floz
- Soy milk**

How often: Never

Amount as: about % or ml floz
- Tea (iced tea, hot tea)**

How often: Never

Amount as: about % or ml floz

How often do you add **sugar or honey** to your tea?

 - almost never or never
 - about 1/4 of the time
 - about 1/2 of the time
 - about 3/4 of the time
 - almost always or always

Amount as: about %

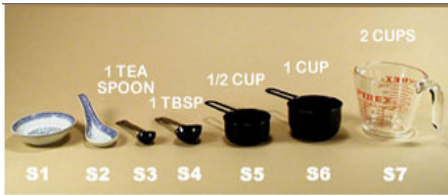
How often do you add **milk or creamer** to your tea?

 - almost never or never
 - about 1/4 of the time
 - about 1/2 of the time
 - about 3/4 of the time
 - almost always or always

What kind of **milk or creamer** did you usually add to your tea?

 - Whole milk
 - 2% milk
 - 1% milk
 - skim or none fat
 - half-half
 - evaporated or condensed (canned) milk
 - non-dairy creamer

Amount as: about %



non-dairy creamer
Amount as: picture about % %

6. Coffee

How often: select how often did you consume it Never
Amount as: picture about % % or ml fl oz

How often do you add sugar or honey to your coffee?

- almost never or never
- about 1/4 of the time
- about 1/2 of the time
- about 3/4 of the time
- almost always or always

Amount as: picture about % %

How often do you add milk or creamer to your coffee?

- almost never or never
- about 1/4 of the time
- about 1/2 of the time
- about 3/4 of the time
- almost always or always

What kind of milk or creamer did you usually add to your coffee?

- Whole milk
- 2% milk
- 1% milk
- skim or none fat
- half-half
- evaporated or condensed (canned) milk
- non-dairy creamer

Amount as: picture about % %

7. Beer

How often: select how often did you consume it Never
Amount as: picture about % unit(s)

8. Wine (red, white)

How often: select how often did you consume it Never
Amount as: A2 about % % or ml fl oz

9. Liquor

How often: select how often did you consume it Never
Amount as: A1 about % % or ml fl oz

You have finished 23% on the section of dietary habits and 20% of the entire survey.

Please continue!!

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Nutrition and Dietary Habits of Chinese

How often you have eaten these **dessert, snacks, and nuts**? How much of each food you usually eat every time?

Over the past 12 months (1 year) . . .



- Chocolate candy**
 How often: Never
 Amount: % % average bar(s) (1~2 oz, 30~60 g)
- Other candy(such as saseme candy)**
 How often: Never
 Consume: piece(s) or gm/ oz
- Dim sum, Chinese style cakes, Chinese crips cakes, Moon cake**
 How often: Never
 Consume: piece(s) or gm/ oz
- Cookies**
 How often: Never
 Consume: unit(s) each time
- Cakes(not cheese cake), English muffin**
 How often: Never
 Amount as: about % % or gm/ oz
- Doughnuts, sweet rolls, Danish, or pop-tarts, rice cracker**
 How often: Never
 Consume: unit(s) each time
- Brownie**
 How often: Never
 Consume: unit(s) Size: small medium large
- Pies**
 How often: Never
 Consume: unit(s)

consume [简明英汉词典]
 [kən'sju:m]
 vt. 消耗, 消费, 消灭, 大吃大喝, 吸引
 vi. 消灭, 毁灭
- Peanuts or other nuts or seeds**
 How often: Never
 Amount as: about % % or gm/ oz

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Nutrition and Dietary Habits of Chinese

How often you have eaten these **fruits**? How much of each fruit you usually eat every time?

Over the past 12 months (1 year) . . .

1. **Apple**
How often: Never
Consume: each time
2. **Pear**
How often: Never
Consume: each time
3. **Banana**
How often: Never
Consume: each time
4. **Orange, tangerines, tangelos**
How often: Never
Consume: each time
5. **Kiwi fruit**
How often: Never
Consume: each time
6. **Peaches, nectarines, plums, Apricot**
How often: Never
Consume: each time
7. **Mango**
How often: Never
Consume: each time

You have finished 2/5 on the section of dietary habits and 38% of the entire survey.

Please continue!!

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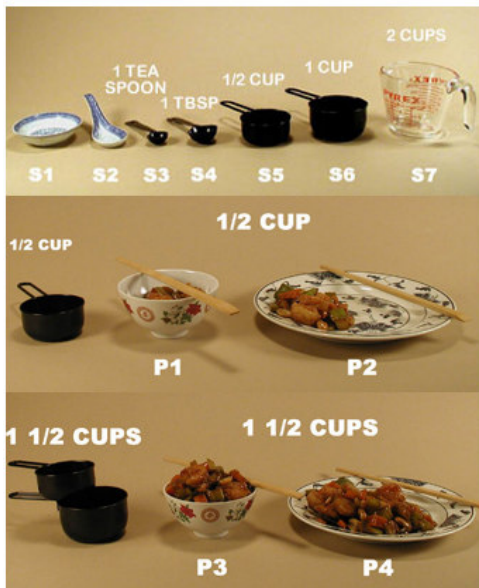
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Nutrition and Dietary Habits of Chinese

How often you have eaten these fruits? How much of each fruit you usually eat every time?

Over the past 12 months (1 year) . . .



1. **Grapefruit**
 How often: Never
 Amount as: about % or gm/ oz
2. **Pineapple**
 How often: Never
 Amount as: about % or gm/ oz
3. **Grape**
 How often: Never
 Amount as: about % or gm/ oz
4. **Strawberry**
 How often: Never
 Amount as: about % or gm/ oz
5. **Other berry (blueberry, blackberry)**
 How often: Never
 Amount as: about % or gm/ oz
6. **Watermelon**
 How often: Never
 Amount as: about % or gm/ oz
7. **Cantaloupe, honeydew, other melon**
 How often: Never
 Amount as: about % or gm/ oz
8. **Papaya**
 How often: Never
 Amount as: about % or gm/ oz
9. **Dates, jujube**
 How often: Never
 Amount as: about % or gm/ oz
10. **Lichee, longan**
 How often: Never
 Amount as: about % or gm/ oz

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Nutrition and Dietary Habits of Chinese

Over the past 12 months (1 year), how often you have eaten these staple foods, like rice, cereal, bread and noodle?

How much of each food you usually eat every time?

If you want to use a container (picture) to estimate the amount that you ate, please select the picture by scrolling down the drop down list and selecting the letter of the picture and the percentage of the serving portion.

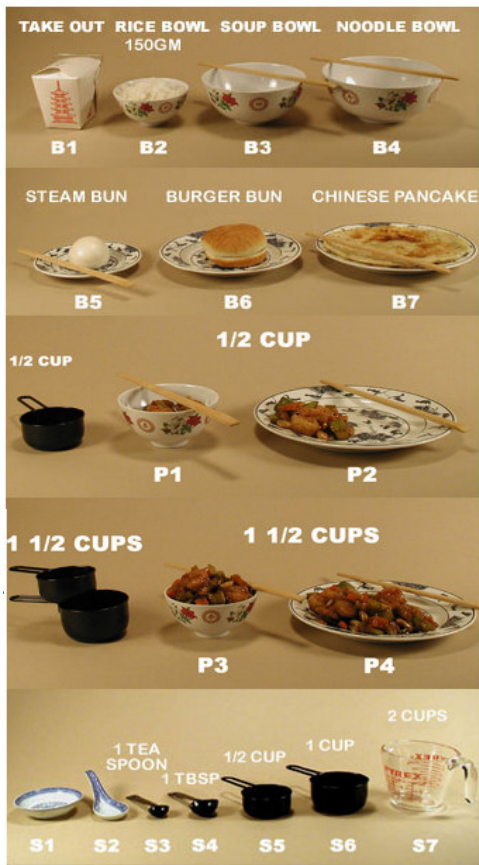
INSTRUCTION: If you usually eat rice twice a day, and you estimated that you usually eat as much as the picture B2, or if you estimated that you usually eat 150gm (3 liang), you would mark in this way:

2. Rice

How often: 2-3 times per day Never

Amount as: B2 about 100 % or 150 gm/ oz

(Note: Blue arrows point to '2-3 times per day', 'B2', and '100'. An orange arrow points to '150'.)



1. Cold cereal

How often: select how often did you consume it Never

Amount as: picture about % or gm/ oz

2. Rice

How often: select how often did you consume it Never

Amount as: picture about % or gm/ oz

3. Rice porridge, congee

How often: select how often did you consume it Never

Amount as: picture about % or gm/ oz

4. Steamed bun

How often: select how often did you consume it Never

Amount as: B5 about % or gm/ oz

5. Chinese pan cake

How often: select how often did you consume it Never

Amount as: B7 about % or gm/ oz

6. Fried dough cake, stick

How often: select how often did you consume it Never

Amount: gm or oz

7. Chinese noodle (noodle soup, lo mei, instant noodle)

How often: select how often did you consume it Never

Amount as: picture about % or gm/ oz

8. Rice noodle

How often: select how often did you consume it Never

Amount as: picture about % or gm/ oz

9. Dumpling or bun with meat stuffing

How often: select how often did you consume it Never

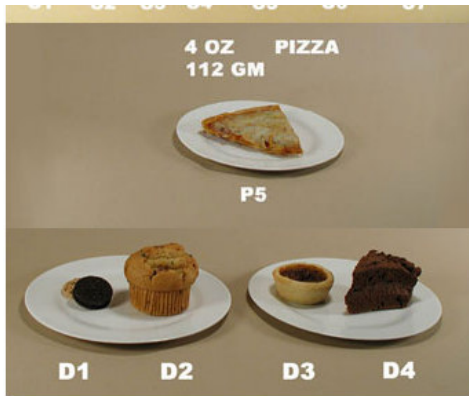
Amount as: picture about % or gm/ oz

10. Sticky rice product

How often: select how often did you consume it Never

Amount as: picture about % or gm/ oz

11. Corn product (corn cake, corn bread, corn muffin)



11. **Corn product (corn cake, corn bread, corn muffin)**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
12. **Pizza**
 How often: select how often did you consume it Never
 Amount as: P5 about % % or gm/ oz
13. **Lasagna, manicotti, ravioli, tortellini**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
14. **Macaroni, pasta, spaghetti and other noodles**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
15. **Bagel**
 How often: select how often did you consume it Never
 Consume: unit unit(s) each time
16. **Pancakes, waffles, French toast**
 How often: select how often did you consume it Never
 Amount as: B6 about % % or gm/ oz
17. **Bread or roll (including bread as part of sandwich, hot dog, burger)**
 How often: select how often did you consume it Never
 Amount as: B6 about % % or unit unit(s) each time
18. **Cracker, biscuit**
 How often: select how often did you consume it Never
 Amount as: D1 about % % or unit unit(s) each time
19. **Potato chips, tortilla chips, corn chips, pop corn, pretzels**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz

You have finished 72% on the section of dietary habits and 68% of the entire survey.

