FOOD CONSUMPTION BEHAVIOR, NUTRITION AND HEALTH KNOWLEDGE AND DIETARY CHANGES AMONG MALAYSIAN STUDENTS AT OKLAHOMA STATE UNIVERSITY

By

SIEW-ING HII

Bachelor of Science

Oklahoma State University

Stillwater, Oklahoma

1994

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirement for
the Degree of
Master of Science
July, 1997

FOOD CONSUMPTION BEHAVIOR, NUTRITION

AND HEALTH KNOWLEDGE AND DIETARY

CHANGES AMONG MALAYSIAN

STUDENTS AT OKLAHOMA

STATE UNIVERSITY

Thesis Approved:

Lee J Ebro

Thesis Adviser

J. K. Leong

Thomas C. Collins

Dean of the Graduate College

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to my major advisor, Dr. Lea Ebro, for her intelligent supervision, constructive guidance, and assistance during my academic work and completion of my research. My sincere appreciation is also conveyed to Dr. William Warde and Dr. Jerrold K. Leong, whose guidance and assistance were invaluable.

I would also like to give my special appreciation to my parents, Hii, Yii Chiok and Ling Choi Sing and my sister, Hii, Ley Mee for their support and encouragement.

TABLE OF CONTENTS

LIST OF TABLES

Table Page

CHAPTER I

INTRODUCTION

Food habits of the parents are often adopted by their children. If food habits are to improve as promptly and as effectively as possible, the interrelationship of certain aspects influencing nutrition practices must be investigated. Malaysian students often adopt the food habits of their parents, while they are young. As a result, eating habits have complex origins in childhood and cultural traditions (Irons, 1974). According to Kurt (1943), a young child does not form rigid "habits" but forms food patterns, learned from adults, to eat certain foods and not others. Individuals' eating habits do not remain the same for long periods of time, but are continually in a state of transition.

Food availability causes changes in an individual's food habits and as a consequence, the amount of food consumed. The college years are a time of transition for Malaysian students who are enrolled for further studies in the United States. Living in the United States is a transitional period between living at home with parents and living independently in an international setting. Food consumption and food selection have to be decided by the students themselves and the decisions may lead to habits that are likely to be maintained (Procter, Gregoire, Holcomb, & Reeves, 1992). Learning or resistance in developing new food habits might occur.

Students may also have difficulty in adopting the new foods (Mead, 1943).As a result, food habits need to be studied, so that, we may know how well these habits

are relative to optimal health as patterned by the students' culture, or the type of individual experience permitted by the general information, food consumption behavior, nutrition and health knowledge (Procter, et al, 1992).

Purpose and Objectives

The purpose of this study was to determine the food consumption behavior, nutrition and health knowledge, and dietary changes among Malaysian students at Oklahoma State University. The specific objectives were as follows:

1. To determine if food consumption behavior is related to the students' demographic characteristics.
3. To determine if nutrition and health knowledge is related to the students' food consumption behavior.

Hypotheses

The following hypotheses were examined:

H1: There were significant associations between food consumption behavior (section II-Meal Pattern and Missed Meals) and students' demographic variables:

1. Gender
2. Age
3. Ethnic classification
4. Major
5. Educational level
6. Marital Status

7. Religious preference
8. Family
9. Length of stay in the United States
10. Geographic location of residence in Malaysia.

H2: There were no significant associations between food consumption behavior (Section II-Snacks) and nutrition and health knowledge (Section III-Daily consumption)

Assumptions and Limitations

The following assumptions and limitations are identified in this study:

1. The students will be honest in providing appropriate information regarding actual nutrition and health knowledge, and food consumption behavior.
2. The students have enough knowledge about selection and preparation of food to accurately answer the questions.

A limitation in this study is that only Malaysian students enrolled during fall 1996 semester at Oklahoma State University was studied. Generalizations regarding results of this study will only apply to this group of students.

Definitions

1. Food Consumption Behavior: It is a behavioral act involving the acquisition of food. Food consumption denotes the purchase, or obtainment by other means, of food (Sanjur, Diva, 1982).
2. Culture: Culture to an anthropologist, is man's way of adapting to and exploiting his physical environment (Niehoff, 1969).
3. Food Habits: It is defined as the patterns into which the available foods are arranged,

such as, number and form of meals, and the culture as opposed to the nutritional equivalence which can be invoked within these patterns (Mead, 1941-1943).

CHAPTER II

REVIEW OF LITERATURE

To understand the food consumption behavior among Malaysian Students at Oklahoma State University, it is necessary to investigate the geographical description and the food and agricultural in Malaysia, in additional, traditional Malaysia foods, food and nutrition in Malaysia, cultural aspects of food, food habits, economics, and acculturation are also needed to be investigated.

Geographical Description, and Food and Agriculture in Malaysia

Malaysia is located in Southeast Asia. More than half of Malaysia's continental area is forest. Agriculture is particularly suited for the river basins, the delta areas and the flatlands. Dry winters and wet summers are typical in this region. The high temperature coupled with heavy rainfall make Malaysia a highly agriculturally productive area. Besides agriculture, this part of Asia is excellent for fishing, particularly fresh water fishing. Most of Malaysians are engaged in agriculture, fishing or simple forestry (Vemury & Levine, 1978).