Please continue!!

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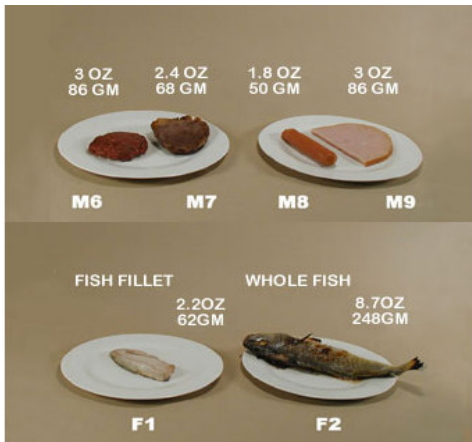
Nutrition and Dietary Habits of Chinese

How often you have eaten these **meat, poultry, fish, and eggs**? How much of each food you usually eat every time?

Over the past 12 months (1 year) . . .



1. **Lean pork (muscle only)**
 How often: Never
 Amount as: about % or gm/ oz
2. **Pork (fat and muscles, ground)**
 How often: Never
 Amount as: about % or gm/ oz
3. **Pork or beef spare ribs**
 How often: Never
 Amount as: about % or gm/ oz
4. **Roast Beef or steak, including beef in sandwiches**
 How often: Never
 Amount as: about % or gm/ oz
5. **Ground beef in mixtures (meat balls, casseroles, chili, meatloaf, including ground beef in burger or sandwich)**
 How often: Never
 Amount as: about % or gm/ oz
6. **Mutton or lamb**
 How often: Never
 Amount as: about % or gm/ oz
7. **Chicken**
 How often: Never
 Amount as: about % or gm/ oz
8. **Turkey**
 How often: Never
 Amount as: about % or gm/ oz
9. **Duck, and other poultry**
 How often: Never
 Amount as: about % or gm/ oz



10. **Ham**
 How often: select how often did you consume it Never
 Amount as: M9 about % % or gm/ oz
11. **Canned Tuna (salad, sandwiches, casseroles)**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
12. **Sausage**
 How often: select how often did you consume it Never
 Amount as: M8 about % % or gm/ oz
13. **Whole fish (fresh water fish or sea fish)**
 How often: select how often did you consume it Never
 Amount as: F2 about % % or gm/ oz
14. **Fish fillet**
 How often: select how often did you consume it Never
 Amount as: F1 about % % or gm/ oz
15. **Whole crab, crab legs with shell**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
16. **Crab meat, crab cake without shell**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
17. **Shrimp (various)**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
18. **Shell fish**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
19. **Liver, liverwurst**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
20. **Other offal (intestine, heart, kidney, stomach)**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
21. **Boiled eggs, duck eggs**
 How often: select how often did you consume it Never
 Consume: unit unit(s) each time
22. **Fried eggs**
 How often: select how often did you consume it Never
 Consume: unit unit(s) each time

You have finished 86% on the section of dietary habits and 83% of the entire survey.

Please continue!!

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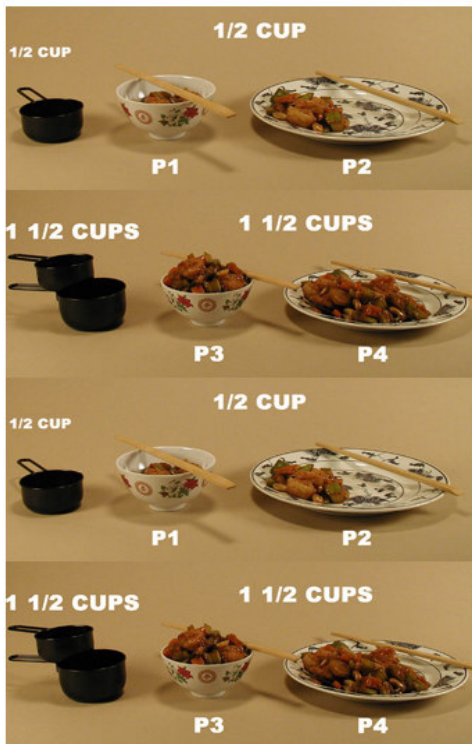
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Nutrition and Dietary Habits of Chinese

How often you have eaten these vegetables? How much of each vegetable you usually eat every time?

Over the past 12 months (1 year) . . .



1. **Bean curd, tofu (all kinds, soft, firm, dried, fried)**
 How often: Never
 Amount as: about % or gm/ oz
2. **Lettuce**
 How often: Never
 Amount as: about % or gm/ oz
3. **Leafy greens (bok choy, spinach, turnip, collard, mustard, chard, kale, Broccoli rape, Artemisia stem)**
 How often: Never
 Amount as: about % or gm/ oz
4. **Cabbage, Chinese cabbage, sauer kraut**
 How often: Never
 Amount as: about % or gm/ oz
5. **Pea sprouts**
 How often: Never
 Amount as: about % or gm/ oz
6. **Celery**
 How often: Never
 Amount as: about % or gm/ oz
7. **Chinese chives**
 How often: Never
 Amount as: about % or gm/ oz
8. **Cucumber**
 How often: Never
 Amount as: about % or gm/ oz
9. **Summer squash, zucchini, wax gourd, bitter squash**
 How often: Never
 Amount as: about % or gm/ oz
10. **Tomato**
 How often: Never
 Amount as: about % or gm/ oz
11. **Carrot**
 How often: Never
 Amount as: about % or gm/ oz
12. **Green pepper, bell pepper, hot pepper**
 How often: Never
 Amount as: about % or gm/ oz
13. **Broccoli**
 How often: Never
 Amount as: about % or gm/ oz
14. **Cauliflower**
 How often: Never
 Amount as: about % or gm/ oz
15. **Asparagus**
 How often: Never
 Amount as: about % or gm/ oz

16. **Bamboo shoot**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
17. **Mung bean sprouts, soy bean sprouts**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
18. **Green bean, dutch bean, long beans**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
19. **Pea, fresh soy bean, lima beans**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
20. **Scallion, onions, green onion**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
21. **Eggplant**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
22. **Mushroom**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
23. **Chinese radish**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
24. **Lotus root**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
25. **Potato**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
26. **Sweet potato, yam**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
27. **Cooked dry beans**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz

You have finished 97% on the section of dietary habits and 89% of the entire survey.

Please continue!!

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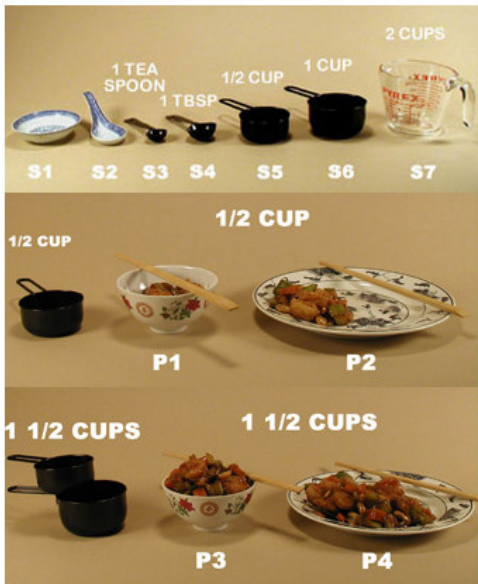
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Nutrition and Dietary Habits of Chinese

How often you have eaten these **condiments and sauces**? How much of each food you **usually** eat every time?

Over the past 12 months (1 year) . . .



1. **Catsup**
 How often: Never
 Amount as: about % or ml floz
2. **Peanut butter**
 How often: Never
 Amount as: about % or ml floz
3. **Butter, margarine**
 How often: Never
 Amount as: about % or ml floz
4. **Fruit jam, jelly, honey**
 How often: Never
 Amount as: about % or ml floz
5. **Salad dressing**
 How often: Never
 Amount as: about % or ml floz
6. **Syrup(on waffle or pancake)**
 How often: Never
 Amount as: about % or ml floz

7. **Gravy (serve on meat, chicken, mash potato, rice)**
 How often: select how often did you consume it Never
 Amount as: picture about % % or ml floz
8. **Sesame paste**
 How often: select how often did you consume it Never
 Amount as: picture about % % or ml floz
9. **Hot sauce**
 How often: select how often did you consume it Never
 Amount as: picture about % % or ml floz
10. **Over the past 12 months, how often you have eaten stir-fired foods (cooked with cooking oil), including stir-fried vegetables, stir-fried rice, stir-fried meat, eggs, etc...? How much you have eaten each time, usually?**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz
11. **Over the past 12 months, how often you have eaten deep-fried foods, for example, french fries, deep fried meat balls, deep fried fish, etc...? How much you have eaten each time, usually?**
 How often: select how often did you consume it Never
 Amount as: picture about % % or gm/ oz

Congratulations! Now you have finished the section of dietary habits. You also have finished 91% of the entire survey.

Please move on!

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Nutrition and Dietary Habits of Chinese

Here are 6 statements about what people eat.

Please use the 7-point scale to indicate your "agreement or disagreement" with each statement, tell us if you:

Strongly Agree >>> Agree >>>> Somewhat Agree >>> Neutral >>> Somewhat Disagree >>> Disagree >>> Strongly

Disagree or not sure with the statements:

1. Choosing a healthy diet is just a matter of knowing what foods are good and what foods are bad.

- strongly agree
- agree
- somewhat agree
- neutral
- somewhat disagree
- disagree
- strongly disagree

2. Eating a variety of foods each day probably gives you all the vitamins and minerals you need.

- strongly agree
- agree
- somewhat agree
- neutral
- somewhat disagree
- disagree
- strongly disagree

3. Some people are born to be fat and some thin; there is not much you can do to change this.

- strongly agree
- agree
- somewhat agree
- neutral
- somewhat disagree
- disagree
- strongly disagree

4. **There are so many recommendations about healthy ways to eat it's hard to know what to believe.**

- strongly agree
- agree
- somewhat agree
- neutral
- somewhat disagree
- disagree
- strongly disagree

5. **What you eat can make a big difference in your chance of getting a disease, like heart disease or cancer.**

- strongly agree
- agree
- somewhat agree
- neutral
- somewhat disagree
- disagree
- strongly disagree

6. **The things I eat and drink now are healthy so there is no reason for me to make changes.**

- strongly agree
- agree
- somewhat agree
- neutral
- somewhat disagree
- disagree
- strongly disagree

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Nutrition and Dietary Habits of Chinese

This section is about what you know about nutrition.