Fish and seafood products are the primary animal protein in Malaysia, which are used in the various curried and fermented fish dishes. Pork is another source of animal protein but consumption is limited among Moslem populations. Poultry are raised mainly for sale and slaughtered for special occasions. In some regions, eggs are eaten

to a small extent. Very little beef and milk are consumed because of the climate and raising of cattle is uncommon in Malaysia. The Orang Asli (aborigines) of Malaya practice shifting agriculture and utilize a wide range of animal species as food. Generally, there is no protein shortage among these people (Vemury & Levine, 1978).

According to Vemury and Levine (1978), in developing Southeast Asia, rice is the primary staple. Because of the relatively high barley production in Southeast Asia, it may be substituted with rice. However, a meal without rice is not complete. The rice will be the judge of the importance and value of other foods. The qualities of rice are determined by its bulk and its filling capacity. Besides rice are consumed as the first meal of the day, flour-cake and coffee are usually eaten by fishermen as the first meal of the day too. Secondary staples are starchy roots and tubers. Pickled or spiced fruits and vegetables may also be part of the menu as condiments, which is unlike in the West. Salads are rarely consumed. The primary vegetables eaten in Malaysia include cabbage, spinach, wild greens, squash, eggplant, okra and a small variety of legumes especially soybean and groundnuts. To cook all foods, Malaysians commonly use red palm oil.

In addition to staples, some foods are considered high status and are associated with wealthy urban dwellers, for example, beef, chicken, turkey, eggs, certain vegetables, and fruits (especially temperate climate varieties like pears, grapes, strawberries, cabbage and spinach), canned or highly processed foods and canned meats. Others are refined sugar, breads, cookies and cakes and dairy products are considered to be high status foods (Vemury & Levine, 1978).

Besides the scientific classification of food stuffs, people in many societies have traditional ways of classifying their food. For example, in some Filipino communities,

people classify their food stuffs in three different categories: food that satisfy hunger such as rice, food that satisfy appetite such as meat and green leafy vegetables, and for taste such as salt, and pepper (Hartog & Staveren, 1983).

In many cultures, foods have their roots in religious convictions and mythology. In certain beliefs, food might be classified as 'hot' or 'cold' beliefs exist to some extent (Vemury & Levine, 1978). For example, in Mexico, the three-course rural meal begins with rice (cold), followed by a soup (hot and cold ingredients) and ending with dark beans (hot). The contrast of hot and cold foods is also present in United States. A hot and cold dichotomy is also known in the folk medicine of China, Burma, India and Sri Lanka. In many rice-consuming countries of Asia, there is a taste for a granular structure in boiled rice. In other parts of the world, however, glutinous staples are highly preferred (Hartog & Staveren, 1985).

Traditional Malaysian Food

Regional Diet of Ethnic Group

Malaysia has three ethnic groups, which have different food habits. The Malay diet is rather monotonous. The Chinese spend more on their diet than the other groups; their diet is slightly better, but quantities are still small. Indians only eat parboiled rice, and Indian dishes, and almost every side dish is cooked with chilis, pepper and salt. The Chinese eat fresh or dried pork in most of the meals. Pork, fish or prawns are generally cut into small pieces, then cooked with spices and vegetables in soup or sauce. Indians cook their foods similar to the Chinese. Eggs are eaten by all groups but in very small amounts and infrequently; scrambled eggs are sprinkled over fish or hard boiled and cut in

curry. Pulses and grams are eaten frequently by Indians, soybean by the Chinese, and less frequently by Malays. Vegetables are used by the Chinese at most meals, but usually those with least nutritional value such as cucumbers and cabbage. Malays eat very few vegetables. Their meals are usually rice, fish and red peppers. Fruits (usually banana) are eaten as a snack for all groups. Quantities of non-rice food, or, snack food is only eaten in small amounts.

Diets by Regions in Malaysia

Kelantan In Kelantan, according to Whyte (1974), tapioca is the staple food, while rice is eaten occasionally. Marrows, bananas, sugar cane, and maize are also grown and eaten. Hunting and fishing supplement the kelantan diet, and no eggs are eaten.

Melanau Community Sarawak The Melanau eat coffee, sago biscuits and dried fish for their first meal. If money is available, water biscuits made of wheat flour from Singapore will be served. The midday meal is comprised of dried fish eaten with boiled rice, a few vegetables, and sauce, which is eaten more as a relish than as a separate dish. The evening meal like a breakfast, includes coffee, sago biscuits and dried fish. If any boiled rice is leftover from lunch, this may take the place of sago biscuits. The Melanau eat more fish than usual during the fishing season, which is in January and February. In times of hardship, less rice is available and more sago biscuits are eaten (Whyte, 1974).

Selangor Wealthier households eat more expensive food such as meat, fish, poultry and vegetables, and also lauk (seaweed). Poorer households usually supplement their diet with home produced fish, vegetables and, occasionally eggs (Whyte, 1974)

Perak and Malacca Kampong In Perak and Malacca Kampong, boiled rice is eaten with side dishes like, animal or vegetable foods, or, if not available, sambal which is made of chili, salad and lemon juice which is always present. Flavorings and spices are important in this region. Meat, fish or egg side dishes are preferred over vegetables. Rice is cooked twice daily. The rice is usually cooked early in morning and they will return from the fields to eat their lunch. The evening meal is usually cold leftovers. The side dishes are usually prepared once daily before lunch and the extra food are put aside. Coconuts are available in Malacca. They consume the coconuts 3 or 4 time per week. Fried food is common in Perak. Leafy greens such as: spinach, radish, chinese chives, cabbage, mustard leaf, tops of papaya, sweet potato, tapioca, pumpkins are purchased in Perak. Rice, green gram porridge, biscuits, cakes, and peanuts are eaten as snack food. Fruit is not part of the regular diet (Whyte, 1974).