****This is a survey, not an exam. Please do it by yourself as well as you can, and do not seek help from your friends and family****

1. Which one of the following has the most calories (energy) for the same weight?
 - Sugar
 - Starchy foods
 - Fiber/roughage
 - Fat
 - Not sure

2. Which fat do experts say is more important for people to cut down on?
 - Monounsaturated fat
 - Polyunsaturated fat
 - Saturated fat
 - Not sure

3. Which kind of fat is more likely to be a liquid rather than a solid?
 - Saturated fats
 - Polyunsaturated fats
 - No difference
 - Not sure

4. If a food has no cholesterol is it also...
 - Low in saturated fat
 - High in saturated fat
 - Could be either high or low in saturated fat
 - Not sure

5. Which kind of food is more likely content cholesterol?
 - Vegetables and vegetables oil
 - Animal products like meat and dairy products
 - All foods containing fat or oil
 - Not sure

6. "High cholesterol" only happens to people who are overweight, it is true or false?
- True
 - False
 - Not sure
7. Are you aware of any major health problem or diseases that may be related to how people eat and their body weight?
- 1 Not eating enough fiber
 - Not related
 - Related
 - Do not know
 - 2 Eating too much salt
 - Not related
 - Related
 - Do not know
 - 3 Eating too much cholesterol
 - Not related
 - Related
 - Do not know
 - 4 Eating too much preservatives/additives
 - Not related
 - Related
 - Do not know
 - 5 Eating too much sugar
 - 6 Being over-weight
 - Not related
 - Related
 - Do not know

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Nutrition and Dietary Habits of Chinese

Below is a list of eating practices made under various conditions. Consider your own eating habits at present, and rate your confidence that you can perform the eating behaviors listed below on "a regular basis". Please tell us **how confident you think you can do** the behaviors listed below.

Rate your degree of confidence by selecting a number from 0 (I know I cannot or not at all confident) to 10 (I know I can or completely confident) using the scale below.

1. Resist having a donut or pastry at work most of the time, even if everybody at my table is having one.
I know I cannot 0 1 2 3 4 5 6 7 8 9 10 I know I can
2. Choose fruit instead of cookies, donuts, candies, or chocolate, most of the time, at coffee breaks.
I know I cannot 0 1 2 3 4 5 6 7 8 9 10 I know I can
3. Avoid the preparation of all deep-fried foods such as French fried, batter-coated chicken, batter-coated fish, and deep fried meat ball.
I know I cannot 0 1 2 3 4 5 6 7 8 9 10 I know I can
4. Always choose lean meat and avoid animal fat in food, as lard.
I know I cannot 0 1 2 3 4 5 6 7 8 9 10 I know I can
5. Choose low-fat product if have choice.
I know I cannot 0 1 2 3 4 5 6 7 8 9 10 I know I can
6. Choose steamed, lightly fried, less oiled food instead of deep fried, oily food.
I know I cannot 0 1 2 3 4 5 6 7 8 9 10 I know I can

You have finished **99%** (if you are in China)/ **98%** (if you are in the US) of the survey.

Please continue!!

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Nutrition and Dietary Habits of Chinese

Below are a few questions asking your "culture background" and "use of languages". Please read each question carefully, and select your answers. *If you are currently living in China and never stayed in the U.S. for more than 6 months, you can skip this section to the last page*

1. In total, how long have you lived in the US?
 - Never stayed in the US for more than 6 months
 - 6 month ~ 2years
 - 3~5 years
 - 6~10 years
 - 11~15years
 - 16~20 years
 - more than 20 years

2. Where were you born?
 - Mainland China Province/city
 - Tai Wan or Hong Kong
 - United States State
 - Other Country in Asia,specify
 - Other Country,specify

3. I am currently living in
 - Beijing
 - Shanghai
 - Shen zhen
 - Other city in China, specify Province/City
 - Seattle
 - Chicago
 - New York City
 - Washington D.C.
 - San Francisco / Bay Area
 - Other city in the United States, specify State
 - Other country, specify

4. Was your **father** born in the US?
 - Yes
 - No

5. Was your **mother** born in the US?
 - Yes
 - No

6. Were any of your **grandfathers** born in the US?
 - Yes
 - No

7. Were any of your **grandmothers** born in the US?
 - Yes
 - No

8. How old were you when you moved to the US? yrs old

9. What language do you speak at home?
- Chinese more than English
 - Chinese and English equally often
 - English more than Chinese
 - Other
10. What languages do you speak outside of home?
- Chinese better than English
 - Chinese and English equally well
 - English better than Chinese
 - Other
11. What languages do you read?
- Chinese better than English
 - Chinese and English equally well
 - English better than Chinese
 - Other
12. Are your good friends.....
- Mostly Chinese
 - About half Chinese and half American
 - Mostly American
 - Other
13. Do you prefer going to social gatherings and parties at which people are...
- Mostly Chinese
 - About half Chinese and half American
 - Mostly American
 - Other
14. Do you belong to an American religious group?
- Yes
 - No
15. Do you belong to a Chinese religious group?
- Yes
 - No

-
16. Do you belong to any **American** recreational groups?
- Yes
 No
17. Do you belong to any **Chinese** recreational groups?
- Yes
 No
18. Do you belong to any **American** work or professional groups?
- Yes
 No
19. Do you belong to any **Chinese** work or professional groups?
- Yes
 No
20. Do you belong to an **American** civic or political group?
- Yes
 No
21. Do you belong to a **Chinese** civic or political group?
- Yes
 No
22. What sort of **movies** do you prefer to watch?
- I generally prefer Chinese movies
 I like both equally
 I generally prefer American movies
 I do not watch movies
 Others
23. What sort of **TV shows** do you prefer to watch?
- I generally prefer Chinese TV show
 I like both equally
 I generally prefer American TV show
 I do not watch TV
 Other
24. What type of **newspapers** do you prefer to look at?
- I generally prefer Chinese newspapers
 I like both equally
 I generally prefer English newspapers
 I do not read newspapers
 Other
25. What type of **websites** do you prefer to check for **news**?
- I generally prefer Chinese websites to check news
 I like both equally
 I generally prefer English websites to check news
 I do not check news on the web
 Other
-

26. What type of **websites** do you prefer for **entertainment**?

- I generally prefer Chinese websites
- I like both equally
- I generally prefer American websites
- I do not spend my leisure time on the web
- Other

27. What sort of **music** do you prefer to listen to?

- I generally prefer Chinese music
- I like both equally
- I generally prefer American music
- I do not listen to music
- Other

28. What type of **restaurants** do you prefer to go to?

- More Chinese than American
- About half Chinese and half American
- More American than Chinese
- Do not go to restaurants
- Other

29. What type of **foods** do you **eat at home**?

- More Chinese than American
- About half Chinese and half American
- More American than Chinese
- I do not eat at home
- Other

30. What type of **grocery stores** do you go to?

- More Chinese/Asian than American
- About half Chinese/Asian and half American
- More American than Chinese/Asian
- I do not go grocery shopping
- Other

[PRE](#)

[NEXT](#)

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Nutrition and Dietary Habits of Chinese

Congratulations! This is the **last page** of the survey asking about you your household characters.

When you finish the final page, you may submit your answers and confirm your information to join our "[incentives program](#)". You will also be given the URL of this research you are participating in, so that you can see more details of our research and check the results of this study when it is completed.

Please Continue!

1. You are working for

- an American company
- a Chinese company
- Other Asian company
- Company with some other ownership

2. What kind of company do you work for?

- Software
- Computer hardware, computer electronic, and peripherals
- Telecommunications
- Computers networking, internet, e-comers
- Bio-technology, medicine, pharmaceuticals and health related business
- Other

3. What is your current position (job title)?

4. You are a

- Male
- Female

5. In what month and year were you born? Month, Year: 19

6. How tall are you without shoes? cm **or** Ft In

7. How much do you weigh without shoes? Kg **or** lb

8. The highest education you obtained in China is:

- None
- Primary school
- Middle school
- High school or skill school
- Community college
- University
- Master degree
- Ph.D.

Major in and

9. The highest education you obtained in the US is:

- None
- K-12
- College/University
- Master
- Ph.D.
- Professional Degree

Major in and

10. What is your current marital status?

- Never been married
- Married/cohabiting
- Divorced/Separated
- Widowed

11. How many children do you have?

12. With whom do you currently live?

- Yourself, alone
- Friends/roommates
- Parents
- Spouse or partner only
- Spouse and child(ren)
- Spouse, and parents /or parents-in-law
- Spouse, children and parents /or parents-in-law

13. What is your own present annual income level before tax (total income including bonus, commission, stock... and salary)?

- | | |
|--|--|
| <input type="radio"/> <15,000RMB | <input type="radio"/> <\$15,000 |
| <input type="radio"/> 15,000 ~ 29,999RMB | <input type="radio"/> \$15,000 ~ \$29,999 |
| <input type="radio"/> 30,000 ~ 59,999RMB | <input type="radio"/> \$30,000 ~ \$49,999 |
| <input type="radio"/> 60,000 ~ 119,999RMB | <input type="radio"/> \$50,000 ~ \$79,999 |
| <input type="radio"/> 120,000 ~ 299,999RMB | <input type="radio"/> \$80,000 ~ \$ 99,999 |
| <input type="radio"/> 300,000 ~ 499,999RMB | <input type="radio"/> \$100,000 ~ \$149,999 |
| <input type="radio"/> 500,000 ~ 999,999RMB | <input type="radio"/> \$150,000 ~ \$ 199,999 |
| <input type="radio"/> >1,000,000RMB | <input type="radio"/> >\$200,000 |

You have finished the survey!

Please submit !!

[PRE](#)

[NEXT](#)

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Nutrition and Dietary Habits of Chinese

Thank you for Participating!

If you have left some questions unanswered, please click to finish them.

You've automatically entered our [sweepstakes](#) program if you have completed every question. The prize (\$50) winner will be selected at random from among all eligible entries. The winners will be notified via the email address he/she provided.

Again, thank your for participating this survey. For more information on this dissertation research, please go to <http://www.ienuitrition.com/> or give us [feedback](#).

Please give us [feedback](#) if you have any comments or suggestions.