Malacca Coastal Plain The diet in the Malacca Coastal Plain is essentially rice, with small amounts of wheat, little fish, small amounts of vegetables, and a few highly flavored food stuffs. In time of scarcity, other cereals and root crops are eaten. Malays rarely eat legumes, although they are for sale; eggs are also rarely eaten. The Indians in this region take milk, especially children. Indian cooking is prolonged and tedious, while Malay cooking is fast and easy (Whyte, 1974).

Pahang The diet of most rural Malay families is deficient in protein-fifty-six percent do not consume meat, while others eat meat rarely and in small amounts. However, Dried fish is usually eaten by 90% of the families, which purchases fish in small quantities. Beans and spinach are a good source of protein, iron, and vitamins A and B-

complex, but the consumption is limited. Regarding infants, fifty-six percent are under 12 months are breastfed, while 44% are on a sweetened condensed milk diet, with some in combination with breast milk. Only 16 percent of Malays' babies receive powdered milk.

Trengganu Trengganu is a fishing village of 550 people whose economy is dependent upon the sea. Rice is also grown in Trengganu. Food intake was observed in a family of five with average income: Their meals was comprised of flour pancakes with sugar, rice noodles in coconut milk, fish curry, fish stew with spices, and rice. For snacks, corn on the cob, cakes, banana, and green mango with soy sauce were consumed, in addition, tea and coffee were consumed with sugar (Whyte, 1974).

Sabah In Sabah, rice from paddies is staples, along with sweet potato, maize local spinach, edible fungi, bananas, and jungle fruits. In addition, most families cultivate gardens and plant trees, for example, sweet potato, greater yam, tapioca, bottle gourd, mung bean, garlic, elephant's ear, tomato, melon, squash, chili, onion, ginger, betel, cowpea, corn mustard, peanut, pineapple, watermelon, eggplant, sugar cane, cabbage, and sago are cultivated by most families. Other plants that are being cultivated are coconut, bread fruit, banana, mango, papaya, Malay apple, durian, lime and other citrus fruits, and coffee beans (Whyte, 1974).

In primary jungles, hunting and gathering are usually done. Supply wild fowl, deer, pigs and fish. There, fish and meat are often salted and stored in bamboo containers with rice and herbs for 6 to 9 months. Most jungle animals are considered edible, especially pig, deer, ant eater, bear, gibbon, orangutan and other monkeys, and rats. Jungle fishing is done by bamboo traps in streams, irrigation channels and paddies, and

also by nets, lines and poles. In addition, fruits and vegetables are gathered from the jungle, and some vegetables, dried and pickled meat may be marketed. Jungle inhabitants may also keep chickens, ducks and geese for storage. In ritual, chicken, pig and cow are important, and are subsequently eaten, while dried, salted and fresh fish are eaten several times a week. Eggs, vegetables and fruits are also eaten regularly, and rice is taken increasingly to Chinese shops for polishing (Whyte, 1974).

Food and Nutrition in Malaysia

Food includes the solid and liquid materials which provide for body growth, energy supply and in regulating of body processes. Nutrients are those substances present in foods which perform one or more of the function. The nutrients in foods are carbohydrates, proteins, fats, vitamins and minerals (Chong, 1969).

In Malaysia, carbohydrate can be obtained by rice, rice products, products of wheat flour such as bread, noodles, chapatties, tapioca, sweet potato, Irish potato, milk powder, bananas, and papayas. Refined cane sugar (sucrose) in drinks and beverages and milk sugar (lactose) are other important sources of carbohydrates. The protein content from animal sources of some Malaysian foods are dried shrimps, ikan bilis (dried), milk powder (whole), prawns (fresh), lean beef or mutton, poultry (dressed), fish, lean pork, eggs, cockles (kerang), and cow's milk (liquid). The protein content from vegetables comes from soybeans, groundnuts, grams/dhall, bread or Chapatti, soybean curd (towhu), rice (uncooked), fresh beans or peas, bean sprouts (towgeh), and soymilk Malaysian foodstuffs which are rich in vitamin A in animal foods are fish, liver oils, livers (chicken, beef or pig) butter, eggs and milk. Malaysian foodstuffs which are rich in carotene from

vegetables and fruits are red palm oil, chekor manis, carrots, chinese vegetables such as kailan, sawi (mustard leaves), kowkay (Wolfberry leaves) and bakchoy (chinese cabbage), spinach, kangkong, papaya, watermelon (red variety), sweet potatoes (yellow-orange variety) and mangoes (Chong, 1969).

Foods that are rich in thiamin are rice bran, yeast, undermined rice, parboiled rice, whole meal bread (brown), groundnuts, pulses (example grams), all animal livers, lean pork and bean sprouts. Riboflavin sources are yeast extract (example marmite), animal livers and kidneys, lean meat, cow's milk and eggs, nuts and pulses, dark green leafy vegetables: kale (Saur), chinese cabbage (Bak choy), kang-kong and chekor manis. Fruits and vegetables that are rich in Vitamin C (ascorbic acid) are papaya, guava, rambutan, starfruit, pineapple, drumstick, kailan (chinese mustard leaves) large peppers and chilies saur, chekor manis, bayam (spinach), kangkong, bean sprouts (towgeh) (Chong, 1969).