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Appendix 4: Webpage of the Web-based questionnaire – Chinese version

English>>

从事高科技行业的中国人之饮食与营养调查

欢迎参加网上饮食与营养的调查研究

诚挚的邀请

我们诚挚地邀请您参与一项网上的饮食与营养调查研究。该调查是“从事高科技行业的中国人之饮食与营养调查”课题的一部分。此项研究由美国马里兰大学营养与食品科学系负责，并由马里兰大学科研审查委员会（Institutional Review Board）审批通过。我们诚挚地邀请您参与我们的此项研究。

如果您符合以下4点的描述，就请您积极参加本调查：

- 1) 是中国人，美籍华人，或华裔美国人
- 2) 目前在高科技行业工作
- 3) 工作性质不属于医学与健康领域
- 4) 年龄在20到45岁之间

认真完成本调查大多数人需要40分钟。这个网上调查的内容包括：您的个人情况、日常饮食习惯、营养知识、营养观念等等。您的参与会帮助我们更为详细地了解高科技行业的中国青年在饮食与健康方面的现状，而研究结果将会指导我们健康工作者在未来更为有针对性并有效益地服务于中国人的社区。所以，您的参与，可谓意义深远。

答谢活动与充满乐趣的过程

我们是大学的科研工作者，所以此项研究没有任何商业目的。但是，为了表达我们对您积极参与的感谢，我们为所有的参与者准备了**奖金答谢活动**。所有完成了该问卷所有题目的人，都具有参与此项活动的资格。在整个调查过程中，共有10人可领取奖金。如果获奖者目前居住在中国，您将会获得奖金，金额为与50美金相等的人民币（以当日汇率为准，大约为税前400元左右）。届时，我们将会通过您所提供的电子邮件地址与您联系，奖金将以汇款形式寄给您。如果获奖者目前居住在美国，您将会获得由Amazon.com提供的购物代金券一个，金额为\$50。

同时，我们将参与本研究的过程是充满乐趣的。我们备有中英文双语问卷，还备有一份中英文对照版问卷。您可以在紧张的工作之余了解一些与营养、健康、文化有关的词汇、新语言，放松心情。另外，在2004年底和2005年初的时候，我们会将研究结果公布于网上。届时，您会了解到与您同样在高科技企业年轻人们的饮食与营养现状。

我们的承诺

本调查采取匿名原则，您的所有答案将会与所有其他参与者的答案整合到数据库，仅供研究分析使用。您有权随时中止答题，您也有权利回答任何不喜欢的问题。本调查不是商业调查，没有人会试图给您任何商品，也没有人会向您邮寄垃圾邮件。

非常感谢您的合作与参与！

在开始之前，请您仔细阅读同意书。只有在您仔细阅读并接受同意书上的条款您才能参与本项研究。

同意书

研究题目：
高科技行业中的中国人之营养观念与饮食习惯的调查。

参与者的年龄声明：
本人年满18岁，自愿参加由马里兰大学营养与食品科学系主持管理的此项科研调查。

研究目的：

我已仔细阅读同意书上所有条款，自愿参加此项调查，并确保认真填写每道问卷每一道问题。

我拒绝参加此项调查。

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从事高科技行业的中国人之饮食与营养调查

登录注册

请使用您的有效电子邮件地址登录并开始答题，或者输入您的邮件地址返回并完成您的调查。

此邮件地址会作为您参与奖金答谢活动的联系方式。只有当您幸运地成为\$50的获奖者时，我们才会给您发送邮件以便通知您如何领取奖金。您的邮件地址不会被用于任何带有商业目的的活动或产品推销，我们也不会把您的邮件地址转让或传播给其他任何单位或组织。

Email:



从事高科技行业的中国人之饮食与营养调查

感谢您积极参与此项有关中国人的饮食与营养的问卷调查。您的参与是您对此项研究最大的贡献。

我们的早期测试结果显示，大多数人需要40分钟来认真并完整地回答此问卷。希望您能够如实、认真地回答每一道。如果您不能一次完成此问卷的全部，您可以先部分提交答案，分多次完成。只要您每次所用的邮件地址相同，我们的系统会自动存录您的答案。

做为我们对您的感谢，当您回答完所有问题并提交答案后，您将会自动加入我们的随机抽奖的奖金答谢活动，您将有机会得到相当于50美金的奖金。如果您幸运地成为我们奖金获得者，我们将通过您所提供的电子邮件地址与您联系具体的奖金邮寄方式。

再一次感谢您的积极参与，并祝您好运！

现在开始！！

第一部分是一些饮食习惯的问题。

1. 在过去的一年里，**通常**您在家庭以外的地点，如正式餐馆或快餐店，吃多少次饭？
请选择平均您在外面吃**中式或西式**早、午、晚餐的次数。

1 **中式早餐：**

快餐：每 周 月 年 次 不曾
 餐馆：每 周 月 年 次 不曾

2 **西式早餐：**

快餐：每 周 月 年 次 不曾
 餐馆：每 周 月 年 次 不曾

3 **中式午餐：**

快餐：每 周 月 年 次 不曾
 餐馆：每 周 月 年 次 不曾

4 **西式午餐：**

快餐：每 周 月 年 次 不曾
 餐馆：每 周 月 年 次 不曾

5 **中式晚餐：**

快餐：每 周 月 年 次 不曾
 餐馆：每 周 月 年 次 不曾

6 西式晚餐：

快餐： 每 周 月 年 次 不曾
餐馆： 每 周 月 年 次 不曾

2. 在过去的一年里，您是否曾经服用过维生素片、矿物质或/及其他种类的营养保健品？
一般情况下，您每次服用多少量？多久服用一次？

1 在过去的12个月里，您是否服用过“复合维生素、多种矿物质”片剂、胶囊等保健品？例如善存片，金施尔康等。

不曾服用

保健品1： 服用频率： 每 天 周 月 年 次
每次服用量： (毫克/微克/单位) 或 几 片(粒)

保健品2： 服用频率： 每 天 周 月 年 次
每次服用量： (毫克/微克/单位) 或 几 片(粒)

其它： **请详细填写品名、服用频率、及每次用量。

2 在过去的12个月里，您是否服用过单纯维生素的保健品？例如维生素C、维生素E、维生素D、维生素B1、叶酸等。

不曾服用

保健品1： 服用频率： 每 天 周 月 年 次
每次服用量： (毫克/微克/单位) 或 几 片(粒)

保健品2： 服用频率： 每 天 周 月 年 次
每次服用量： (毫克/微克/单位) 或 几 片(粒)

其它： **请详细填写品名、服用频率、及每次用量。

3 在过去的12个月里，您是否服用过单纯矿物质的保健品？例如钙片、铁剂、锌、硒等。

不曾服用

保健品1： 服用频率： 每 天 周 月 年 次
每次服用量： (毫克/微克/单位) 或 几 片(粒)

保健品2： 服用频率： 每 天 周 月 年 次
每次服用量： (毫克/微克/单位) 或 几 片(粒)

其它： **请详细填写品名、服用频率、及每次用量。

4 在过去的12个月里，您是否服用过蛋白质、氨基酸类保健品？

不曾服用

保健品1: 服用频率: 每 天 周 月 年 次
每次服用量: (毫克/微克/单位) 或 几 片(粒)

保健品2: 服用频率: 每 天 周 月 年 次
每次服用量: (毫克/微克/单位) 或 几 片(粒)

其它: **请详细填写品名、服用频率、及每次用量。

5 在过去的12个月里，您是否服用过中草药保健品？例如人参、银杏叶、芦荟等。

不曾服用

保健品1: 服用频率: 每 天 周 月 年 次
每次服用量: (毫克/微克/单位) 或 几 片(粒)

保健品2: 服用频率: 每 天 周 月 年 次
每次服用量: (毫克/微克/单位) 或 几 片(粒)

其它: **请详细填写品名、服用频率、及每次用量。

6 在过去的12个月里，您是否服用过其它任何其他种类保健品？例如鱼油、花粉、蜂王浆、褪黑激素 (melatonin, 脑白金)、大豆甾激素 等。

不曾服用

保健品1: 服用频率: 每 天 周 月 年 次
每次服用量: (毫克/微克/单位) 或 几 片(粒)

保健品2: 服用频率: 每 天 周 月 年 次
每次服用量: (毫克/微克/单位) 或 几 片(粒)

其它: **请详细填写品名、服用频率、及每次用量。

下一页



从事高科技行业的中国人之饮食与营养调查

通常情况下，您食用以下各种“奶制品”的频率和量的情况为

在过去的12个月(1年)里.....



- 全脂牛奶 Whole milk**
 食用频率: 请选择食用次数
 用量如图: 图 约: % 或 克 盎司
 从来不吃
- 低脂奶 Low fat milk**
 2%fat 减脂奶 1%fat 低脂奶 non-fat 脱脂奶
 食用频率: 请选择食用次数
 用量如图: 图 约: % 或 克 盎司
 从来不吃
- 奶粉 Milk powder**
 食用频率: 请选择食用次数
 用量如图: 图 约: % 或 克 盎司
 从来不吃
- 酸奶 Yogurt**
 食用频率: 请选择食用次数
 用量如图: 图 约: % 或 克 盎司
 从来不吃
- 干酪, 干乳酪 Cottage cheese**
 食用频率: 请选择食用次数
 用量如图: 图 约: % 或 克 盎司
 从来不吃
- 奶酪 Cheese**
 食用频率: 请选择食用次数
 用量如图: 图 约: % 或 克 盎司
 从来不吃
- 奶酪蛋糕 Cheese cake**
 食用频率: 请选择食用次数
 用量如图: D4 约: % 或 克 盎司
 从来不吃
- 冰淇淋, 冰棍, 奶油果露等 Ice cream, ice cream bars**
 食用频率: 请选择食用次数
 用量如图: 图 约: % 或 克 盎司
 从来不吃

上一页

下一页



从事高科技行业的中国人之饮食与营养调查

通常情况下，您饮用以下各种“饮料和酒”的频率和量的情况为

在过去的12个月(1年)里.....