Sun-dried fish eaten with its bones such as ikan bilis are excellent sources of calcium. Soybean products like towhu (bean curd), and soymilk require the addition of calcium salts during its manufacturing. Milk and dairy products are other good sources of calcium. Foods that are rich in iron are mainly from animals include ikan bilis, kerang, dried shrimp and balachan. Foods that are rich in iron in plants are dried peas and beans and all dark green leafy vegetables. Iodine-rich foods are sea-fish, shell-fish and sea-weeds, ikan bilis and other dried sea-fish, balachan, dried shrimp, marmite and tinned mustard (Chong, 1969).

Nutritional and Health Knowledge

Nutrition knowledge can influence people's attitudes, and also enhance the

people's ability to make rational decisions about food choices, but such knowledge only function when people are ready to make changes. Knowledge by itself is not the instigator of change. From research on other health-related behaviors, "emotional readiness" is needed for a person to shift from a present to a different kind of behavior in order for factual knowledge to be accepted (Hochbaum, 1981). The factors that influence food choices are the desire to avoid weight gain, limited financial resources, limited access to food, and low levels of nutrition knowledge (Betts, Amos, Georgiou, Hoerr, Ivaturi, Keim, Tinsley and Voichick, 1995). Providing nutrition information is known to be the traditional approach to effect changes in behavior, however, according to Hochbaum(1981), increases in nutrition knowledge have not been found to improve dietary behavior. This failure of education to promote behavior change may be due to a lack of selection of the nutrition education message that are relevant to the consumer group.

In a study of students at the University of Malaysia, respondents who took home science courses in high school scored higher in nutrition as evidenced by their knowledge of sources and functions of specific nutrients. The respondents were primarily women, however, the study did not show that the improvement of eating habits among women. The food habits of college students might be influenced by many factors and one of them was the type of food service available on campus. The acceptance and rejection of these foods by the students might be determined by the frequency or skipping of meals. Female students tended to skip meals more than male students. The reasons given for skipping meals were lack of hunger, lack of familiarity with food and weight consciousness. The practice of skipping meals has encouraged students to turn to snack foods that might have

high calories. This same study also showed that college students have poor intake of ascorbic acid and iron. Half of the students perceived food quality as having the following aspects: nutrient content, appearance, taste, variety and freshness of foods (Marjon & Choo, 1986).

According to Story & Harris (1989), Southeast asian refugee families living in the United States indicated that their diets are healthier prior to immigration. The primary reasons given for a healthier diet in the United States were an abundant food supply with a wide variety of foods and refrigeration.

Einstein and Hornstein (1970) examined the relationships between food preferences and nutritional values of foods. The percent of the RDA provided by one serving of a given food item was calculated for vitamin A, vitamin C, calcium and iron. The results indicated that if food preferences were the sole determination of food intake, then, the dietary intake would be low in vitamin A. The best sources of vitamin A were among the most disliked foods in the entire survey. The relationship between food preferences and possible vitamin C and calcium deficiencies were not clear-cut. There was little evidence to show food preferences for foods that contain significant amounts of iron, especially liver, one of the best sources of dietary iron (Einstein and Hornstein, 1970).

In addition, in order to successfully promote positive, lasting food intake changes in a specific group. Examining the common traits, beliefs, life-styles and interest of the consumer group may be necessary (Senaur, Elaine, and Kinsy, 1991). People who are adapting to the new culture and are unable to obtain the foods they are used to eat at home, might make unsatisfactory substitutions nutritionally in the new cultural setting (Irons, 1974). Cultural diversity does influence food selection and eating habits of persons

in all societies throughout history. Knowledge and understanding of local beliefs, customs and practices are also necessary to be studied, in order to, refine guidelines for planning, developing and designing appropriate and effective nutrition intervention programs for the people who are adopting to the new culture. In dealing with concepts of health and nutrition in the developing world, one must first begin from the perspective of the people in the different culture being studied, in order to implement a nutrition education for the developing countries (Vemury & Howard, 1978). According to Melby, Femea and Sciacca (1986), the major influences on health status are diet and physical activity. Current nutrition education is not the complete answer in changing food habits; however, if the greatest influences on food habits were known, then perhaps future nutrition education could be made more effective (Irons, 1974).

Cultural Aspects of Food

Today, especially in developing countries, food traditions continued to play an important part of the social, economic and religious life of many societies. They often helped to maintain cultural identity and traditional values that are often characterize food habits and point out the necessity of looking at each culture individually on its own terms (Vemury & Levine, 1978).

The cultural identity of a group of people or even whole nations may be established by food. Food avoidances or taboos in a society show differences between various groups and as a means of cultural identity. For example, in Moslem countries with Christian communities, eating of pork distinguishes the two different groups quite clearly. Pork is avoided to a greater or lesser degree among the many Moslems in this part of the

world depending upon the orthodoxy of the group. The Orang Asli (Native Malaysian), an aboriginal jungle tribe in West Malay, avoid eating certain animals because they may contain kindred spirits (Vemury & Levine, 1978). The same applied until recently in Europe where the eating of fish or meat on a Friday indicated whether people were Roman Catholics or not (Hartog & Staveren, 1983).

Nevertheless, as a group, nonwhite ethnic minorities spend more time eating at home. They buy fewer dairy products, and less cheese but more poultry. This is probably because beef is unacceptable to Hindus. Racial structure of the population is implicated in the decline in milk consumption, especially in non white households, where they consume less milk because of cultural differences and inability to digest milk protein (Frank, 1987).