1. 橙汁，或其它果汁 Orange juice, other fruit juice
 饮用频率: 请选择食用次数 [v] 从来不喝
 用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司

2. 健怡可乐，无糖汽水 Diet soda (coke, sprit, 7-up...)
 饮用频率: 请选择食用次数 [v] 从来不喝
 用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司

3. 普通汽水，可乐、雪碧、七喜等 Regular soda
 饮用频率: 请选择食用次数 [v] 从来不喝
 用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司

4. 豆浆、豆奶 Soy milk
 饮用频率: 请选择食用次数 [v] 从来不喝
 用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司

5. 茶，冰茶、热茶 Tea (iced tea, hot tea)
 饮用频率: 请选择食用次数 [v] 从来不喝
 用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司

喝茶时，通常情况下是否加“糖”？每次加多少？

- (几乎)从来不加糖
- 大约有1/4的时间会加糖
- 大约有1/2的时间会加糖
- 大约有3/4的时间会加糖
- (几乎)总是加糖

每次加糖量大约如图: [v] 的 % [v] %

喝茶时，您通常是否加“奶”等调味品？哪种调品？每次加多少？

- (几乎)从不加
- 大约有1/4的时间会加
- 大约有1/2的时间会加
- 大约有3/4的时间会加
- (几乎)总是加奶等调味品

通常喝茶时，使用的奶品或调味品为：

- 全脂奶 whole milk
- 2% 减脂奶 2% low-fat milk
- 1% 低脂奶 1% low-fat milk
- 脱脂奶 non-fat milk
- 半奶半奶油 half-half
- (精)炼乳 evaporated or condensed milk
- 植脂末 non-dairy creamer

每次添加奶等调味品的量大约如图: [v] 的 % [v] %

6. 咖啡 Coffee
 饮用频率: 请选择食用次数 [v] 从来不喝
 用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司

喝咖啡时，通常情况下是否加“糖”？加多少？

- (几乎)从不加糖
- 大约有 1/4 的时间会加糖
- 大约有 1/2 的时间会加糖
- 大约有 3/4 的时间会加糖
- (几乎)总是加糖

每次加糖量大约如图： 图 的 % %

喝咖啡时，您通常是否加“奶”等调味品？哪种调品？加多少？

- (几乎)从不加
- 大约有 1/4 的时间会加
- 大约有 1/2 的时间会加
- 大约有 3/4 的时间会加
- (几乎)总是加奶等调味品

通常喝咖啡时，使用的奶品或调味品为：

- 全脂奶 whole milk
- 2% 减脂奶 2% low-fat milk
- 1% 低脂奶 1% low-fat milk
- 脱脂奶 non-fat milk
- 半奶半奶油 half-half
- (精)炼乳 evaporated or condensed milk
- 植脂末 non-dairy creamer

每次添加奶等调味品的量大约如图： 图 的 % %

7. 啤酒 Beer

饮用频率： 请选择食用次数 从来不喝
用量如图： 图 约： unit unit(s) 或 克 盎司

8. 葡萄酒，果酒 Wine (red, white)

饮用频率： 请选择食用次数 从来不喝
用量如图： A2 约： % % 或 克 盎司

9. 白酒、烈酒 Liquor

饮用频率： 请选择食用次数 从来不喝
用量如图： A1 约： % % 或 克 盎司

您已经完成饮食部分的 23%，全部调查的 20%。请继续！！

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从事高科技行业的中国人之饮食与营养调查

通常情况下，您食用以下各种“甜点”类食物的频率和量的情况为

在过去的12个月(1年)里.....



- 巧克力糖 Chocolate candy**
 食用频率: 请选择食用次数 从来不吃
 每次食用: 几 块 (普通大小, 30~60克, 1~2 盎司)
- 其它糖果, 如芝麻糖 Other candy(such as saseme candy)**
 食用频率: 请选择食用次数 从来不吃
 每次食用: 几 块 或 克 / 盎司
- 中式点心, 酥皮儿面点, 月饼等 Dim sum, Chinese style cakes, Chinese crips cakes, Moon cake**
 食用频率: 请选择食用次数 从来不吃
 每次食用: 几 块 或 克 / 盎司
- 曲奇饼干 Cookies**
 食用频率: 请选择食用次数 从来不吃
 每次食用: 几 个
- 蛋糕, 松糕 Cake (not cheese cake), English Muffin**
 食用频率: 请选择食用次数 从来不吃
 用量如图: D4 约: % % 或 克 盎司
- 甜甜圈, 甜面点, 丹麦小甜点, 水果(果仁)烘培馅饼, 蛋塔, 米花糖等 Doughnuts, sweet rolls, Danish, or pop-tarts, rice cracker**
 食用频率: 请选择食用次数 从来不吃
 每次食用: 几 个
- 核桃仁巧克力饼 Brownie**
 食用频率: 请选择食用次数 从来不吃
 每次食用: 大小: 小块 中等 大块 几 个
- 各种派, 西式夹心馅饼 Pies**
 食用频率: 请选择食用次数 从来不吃
 每次食用: ? 个
- 花生或其它坚果果仁 Peanuts or other nuts or seeds**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司

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从事高科技行业的中国人之饮食与营养调查

通常情况下，您食用以下各种“水果”的频率和量的情况为

在过去的12个月（1年）里.....

请注意季节的变化 例如，您在去年的一年里，只在夏季的三个月里曾经食用桃子，大约每天吃1次，每次吃1个。经过计算，您应该填写：在过去的一年里，大概为每4天吃一个桃子，约为每月吃7个桃子。

1. **苹果 Apple**
 食用频率: 请选择食用次数
 每次食用: 从来不吃
2. **梨 Pear**
 食用频率: 请选择食用次数
 每次食用: 从来不吃
3. **香蕉 Banana**
 食用频率: 请选择食用次数
 每次食用: 从来不吃
4. **橙子, 桔子, 柑子 Orange, tangerines, tangelos**
 食用频率: 请选择食用次数
 每次食用: 从来不吃
5. **猕猴桃 Kiwi fruit**
 食用频率: 请选择食用次数
 每次食用: 从来不吃
6. **桃子、油桃, 李子等 Peaches, nectarines, plums, Apricot**
 食用频率: 请选择食用次数
 每次食用: 从来不吃
7. **芒果等 Mango**
 食用频率: 请选择食用次数
 每次食用: 从来不吃

您已经完成了饮食部分的 2/5，全部调查的 38%。请继续!!

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从事高科技行业的中国人之饮食与营养调查

通常情况下，您食用以下各种“水果”的频率和量的情况为

在过去的12个月(1年)里.....

请注意季节的变化 例如，您在去年的一年里，只在夏季的三个月里曾经食用桃子，大约每天吃1次，每次吃1个。经过计算，您应该填写：在过去的一年里，大概为每4天吃一个桃子，约为每月吃7个桃子。



1. **西柚, 柚子 Grapefruit**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
2. **菠萝 Pineapple**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
3. **葡萄 Grape**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
4. **草莓 Strawberry**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
5. **其它浆果, 如蓝莓, 黑莓 Other berry (blueberry, blackberry)**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
6. **西瓜 Watermelon**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
7. **美国甜瓜, 白兰瓜及各种甜瓜 Cantaloupe, honeydew, other melon**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
8. **木瓜 Papaya**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
9. **枣 Dates, jujube**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
10. **荔枝, 龙眼桂圆 Lichee, longan**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司

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从事高科技行业的中国人之饮食与营养调查

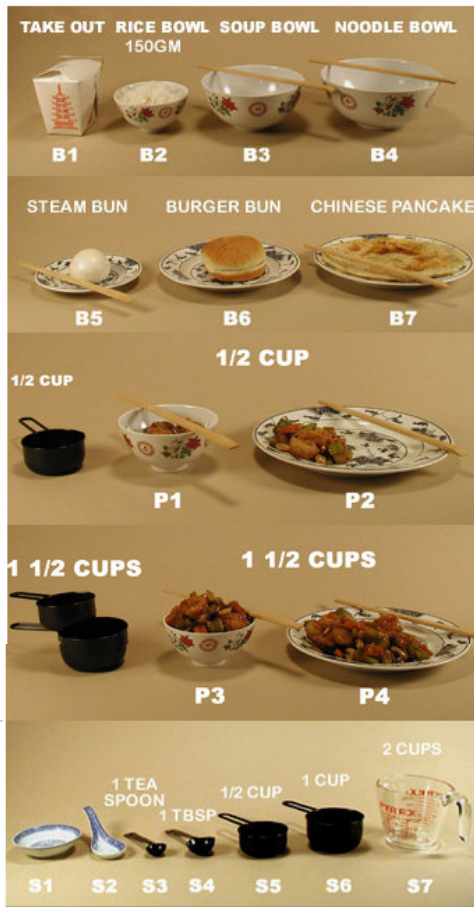
通常情况下，您食用以下各种“**米面等主食类食品**”的频率和量的情况为

填写样例：

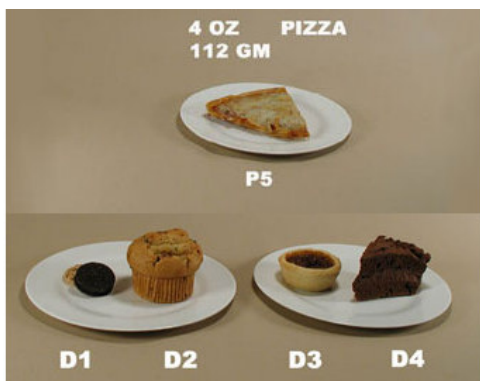
2. 米饭 Rice

食用频率: 每天 2~3次 从来不吃

用量如图: 图 B2 约: 100% 或 150克 盎司



1. 麦片 Cold cereal
食用频率: 请选择食用次数 从来不吃
用量如图: 图 约: % % 或 克 盎司
2. 米饭 Rice
食用频率: 请选择食用次数 从来不吃
用量如图: 图 约: % % 或 克 盎司
3. 稀饭, 粥等 Rice porridge, congee
食用频率: 请选择食用次数 从来不吃
用量如图: 图 约: % % 或 克 盎司
4. 花卷, 馒头等 Steamed bun
食用频率: 请选择食用次数 从来不吃
用量如图: B5 约: % % 或 克 盎司
5. 中式烙饼, 烧饼, 烤饼等 Chinese pan cake
食用频率: 请选择食用次数 从来不吃
用量如图: B7 约: % % 或 克 盎司
6. 油条、油饼、薄脆等 Fried dough cake, stick
食用频率: 请选择食用次数 从来不吃
每次用量: 克 盎司
7. 中式面条(汤面、炒面, 方便面) Chinese noodle (noodle soup, lo mei, instant noodle)
食用频率: 请选择食用次数 从来不吃
用量如图: 图 约: % % 或 克 盎司
8. 米粉, 米线等 Rice noodle
食用频率: 请选择食用次数 从来不吃
用量如图: 图 约: % % 或 克 盎司
9. 肉馅包子, 饺子, 馅饼等 Dumpling or bun with meat stuffing
食用频率: 请选择食用次数 从来不吃
用量如图: 图 约: % % 或 克 盎司
10. 糯米, 黏米食品(如粽子、年糕等) Sticky rice product
食用频率: 请选择食用次数 从来不吃
用量如图: 图 约: % % 或 克 盎司



11. 玉米制品（玉米糕，玉米饼等）Corn product (corn cake, corn bread, corn muffin)
 食用频率: 请选择食用次数 约: % % 或 克 盎司 从来不吃
12. 比萨饼 Pizza
 食用频率: 请选择食用次数 约: % % 或 克 盎司 从来不吃
13. 各式意大利宽面条、意大利饺子等 Lasagna, manicotti, ravioli, tortellini
 食用频率: 请选择食用次数 约: % % 或 克 盎司 从来不吃
14. 各式意大利细面条、通心粉等 Macaroni, pasta, spaghetti and other noodles
 食用频率: 请选择食用次数 约: % % 或 克 盎司 从来不吃
15. 硬面包圈 Bagel
 食用频率: 请选择食用次数 约: % % 或 克 盎司 从来不吃
 每次吃: 几 个
16. 华夫饼、西式烤饼，法国土司面包等 Pancakes, waffles, French toast
 食用频率: 请选择食用次数 约: % % 或 克 盎司 从来不吃
17. 各种面包（包括三明治、汉堡包、热狗等的面包）Breads or rolls (including breads as part of sandwiches, hot dog, burgers)
 食用频率: 请选择食用次数 约: % % 或 克 盎司 从来不吃
18. 饼干，小面点 Crackers, biscuit
 食用频率: 请选择食用次数 约: % % 或 克 盎司 从来不吃
19. 土豆薯片，玉米薯片，爆米花，脆饼干等 Potato chips, tortilla chips, corn chips, pop corn, pretzels
 食用频率: 请选择食用次数 约: % % 或 克 盎司 从来不吃

您已经完成了饮食部分的 72%，全部调查的 68%。请继续! !