According to Hochbaum (1981), food purchasing, preparation, and consumption behaviors are determined by psychosocial, cultural and certain situational factors. Social and cultural factors influence not only what to eat but also when we feel the need to eat. Although the sensation of hunger is produced by the physiological phenomenon of gastric motility, it can also be produced merely by the awareness that the accustomed mealtime has arrived (Hochbaum, 1981).What foods we select, how we prepare them, when we eat, and even when we feel hunger, are mostly learned behaviors. Some of these behaviors are deeply influenced by cultural norms and tend to resist any but moderate modifications. Foods that may be considered delicacies in one culture are rejected as odious in others. Even within the United States, wide variations in food preferences can be found in geographic regions and religious and ethnic subculture (Hochbaum, 1981).

Food Habits

According to Postel, McComber, Hinz and Finley (1993), actual food behaviors are the result of the synergistic relationships among biological, ecological, and social-cultural environments. Food habits which may be defined as standardized behaviors within a given culture must be viewed in the total complex of behavior.

Food habits were acquired through the processes of acculturation and enculturation, or socialization-learning to do what was expected of one within one's own culture under particular circumstances. A food habit is also behavior, but not all food behaviors can be classified as a food habit. Food habits were repetitive, characteristic acts, largely automatic, that an individual completes in order to satisfy a real or imagined need for food.

Human dietary adaptations involved responses to external factors like environmental change, as well as to internal cultural factors such as patterns of selection exchange, or redistribution of resources. Food habits are related to ethnic identity, culinary tradition, social structure, social status, and cultural changes. Dietary intake are not totally influenced by outside forces. Rather, people make individual dietary intake decisions due to personal of values and goals, most of which are not concerned with nutrition. Personal preferences, tradition and appropriateness, status and prestige, finances and economics and the availability and accessibility of stuffs all play a role in determining dietary selection and dietary need. The impact of tradition is great. As a result, the kinds of food considered edible, the way of preparing it, and the manner of consuming it are deeply embedded in the behavioral systems of each culture (Frank, 1987).

According to Mead (1964) and Hochbaum (1981), food habits result from past experiences. Food habits are also influenced by genetic characteristics, childhood experience, trauma, and habits of handling inner and outer stimuli. Food choices are deeply rooted in the person's past (Mead, 1966 and Hochbaum, 1981). Brown (1945) and Bass, Wakefield and Kolasa (1979) and Slare & McWilliams (1973) stated that the factors which influence students food habits were parental influence, especially by the mother, regarding parental policies, concerning food served at meal time. The family community customs are an important influence on children's food habits. Social class influences the family food patterns (Iron, 1974), and variety and appearance of food served (Brown, 1945). According to Brown (1945), Marjon & Choo (1986) and Iron (1974), the factors that influence family's food habits are: Pressures of life, influence of peers, and influence of eating situations. College students represent a group whose food habits are being influenced by many factors, namely peer pressure, pressure of life, living arrangements, financial situations, nutrition knowledge and the food service available (Brown, 1967). Diet may also be affected by availability and acceptability of food. The various phases and functions of economics definitely affect availability while acceptability is determined by cultural and symbolic influences.

Economics of Food

Invariably, food spending differs significantly between immigrant and indigenous household; possibly because immigrants and the children are more prone than average to unemployment. The young are more affected than the old and certain ethnic groups more than others (Frank, 1987).

According to Frank (1987), developing countries were concerned about food shortages. However, the causes of widespread malnutrition were often caused by poverty and uneven income distribution in the long term instead of the insufficiency of food production. People can attain sufficient food only if they have adequate incomes. Economic policies, such as, those on internal and external trade, produces prices, and methods of financing and distributing food will cause a countries to be vulnerable to food shortages. On the other hand, higher income provides a variety diet, at the same time growth in domestic production and imports ensures a continuous and sufficient food supply. By any international standard, diets are poorest in the Far East in Africa. Throughout most of this region the daily average per capita intake is considerably below the standard estimated by the Food and Agricultural Organization (FAO) as adequate. While the energy content of the diet in Africa is higher, the quality is poorer due to heavy dependence on carbohydrate foods. Diets in the Near East and Latin America are generally better than those in the Far East and Africa. The greatest need of Far East and Africa is proteins of high nutritive value. Even in the less developed countries, the demand for food often failed to produce a sufficiently nutritious diet because of the existing level of income. Sufficient dietary intake could only be improved by raising the productivity and having higher income. Social and economic development are a necessary condition for improving nutritional standards, for reducing rate of population growth, and ultimately for a stationary world population. Under conditions common to the less developed regions, excessively rapid population growth tended to retard economic growth. Beyond a certain point, provision of cheap food for the poor by income transfers, by aid relief efforts and by other types of food and nutrition programs

reduces economic growth and make it harder to finance the measures wanted by the government. Increasing demand for food was closely linked to population growth. Less developed countries were engaged in a race to keep food supplies growing at least as fast as population. Although production of food had grown faster than population, consumption of food had grown even faster because of imports. Food in developing countries' food consumption grew at 3.5% a year between 1971 and 1984, while population grew at 2.0% a year. However, in Africa, consumption grew at only 2.6% a year which was less than the continent's 2.8% annual growth in population (Frank, 1987).