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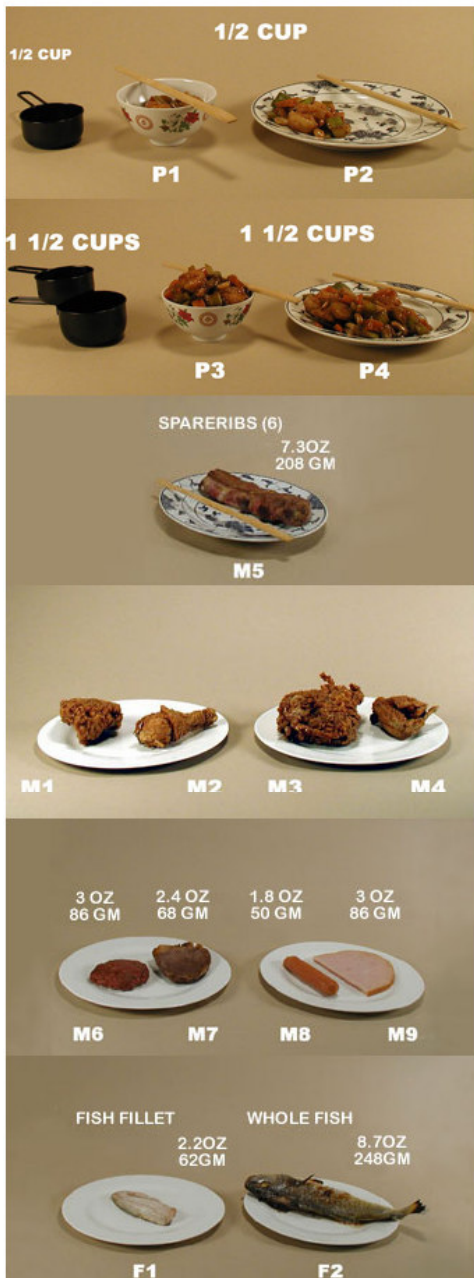
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从事高科技行业的中国人之饮食与营养调查

通常情况下，您食用以下各种“鱼、肉、禽、蛋”等类食物的频率和量的情况为

在过去的12个月(1年)里.....



1. 瘦/精猪肉 Lean pork
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司
2. 五花肉,肥瘦猪肉,猪肉馅 Pork (fat and muscles, ground)
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司
3. 猪、牛排骨 Pork or beef spare ribs
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: M5 [v] 约: % [v] % 或 [] 克 [] 盎司
4. 烤牛肉、牛排, 包括三明治里的烤牛肉 Roast Beef or steak, including beef in sandwiches
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司
5. 绞牛肉馅(肉丸, 绞细牛肉饼, 包括汉堡和三明治里的) Ground beef in mixtures (meat balls, casseroles, chili, meatloaf, including ground beef in burger or sandwich)
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司
6. 羊肉 Mutton
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司
7. 鸡肉 Chicken
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司
8. 火鸡肉 Turkey
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: M9 [v] 约: % [v] % 或 [] 克 [] 盎司
9. 鸭或其它类家禽 Duck and other poultry
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司
10. 火腿 Ham
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: M9 [v] 约: % [v] % 或 [] 克 [] 盎司
11. 灌装吞拿鱼 Caned Tuna (salad, sandwiches, casseroles)
[] 次 [] 天 [] 周 [] 月 [] 年 从来不吃
用量如图: 图 [v] 约: % [v] % 或 [] 克 [] 盎司
食用频率: 请选择食用次数 [v] 从来不吃
12. 肉肠, 腊肠 Sausage
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: M8 [v] 约: % [v] % 或 [] 克 [] 盎司
13. 整鱼(淡水鱼, 海水鱼、咸水鱼) Whole fish (fresh water fish or sea fish)
食用频率: 请选择食用次数 [v] 从来不吃
用量如图: F2 [v] 约: % [v] % 或 [] 克 [] 盎司

14. **鱼片(脱骨无刺) Fish fillet**
 食用频率: 请选择食用次数
 用量如图: F1 约: % % 或 克 盎司 从来不吃
15. **整蟹或带壳螃蟹腿 Whole crab, crab legs with shell**
 食用频率: 请选择食用次数
 用量如图: 图 约: % % 或 克 盎司 从来不吃
16. **去壳蟹肉, 蟹肉饼 Crab meat, crab cake without shell**
 几 次 每 天 周 月 年 从来不吃
 用量如图: 图 约: % % 或 克 盎司
 食用频率: 请选择食用次数 从来不吃
17. **各种虾 Shrimp (various)**
 食用频率: 请选择食用次数
 用量如图: 图 约: % % 或 克 盎司 从来不吃
18. **蛤蜊、蚌等壳类海产 Shell fish**
 食用频率: 请选择食用次数
 用量如图: 图 约: % % 或 克 盎司 从来不吃
19. **猪肝, 鸡肝, 肝泥肠 Liver, liverwurst**
 食用频率: 请选择食用次数
 用量如图: 图 约: % % 或 克 盎司 从来不吃
20. **其它内脏下水(如肥肠, 肝儿, 心, 腰子, 百叶等) Other offal (intestine, heart, kidney, stomach)**
 食用频率: 请选择食用次数
 用量如图: 图 约: % % 或 克 盎司 从来不吃
21. **煮的鸡蛋或鸭蛋 Boiled eggs, duck eggs**
 食用频率: 请选择食用次数
 每次食用: 几 个 从来不吃
22. **炒鸡蛋 Fried eggs**
 食用频率: 请选择食用次数
 每次食用: 几 个 从来不吃

您已经完成了饮食部分的 86%，全部调查的 83%。请继续！！

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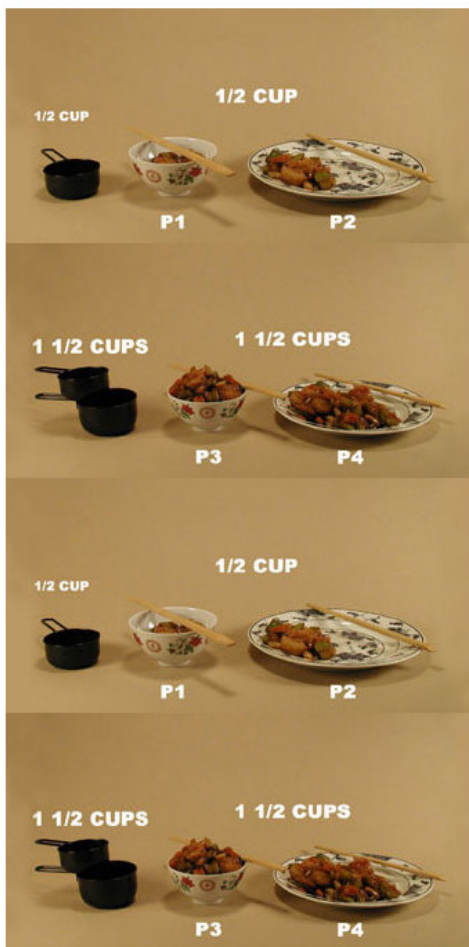


从事高科技行业的中国人之饮食与营养调查

通常情况下，您食用以下各种“蔬菜”的频率和量的情况为

在过去的12个月(1年)里.....

请注意季节的变化 例如，您在去年的一年里，只在夏季和秋季的六个月里曾经食用茄子，大约每周吃1次。经过计算，在过去的一年里，大概为每2周吃一次茄子，约为每月吃2次茄子。



- 各种豆腐, 软豆腐、老豆腐, 干豆腐, 油豆腐, 豆腐脑等**
 Bean curd, tofu (all kinds, soft, firm, dried, fried)
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 生菜, 生菜色拉 Lettuce, lettuce salad**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 大绿叶菜 (如菠菜、芥蓝、盖菜、甘蓝菜、油菜、蒿子秆等)**
 Leafy greens (bok choy, spinach, turnip, collard, mustard, chard, kale, broccoli rape, artemisia stem)
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 圆白菜, 卷心菜, 大白菜, 酸菜 Cabbage, Chinese cabbage, sauer kraut**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 豆苗, 豆尖 Pea sprouts**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 芹菜 Celery**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 韭菜 Chinese chives, leek**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 黄瓜 Cucumber**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 青瓜、意大利瓜、冬瓜、苦瓜 Summer squash, zucchini, wax gourd, bitter squash**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 西红柿 Tomato**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 胡萝卜 Carrot**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 辣椒, 柿子椒, 尖椒 Green pepper, bell pepper, hot pepper**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司

13. 西兰花, 绿菜花 Broccoli
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
14. 菜花 Cauliflower
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
15. 芦笋 Asparagus
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
16. 竹笋 Bamboo shoot
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
17. 绿豆芽、黄豆芽 Mung bean sprouts, soy bean sprouts
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
18. 扁豆, 豆角, 荷兰豆, 豇豆 Green bean, dutch bean, long beans
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
19. 豌豆, 毛豆, 青蚕豆 Pea, fresh soy bean, lima beans
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
20. 葱, 洋葱, 香葱 Scallion, onions, green onion
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
21. 茄子 Eggplant
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
22. 各式蘑菇 Mushroom
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
23. 白萝卜, 红萝卜 Chinese radish
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
24. 藕 Lotus root
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
25. 土豆 Potato
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
26. 红薯, 白薯, 山药, 番薯 Sweet potato, yam
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
27. 各种干豆子 Cooked dry beans
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司

您已经完成了饮食部分的 97%，全部调查的 90%。请继续！！

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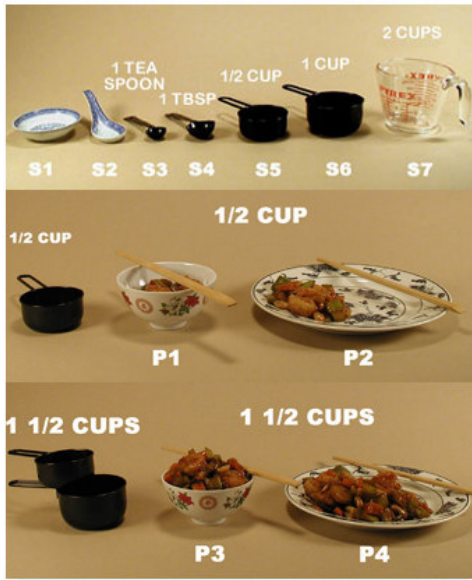
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从事高科技行业的中国人之饮食与营养调查

通常情况下，您食用以下各种“食品佐料或调料”的频率和量的情况为

在过去的12个月(1年)里.....