Acculturation

To a large extent, choice of food depends on what a person has learned to accept. The foods that immigrants choose to eat are quite limited and they tend to resist strange foods. Among all immigrants, a period of adaptation and acculturation is necessary before accepting any food that are unfamiliar to people's culture (Frank, 1987).

Immigrants to a new land will give up their food behavior provided the old foods if their ingredients or reasonable substitutes are still available. Immigrants may be pressured to conform to language, dress, and other customs. In the privacy of their home, they can select, prepare, and enjoy foods that meet either old or new expectations. Adapting to those forces at work in an alien environment is a learning process termed *acculturation*. For some groups, the alteration of food behavior required to maintain health and well-being would be large because the food will be totally different from their country (Bass, Wakefield and Kolasa, 1979). The changes in food habits will depend on the flexibility of these habits. One factor related to flexibility is whether a culture's

traditional food can be replaced by another food. Changes in availability of food are one obvious cause of changes in food habits (Mead, 1943). To change food habits successfully, we must know something about food traditions in different cultures with emphasis on the fact that the tradition is both meaningful and conservative. For example, in a related study by Yang & Read (1996) discussed the dietary pattern changes, food preparation techniques, food practices, and nutrition beliefs before and after immigration among 124 immigrants. Results indicated that the pre-immigration diet is relatively low in fat, high in carbohydrate and high in fiber. Comparison of post-immigration diet to the pre-immigration diet indicated a significant increase in the intake of cholesterol and fat, especially saturated fat and unsaturated fat intake; conversely, there was a decrease in carbohydrate intake. The survey concluded that: 1) Upon immigration, the Asian immigrants increased fat and cholesterol intake, decreased carbohydrate and fiber intake, 2) Yet, by American standards, the Asian immigrant's current diet is relatively low fat, high carbohydrate and high fiber, and 3) further research is needed to study the health effects of these changes.

According to Story and Harris (1989), Southeast Asian refugee families have changed their food buying practices drastically in the United States. In Southeast Asia, the adults have primary responsibility for family meal preparation. In Southeast Asia food is generally purchased daily from independent vendors who sell meat, produce, and other foods in open markets. The study showed that most of them shop for food at least once a day while they were still in Southeast asia, but there is no one shopped on a daily basis in the United States. The basic meal pattern in Southeast Asia consists of breakfast, lunch, dinner, and occasional snacks between meals. Each meal is typically

based on rice and is accompanied by a clear or a vegetable soup, fish, or meat and vegetables (fresh and dried). However, after coming to the United States, most immigrants change their meals drastically. Most of them ate all three meals together in Southeast asia, meanwhile, the only meal they eat together after arriving in the United States is the evening meal. The study also showed that most adults preferred eating their native foods, while their children preferred both American and native foods. The research also showed that 30% of the teenagers in the home had major responsibility for meal preparation, and almost 25% of the teenagers did most of the food shopping. As a result, it is necessary to conduct nutrition education for the teenagers regarding general education nutrition issues, and cooking American foods, and the nutrition quality of specific foods. They can then make informed decisions about adapting to new food ways and making healthy food choices in the new environment (Story & Harris, 1989).

Given the cultural determinants of food habits, certain attributes of culture should be considered especially by the individual who sees the need to change dietary patterns in a sociocultural system.

> "1. One important attribute of culture is that culture is a learned experience, not a biologically determined experience. It is the product of interaction among generations, always with some modification over time. Thus, the notion that culture is learned also implies that it can be unlearned.
> 2. Change is another attribute of culture, and culture processes change at different rates. Thus, we can view food habits as a dynamic process, always changing, and,
> 3. Every culture also resists change by self generated mechanism to perpetuate its culture traits and maintain its boundaries. Food habits, although far from fixed, like all fundamental habits, are resistant to change (Sanjur, 1982, p.3-4)."

Many cultures have contributed food habits to the United States: food, food preferences, and general food behaviors have been bought to the United States from every part of the world (Bass, Wakefield & Kolasa, 1979).

In contemporary society occurs change in food habits more rapidly and to a greater extent than in the past, because travel, and mass communications are indeed making the world 'smaller', and people today are more aware of other cultures and foods, in addition, they are less bothered by differences in food choices than they were even a few decades ago. Furthermore, traditional diets have undergone dramatic change when they are exposed to outside contacts, and breakthroughs in technology contribute to changes. Food habit changes took place in the various ethnic groups examined, and did so rapidly, the environmental and technological forces brought about to the changes in food habits. Eating patterns also seem to be influenced by changing societal values. Economic changes have such an impact on the behavior and social attitudes of people that a change in economic status altered even the staple food produced and made new products likely to be adopted. Very often, the opening of new roads between rural areas and large urban centers will facilitate food habit modification (Mead, 1943 and Frank, 1987). Likewise, the developed countries consume more meat, milk, and other animal products compare to the developing countries (Frank, 1987).

Long Term Dietary Changes

According to Frank (1987), the foods that people choose to eat, and the resulting pattern of consumption are determined by events and circumstances in the wider

environment. In the past, the availability of food was the most important influence on dietary habits; viewed in the long-term it can be seen that:

*Consumption of total dairy products has increased; liquid milk consumption has gone up slightly but there has been a vast increase in cheese consumption.

*Meat consumption has increased; in recent years there has been a phenomenal rise in the consumption of poultry and game.

*The number of eggs consumed has increased.

*Butter consumption has increased; since the 1930's consumption of other fats has gone up; margarine consumption, unrecorded before 1909, has increased over a seventy year period.

*Sugar consumption has risen.

*Consumption of vegetables has almost doubled, and that of fruit has increased

In contrast:-

*Potato consumption has gone down.

*Fish consumption has decreased.

*Wheat flour consumption has halved, and other cereals' consumption has fallen.

At an individual level, eating habits are influenced by a great many factors including the range of food available, personal lifestyle, family traditions, health concerns, and the level of an individual's knowledge of and interest in food.

Short Term Dietary Changes

It is generally understood that supply and demand can be controlled by a price-that is the purchase pattern of any commodity is governed by price. However, in the short term, the demand for some foods is unrelated to the movement in prices, consumption of expensive products continues to rise independent of the general rise in retail prices. It also appears that consumer attitudes are increasingly affecting people's food consumption habits. Healthy eating and quality products are becoming important determinants of food consumption patterns. Fluctuations in price have some effect in changing eating habits, but they are not the total explanation. On the whole, relative price is less important than it used to be. Patterns of food consumption are no longer determined by economic factors alone, impart because health interests also influence the food choice of individuals (Frank, 1987).

CHAPTER III

METHODOLOGY

The purpose of the research was to determine the food consumption behavior, nutrition and health knowledge, and dietary changes among Malaysian students at Oklahoma State University. The research design, population and sample, data collection, and analysis of data will be included in this chapter. The study was approved by the Oklahoma State University Institutional Review Board and International Student Services.

Research Design

A descriptive status survey in the form of a mailed questionnaire was used in this study. The purpose in status survey research is to describe, analyze, and interpret conditions that exist. It uses comparison or contrast and tries to discover relationships which exists between variables (Best, 1981).

The dependent variables in this study were the food consumption behavior, and nutrition and health knowledge of Malaysian Students. The independent variable included selected demographics of Malaysian Students at Oklahoma State University.

Population and Sample

The population, which was also the sample in this study, was all Malaysianstudents enrolled at Oklahoma State University, Stillwater, Oklahoma during fall semester,

1996. The labels of the names of students (N=422) were obtained from the International Students Service, Student Union. Sixteen students did not have Stillwater addresses, hence only 406 questionnaires were mailed out. The questionnaires were sent with a cover letter explaining the purpose of the study and the importance of the students' involvement in the study. Eight questionnaires were returned because of wrong addresses. Perhaps, the students moved out of Stillwater or have graduated. Therefore the total sample/population was N=398.

Data Collection

Planning and Instrumentation

Research plans were started during Spring semester 1996, while, the questionnaire was developed during Spring'96 and Summer'96. Specific sections were included based on literature review and adapted from other research instruments (Kuo,1996, Woody, 1973, Warren, 1962, Abbott, 1957, Hunt,1973, Plato, 1993, Mujeib, 1949, and Woody, 1968). The content validity, format and clarity of the questionnaire were examined and approved by the graduate committee.

The questionnaire was divided into three parts: 1) General Information, 2) Food Consumption Behavior, and 3) Nutrition and Health Knowledge. Part I included questions about demographics, Part II comprised of questions concerning eating habits, meal patterns, missed meals, favorite snacks and while in Malaysia and foods preferred upon arrival in the United States. Part III comprised of questions concerning the Food Guide Pyramid and general nutrition knowledge.

Procedures

A mini-proposal, cover letters and questionnaires were sent to the Institutional Review Board (IRB) for approval. Five hundred questionnaires were the photocopied at North Engineering Department Duplicating services. The questionnaires were folded and stapled and taken to the International Student Office where address labels were provided. The cover letter introduced the researcher, provided the purpose of the study, instructions on how to complete the information sought, and the students were assured that confidentiality will be enforced. Only the researcher will have access to the raw data and she will not know the names of the respondents. The addressed questionnaires were mailed out by the International Student Services, using the University Central Mailing Services . Respondents returned the completed questionnaire to the researcher.

Data Analysis

All questionnaires received within three weeks of the mailing were included in the data analysis. The data collected were transcribed into computer for statistical analysis using the software program PC-File III. A total of 153 (38.4%) were return. The data were coded and filed on a PC file and tabulated for analysis. Chi Square analysis was used to determine the association between variables.

CHAPTER IV

RESULTS AND DISCUSSION

The study was undertaken to investigate the relationships between food consumption behavior, nutrition and health and dietary changes among Malaysian students at Oklahoma State University. There were 422 Malaysian students enrolled at Oklahoma State University during fall, 1996, according to the International Students Office, however, 24 did not have updated addresses or may have graduated, hence questionnaires were sent to 398 students. The response rate was 38.44% (N=153).

Characteristics of Malaysian Students

Gender, Age, Ethnic, Marital Status and Family Size

Of the 153 respondents, about two thirds were males (N=97), and one third (N=56) were females (Table 1). The age ranged were from under 20 to older than 36, however, the predominant age range was 21-25 (82%). The predominant ethnic composition of the students were Chinese (N=127, 83%), followed by Malay (N=23, 15%), and other (N=3, 2%). Most of the Malaysian students at OSU were single N=142 (93%) and almost all N=130 (86%) did not have any family members in Stillwater (Table I).

Education level and College

The academic level of most of the Malaysian students at OSU were Juniors and Seniors. Forty-five percent (N=66) of the students were enrolled in the College of Business Administration. Forty-four percent (N=64) of the students were enrolled in the College of Engineering, Architecture and Technology (Table I).