- 番茄酱 Catsup**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 花生酱 Peanut butter**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 黄油, 人造黄油 Butter, margarine**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 果酱、蜜酱 Fruit jam, jelly, honey**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 色拉酱 Salad dressing**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 糖浆(如浇于华夫饼或薄烤饼上等) Syrup(on waffle or pancake)**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 肉汁(浇于牛排上, 土豆泥上, 米饭上等) Gravy (on meat, chicken, mash potato, rice)**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 芝麻酱 Sesame paste**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 辣椒酱 Hot sauce**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 在过去的一年里, 您是否经常吃炒菜、炒饭等用植物油炒制的食品? 每次吃多少?**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司
- 在过去的一年里, 您是否经常吃油炸的食品, 例如炸丸子、炸鱼、炸薯条等? 每次吃多少?**
 食用频率: 请选择食用次数 从来不吃
 用量如图: 图 约: % % 或 克 盎司

祝贺您, 您已经完成了 饮食习惯部分的所有问题, 以及全部调查的 91%。请继续!!

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从事高科技行业的中国人之饮食与营养调查

非常感谢您耐心地完成以上的饮食习惯的调查！！您已经完成了全部调查的91%!!
接下来有一些关于您的饮食观念、营养知识以及一些与文化相关的题目。完成余下的部分，最多需要10分钟。

请阅读以下关于饮食的论述观点，请指出您对如下陈述的“态度”是：

1-极力反对，2-反对，3-有些反对，4-意见中立，5-有些同意，6-同意，还是7-非常同意。

1. **选择健康的饮食其实就是：知道什么食物对身体好，什么食物是对身体不好的。**
 - 完全不同意
 - 不同意
 - 有些不同意
 - 意见中立
 - 有些同意
 - 同意
 - 非常同意

2. **如果每天吃多样化的食物可以给您提供全部必需的维生素和矿物质。**
 - 完全不同意
 - 不同意
 - 有些不同意
 - 意见中立
 - 有些同意
 - 同意
 - 非常同意

3. **有些人人生来是胖的，有些人人生来就瘦，这是我们无法改变的事实。**
 - 完全不同意
 - 不同意
 - 有些不同意
 - 意见中立
 - 有些同意
 - 同意
 - 非常同意

4. **现在非常多的关于健康饮食的各种建议，很难知道应该相信哪些意见。**
 - 完全不同意
 - 不同意
 - 有些不同意
 - 意见中立
 - 有些同意
 - 同意
 - 非常同意

5. **“每天吃的食品”在很大程度上控制着一些慢性疾病的患病机率，比如心脏病，癌症等。**
 - 完全不同意
 - 不同意
 - 有些不同意
 - 意见中立
 - 有些同意
 - 同意
 - 非常同意

6. **我现在的饮食已经足够健康，我没有改变我的饮食的必要。**
 - 完全不同意
 - 不同意
 - 有些不同意
 - 意见中立
 - 有些同意
 - 同意
 - 非常同意

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从事高科技行业的中国人之饮食与营养调查

下面是7道有关脂类食物的**营养知识**的选择题。

请注意,这只是一个基本情况的调查,而不是考试,请您尽量自己选出您认为正确的答案,而不要咨询您的家人或朋友

1. 在同样重量的情况下,下面4种食物中哪一个**含热量或能量最高**?
 - 糖
 - 淀粉(类食物)
 - 纤维素
 - 脂肪
 - 我不知道

2. 医学专家们建议我们**少吃**下面哪种脂肪?
 - 单不饱和脂肪
 - 多不饱和脂肪
 - 饱和脂肪
 - 我不知道

3. 下列哪种脂肪更容易在室温下以**液体状态**存在,而不容易成为固体?
 - 饱和脂肪酸
 - 多不饱和脂肪酸
 - 没有差别
 - 我不知道

4. 如果一种食物**不含胆固醇**,那么它同时也会...?
 - 含很**低量**的饱和脂肪酸
 - 含很**高量**的饱和脂肪酸
 - 不一定,饱和脂肪酸可能低也可能高
 - 我不知道

5. 下列哪种食物中**更容易**含有胆固醇?
 - 蔬菜或植物油
 - 动物食品如肉类和奶制品
 - 所有含油脂的食物都一样
 - 我不知道

6. **只有肥胖的人**才会患有高胆固醇(血)症,这样说对吗?
 - 对
 - 错
 - 我不知道

7. 您是否知道下面的一些主要的人们的饮食方式或体重与某些慢性疾病的发生有没有关系?
 - 1 纤维素摄入不足
 - 不相关
 - 相关
 - 不知道

 - 2 盐摄入过多或高盐饮食
 - 不相关
 - 相关
 - 不知道

 - 3 胆固醇摄入过多
 - 不相关
 - 相关
 - 不知道

 - 4 食用过多膨制品、添加剂
 - 不相关
 - 相关
 - 不知道

 - 5 糖摄入过多
 - 不相关
 - 相关
 - 不知道

 - 6 **肥胖**
 - 不相关
 - 相关
 - 不知道

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从事高科技行业的中国人之饮食与营养调查

下面列出的是在不同情况下人们的饮食行为。请回想您在日常生活中的饮食习惯，您认为您在通常的情况下是否会象以下所描述的那样选择食品，还是您根本不认为您会那样做？从0到10分别代表您是否认为您能够做到下面各种行为的不同程度：

0 代表您认为您肯定做不到，

10 代表您认为您一定能做到，

中间选项代表不同程度地认为您能做到以下行为。

1. 即使我周围的人都在吃糕点、奶油巧克力，甜甜圈等甜点，我也不会吃。我觉得我：
做不到 0 1 2 3 4 5 6 7 8 9 10 能做到
2. 休息时间，总是选择水果当做零食，而不吃曲奇、甜甜圈，糖果，巧克力等甜食。我觉得我：
做不到 0 1 2 3 4 5 6 7 8 9 10 能做到
3. 避免吃任何油炸食品，比如炸薯条，炸鸡块，炸鱼，炸肉丸子等。我觉得我：
做不到 0 1 2 3 4 5 6 7 8 9 10 能做到
4. 总是选择瘦肉，而不吃肥肉，如肥猪肉，肥牛肉等。我觉得我：
做不到 0 1 2 3 4 5 6 7 8 9 10 能做到
5. 如果有选择的可能，我总是会选择购买或食用“低脂”食品。我觉得我：
做不到 0 1 2 3 4 5 6 7 8 9 10 能做到
6. 总是选择蒸、煮的或低油炒制食物，而避免高油煎炸食物。我觉得我：
做不到 0 1 2 3 4 5 6 7 8 9 10 能做到

您已经完成全部调查的 99% (如果您目前在中国) / 98% (如果您目前在美国)。请继续！！

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从事高科技行业的中国人之饮食与营养调查

下面有一些关于日常文化生活的问卷。

****如果您目前居住在中国并且您从未在美国居住6个月以上，您可以略过这一部分问题，直接回答最后一页的基本情况问题****

1. **我居住在美国已经有**
 - 从未在美国居住6个月以上
 - 6个月~2年
 - 3年~5年
 - 6年~10年
 - 11年~15年
 - 16年~20年
 - 20年以上
2. **我出生于**
 - 中国大陆
 - 台湾或香港
 - 英国
 - 其它亚洲国家
 - 其他地区国家
3. **我目前居住于**
 - 北京
 - 上海
 - 深圳
 - 中国其它城市
 - 西雅图
 - 芝加哥
 - 纽约
 - 华盛顿（大华府地区）
 - 旧金山（湾区）
 - 美国其它城市
 - 其他国家
4. **我的父亲出生于美国**
 - 是
 - 否
5. **我的母亲出生于美国**
 - 是
 - 否
6. **我的祖父或外祖父出生于美国**
 - 是
 - 否
7. **我的祖母或外祖母出生于美国**
 - 是
 - 否
8. **第一次来美国长时间居住时，我的年纪是 月**
9. **我在家里讲语言的情况是**
 - 汉语多于英语
 - 汉语和英语差不多
 - 英语多于汉语
 - 我讲其它语言
10. **我说在家庭以外讲口语的情况是**
 - 汉语多于英语
 - 汉语和英语差不多
 - 英语多于汉语
 - 我讲其它语言
11. **关于文字阅读能力，我**
 - 读中文好于英文
 - 读中文英文一样好
 - 读英文好于中文
 - 读其它文字好
12. **我的好朋友中**
 - 中国人多于英国人
 - 中国人和英国人基本各占一半
 - 英国人多于中国人
 - 其它人群的朋友多
13. **对于参加聚会活动，我会更喜欢以下的情况**
 - 中国人多于英国人的
 - 中国人、英国人各一半
 - 英国人多于中国人
 - 都可以，无所谓
14. **对于美国人组织的教会活动，我**
 - 参加
 - 不参加
15. **对于中国人组织的教会活动，我**
 - 参加
 - 不参加

16. 对于**美国人**组织的体育锻炼队活动，我
- 参加
- 不参加
17. 对于**中国人**组织的体育锻炼队活动，我
- 参加
- 不参加
18. 对于**美国人**组织的工作上或学术上活动，我
- 参加
- 不参加
19. 对于**中国人**组织的工作上或学术上活动，我
- 参加
- 不参加
20. 对于**美国人**组织的市政或政治活动，我
- 参加
- 不参加
21. 对于**中国人**组织的市政或政治活动，我
- 参加
- 不参加
22. 对于**电影**，我
- 更喜欢中国电影
- 对于中国电影、英国电影一样喜欢
- 更喜欢英国电影
- 更喜欢其他国家的节目
- 不看电影
23. 对于**电视节目**，我
- 更喜欢看中国的电视节目
- 中国的电视节目和英国的电视节目一样喜欢
- 更喜欢看英国的电视节目
- 更喜欢其他国家的电视节目
- 不看电视节目
24. 我看的**报纸杂志**
- 中国报章多于英国报章
- 一半中国的一半英国的
- 英国的报章多于中国的报章
- 看其他国家的报章多
- 不看报纸和杂志
25. 如果在**互联网上浏览新闻**，我
- 更喜欢中文网站
- 一半中文网站一半英文网站
- 更喜欢英文网站
- 更喜欢浏览其他语言的网站
- 不在互联网上看新闻
26. 关于**娱乐网站**，我
- 更喜欢浏览中文网站
- 中文、英文的娱乐网站各半
- 更喜欢浏览英文的娱乐网站
- 更喜欢其他语言的网站
- 从不上娱乐网站
27. 关于**音乐和歌曲**，我
- 更喜欢中国的音乐和歌曲
- 中国的和英国的音乐歌曲同样喜欢
- 更喜欢听英国的音乐和歌曲
- 更喜欢其它国家的音乐
- 不听音乐和歌曲
28. 如果去**餐馆吃饭**，我
- 选择中餐馆多于英国餐馆
- 选择中餐馆或英国餐馆的几率各半
- 选择英国餐馆多于中餐馆
- 去其他国家餐馆多
- 不去餐馆吃饭
29. 我**在家里吃食物**的情况是
- 中国饮食多于英国的饮食
- 一半中式一半英国式
- 英国式饮食多于中式饮食
- 其他国家饮食更多
- 不在家里吃饭
30. 如果去**食品超市为家里采购日常食物**，我
- 去中国店/亚洲店的次数多于英国店
- 去中国/亚洲店和去英国店的次数差不多
- 去英国店的次数多于中国店/亚洲店
- 去其他类别食品超市次数更多
- 不去到食品店采购

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从事高科技行业的中国人之饮食与营养调查

本调查的最后一部分是关于您的**个人基本情况**。请您认真填写。

当您全部完成此调查，提交答案后您将得到参加奖金活动的确认信息。同时，我们会告诉您本项科研的互联网地址，您可以了解更多的详细情况。您也可以在未来参观同一网站以了解我们的研究结果。感谢您的合作与支持。

1. 我目前工作于
 - 美国公司
 - 中国公司（包括香港和台湾）
 - 其他亚洲国家公司
 - 其他，如欧洲公司
2. 我目前工作于
 - 软件公司
 - 计算机硬件、电子及计算机配件公司
 - 电信公司
 - 计算机网络、互联网、电子商务公司
 - 生物技术、医学、药品即其他医药相关企业
 - 其他
3. 我目前工作的职位是
4. 我是 男生 女生
5. 我出生于 月份 19 年
6. 不穿鞋子，我身高 厘米 或 英尺 英寸
7. 脱掉鞋子，我的体重约为 公斤 或 磅
8. 我在中国的受教育程度为
 - 无
 - 高中、技校或以下
 - 大专
 - 本科
 - 硕士
 - 博士
 专业为 和
9. 我在美国的受教育程度为
 - 无
 - 高中或以下
 - 本科
 - 硕士
 - 博士
 - 专业学位 (Professional Degree)
 专业为 和
10. 我目前的婚姻状况为
 - 至今未婚
 - 已婚/同居
 - 离婚/分居
 - 丧偶
11. 我目前有小孩 个
12. 目前和我居住在一起的有
 - 自己单独
 - 朋友/室友
 - 父母
 - 配偶/恋人
 - 配偶及子女
 - 配偶以及我的父母/岳父母/公婆
 - 配偶，子女以及我的父母/岳父母/公婆
13. 我现在的税前的年收入为(包括年薪、奖金、津贴、股票收入等等)

<input type="radio"/> <15,000 元	<input type="radio"/> <\$15,000
<input type="radio"/> 15,000 ~ 29,999元	<input type="radio"/> \$15,000 ~ \$29,999
<input type="radio"/> 30,000 ~ 59,999元	<input type="radio"/> \$30,000 ~ \$49,999
<input type="radio"/> 60,000 ~ 119,999元	<input type="radio"/> \$50,000 ~ \$79,999
<input type="radio"/> 120,000 ~ 299,999元	<input type="radio"/> \$80,000 ~ \$ 99,999
<input type="radio"/> 300,000 ~ 499,999元	<input type="radio"/> \$100,000 ~ \$149,999
<input type="radio"/> 500,000 ~ 999,999元	<input type="radio"/> \$150,000 ~ \$ 199,999
<input type="radio"/> >1,000,000元	<input type="radio"/> >\$200,000

您已经完成全部问题!
请提交答案! ?

[上一页](#)
[下一页](#)



从事高科技行业的中国人之饮食与营养调查

您已经完成了此项调查。感谢您的合作和参与。

如果您仍留有个别题目没有回答，您可以按 [上一页](#) 回到问卷区，将其完成。如果您已经回答了所有的问题，那么您已经自动加入了我们每月一次的幸运 [抽奖活动](#)。我们会采用随机抽奖的方式，抽取获奖者名单。如果您幸运地成为我们的获奖者，我们会通过您注册所用的电子邮件地址通知您。

再一次地感谢您的参与。如果您想要了解此项科研的详细信息，请参看 <http://www.ienutrition.com/>

如果您对我们的调查或研究有任何疑问、意见或建议，请直接给我们 [留言](#)。

如需引用，请与作者联系

技术支持：8848网络技术有限公司

Appendix 5: Portion estimation aids



Appendix 6: Focus Group Protocol

1. Opening:

- 1) Welcome the participants and thank them for coming.
- 2) Explain the objective of the meeting; explain the nature of the research
- 3) Explain why the participants were chosen. Include the importance of their contribution to the study and the community.
- 4) Make sure people understand that the session will be confidential.
- 5) Session lasts for around 2 hours;
- 6) Explain how the focus group works and "ground rules":
 - i. Share their ideas without hesitation. Tell participants you would like to hear from ALL of them about their feelings on the subject. Anything they want to say is important. Remember to give all in the group the chance to speak.
 - ii. Because of the need for recording, it is essential that only one person talks at a time;
 - iii. Try to keep the conversation "in the group" as other conversations going on between a couple of group members may distract the flow of discussion.
 - iv. Because there is much information to get through in 2 hours, explain I may need to move onto the next question before the group has really explored one area.

2. The group members introduce themselves.

3. Start the discussion with open-ended questions:

e.g.: What kind of staple (or other categories) food do you eat usually? How much? What container do you usually use? Any different with you used to have in China?

4. Closing:

- 1) Again mention that your comments will be held confidential.
- 2) Thank you for participating in today's session. We appreciate your taking the time and sharing your ideas with us!
- 3) Feel free to contact with any further questions and suggestions

5. Special techniques to encourage and control the discussion:

- 1) Maintain a friendly and warm attitude to make the participants feel comfortable.
- 2) Pausing to allow a participant to think more on the topic being discussed.
- 3) Establishing eye contact can also be a means of prompting someone to continue to talk.

- 4) Use prepared probes for each question when no one responds to encourage a speaker, e.g.

"Could you explain further?"

"Would you give me an example of what you mean?"

- 5) Use rephrasing, reminder questions and hypothetical questions to help speakers express their points better.

Appendix 7: Cognitive Interview Protocol

Thank you for agreeing to help us. Let me tell you what this is about.

Today you will be helping me to improve the questions that are in a survey for nutrition and diet study among Chinese people who are working in high-tech industries. To make sure the survey or the questionnaire is useful, it is very important that people can easily understand the questions and provide meaningful answers for them. I am asking you to read the questions and tell me your reactions to them. Listening to your reactions will help me to know whether the questions are good ones, or how to improve them. (Make sure the participants realize that the questionnaire, not they, is under scrutiny)

Before we get started, I should make you aware of a few things. First, I want to assure you that everything we cover in the interview will be kept confidential. Only people actually working on the project will have access to the information you share with us.

CONSENT FORM: Here is a form (Please open the email attachment that I sent to you). I would like to ask you to look over and sign – it basically covers the points I've just gone over with you and indicates you have agreed to participate.

Let me tell you how this will work: I'm going to ask you to fill out the questionnaire on the web. You can pretend that you are working on your own computer at home or at work. As much as possible, just read and respond to it the way you normally would. Also, because I am testing the questions,

1. I'd appreciate it if you could READ ALOUD as you go along – that will help me keep track of where you are and what exactly you're reading.
2. I would also like to ask you to "THINK ALOUD" while you answer the questions – as much as possible. Just say whatever comes to mind while you think about the question and come up with your answer.

I'm going to give you an example of what I mean by this, and then let you try it. Suppose one of the questions is: "Over the past one year, how often did you eat at restaurants or fast food restaurant usually? – Chinese style breakfast:

In coming up with an answer, someone may think aloud by saying: "Well, Chinese style breakfast, hum, soybean milk, fried stick, silky tofu soup, wonton soup, boiled eggs... Western style breakfast, yeah, I go to KFC and have that biscuit and black tea; and I got to the "Vie Da France" to have a croissant and a cup of cappuccino some time. How often did I go out for Chinese breakfast? Over the past one year? It means from April 2004 to now. Surely, I go to the little store at the corner a lot; but some times I go to the one near the office. I started my current job 2 years ago, and I have a routine since then. I ate at those 2 stores most of the work days, and I skip breakfast from time to time, about once a week. So that's a total of 4 times a week during the work days. For weekends, I usually get up late, about 9:00 in

the morning, and I usually do not go to that little fast breakfast store. I go to the coffee places often instead. I cook a little bit occasionally on Sunday. So, 4 times a week is the answer. I go to Chinese fast breakfast place 4 times a week. Hum, I never go to a “restaurant” for breakfast. Maybe Cantonese people go to restaurant for breakfast...”

Occasionally, after you’ve answered a question, I might ask you to tell me a little bit about why you answered the way you did, or to tell me what something means to you. And once we’ve gone through the questions we’ll review some of them in more depth. I would really appreciate your patience and cooperation.

Note: 1. Use of prompts when the participant stuck or silent:

- What are you thinking now?
- Why did you choose that?

2. The method is informal and the most effective single way to maximize effectiveness is to create an informal atmosphere. This is where the subject can feel relaxed and as unaware as possible that their actions are being observed.

Appendix 8: 24-hour recalls Script

1. The quick list: recall all the food items consumed “yesterday” as much as possible.
2. The forgotten foods list: such as side dishes of each meal, snacks, and beverages.
3. Report a time and occasion at which food were consumed and finalize the food list.
4. The detailed cycle: description of foods and amounts eaten. The portion-aid pictures were sent to each participant via email before the interview, and the portion-aid pictures were used to assist in portion-size estimation of consumed foods.
5. The final probe review: Recall any missing items and confirm the portion sizes.

Appendix 9: Recruiting e-mail: Invitation letter

Subject: You are invited to a web-based research project on nutrition

Dear Chinese employees of XXX,

You are being invited to participate in this research study conducted by the Department of Nutrition and Food Science, University of Maryland.

Completing the survey takes most people about 40 minutes. The survey asks a number of questions about yourself, what you eat everyday, what you know about nutrition, how you feel about nutrition. Your response can contribute to a better understanding of the nutrition and dietary habits of Chinese people. The study results will be used to develop better health services programs to the Chinese community in the future.

Please note that all the information collected in the study will remain confidential for research purposes only. You can decide to stop participating in the survey at any time, for any reason. This is not a marketing study. No one will use this information to try to sell you anything and no one will send you unwanted email messages ("spam").

Survey Link:

<http://www.ienutrition.net>

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