Religion

Most of the Malaysian students were Buddhist, (N=64, 42%). Although 21% (N=52) indicated no religious preferences, 18% (N=28) were Christians and 15% (N=23) were Muslims (Table I).

Length of Stay in the United States

The majority of the students (N=66, 43%) have been in the US less than one year. About 1/3 of the students have been here 1-2 years, while 25% (N=38) have lived in the US for more than 2 years (Table I).

Where Family Lives in Malaysia

Most of the Malaysian students were city dwellers (52.3%, N=80). There were 41.2% (N=63) who resided in towns, while 18.3% (N=28) of the students were from village (Table I).

TABLE I

CHARACTERISTICS OF MALAYSIAN STUDENTS

Characteristics	N	%
Gender:		
Male	97	63.4
Female	56	36.6
Age:		
<20	16	10.5
21 - 25	126	82.4
26 - 30	8	5.2
31 - 35	1	0.7
>36	2	1.3
Marital Status:		
Single	142	93.2
Married	10	6.6
Family Size:		
None	130	85.5
Spouse	4	2.6
Children(#)	1	0.7
Others:	14	9:2
Ethnic:		
Chinese	127	83
Malay	23	15
Others	3	2
Colleges:		
College of Arts and Sciences	11	7.5
College of Business Administration	66	45.2
College of Engineering , Architecture & Technology	64	43.8
College of Human Environmental Sciences	4	2.7
Education:		
Freshman and Sophomore	27	17.7
Junior and Senior	118	77.1
Graduate	8	5.2
Length of stay in the United State:		
<1 Year	66	43.14
1 - 2 Years	48	31.4
>2 Years	38	24.8
Family live in Malaysia:		
City	80	52.3
Town	63	41.2
Village	28	18.3
Religious:		
Buddhist	64	41.8
No Religious Preference	32	20.9
Christian	28	18.3
Muslim	23	15
Others	4	2.7

Food Consumption Behavior of Malaysian Students

Meal pattern of Malaysian students

Forty-three percent (N=66) of the students ate breakfast everyday. In contrast, 11% (N=16) did not eat breakfast at all (Table II). Almost 2/3 of the students (N=97, 63.4%)ate lunch while 77% (N=118) ate dinner daily (Table II).

TABLE II

MEAL PATTERN OF MALAYSIAN STUDENT

Meals		N	%
Breakfast:	None	16	10.50
	<7/wk	50	2.70
	7/wk	66	43.14
Lunch:	<7/wk	34	22.22
	7/wk	97	63.40
Dinner:	<7/wk	14	9.20
Dinner:	7/wk	118	77.10

Reasons Given by Students For Missing Meals

The major reasons given by students for missing meals were related to time, and food preparation techniques. (Table III). Too little time for taking meals, inconvenient

servings' hours, and preference for sleeping longer ranked as the top three reasons given for not eating. Students who hated cooking, did not know how to cook or were too lazy to cook also missed meals often. About twenty-five percent (N=36) of the students, however, indicated that they do not miss meals. Other reasons for missing meals are listed in Table III.

TABLE III

REASONS FOR MISSING MEALS

	N	%
To little time for taking their meals	67	44.50
Do not miss any meals	36	23.50
Inconvenient serving hours	35	22.90
Sleep	34	22.20
Hate to cook/Don't know to cook/lazy to cook	34	22.20
Dieting to lose weight	15	9.80
Work	12	7.80
Dislikes Foods	9	5.90
Playing with the computer	2	1.30
Never get up early for breakfast	2	1.30
Having supper at night and miss the breakfast	1	0.70
Not hungry	1	0.70
Don't feel like it	1	0.70
Classes	1	0.70

*Multiple answers were allowed.

Number of Snacks Eaten By Malaysian Students

In the questionnaire, snack foods were divided into categories which the researcher has identified as sweet, salty, nutritious and others. Among the sweet category, the favorite snacks were: ice cream, cookies, cake, gum and candy. Different kind of chips was the favorite salty snack. Vegetables were preferred over fruit under nutritious snacks.

Corn on-cob is a favorite snack among Asian Students. It is usually eaten between meals, in the some day that popcorn and chips are eaten in the U. S. Tropical fruits are popular in Malaysia but are not available here, however, a few students ate oranges, apples and tangerines food. Other snacks included bread, cereal, beverages, and specialty items (Table IV) as snack.

TABLE IV

SNACK FOODS EATEN BY MALAYSIAN STUDENTS

Sweets			Salty			Nutritious Foods			Others		
	N	%		N	%		N	%		N	%
Ice Cream	80	52.30	Chips	72	47.10	Corn	39	25.50	Bread	3	2.00
Cookies	49	32.00	Crackers	21	13.70	Carrots	34	22.20	Cereal	3	2.00
Cake	42	28.10	Cheese	12	7.80	Cauliflower	24	15.70	Durian	3	2.00
Gum	36	23.50	Pretzel	11	7.20	/Broccoli			Twisties	2	1.30
Candy	36	23.50				Orange	12	7.80	Blck Bean	2	1.30
Yogurt	20	13.10				Grn pepper	11	7.20	Mt. Dew	2	1.30
Pudding	10	6.50				Apple	9	9.00	Curry	2	1.30
						Tangerine	5	3.30	powder		
						Cantaloupe	2	1.30	Fr. Fries	2	1.30
						Banana	2	1.30	Kaya	1	0.70
						Fruit Juice	1	0.70	Bacon	1	0.70
									Whl. Milk	1	0.70

Frequency of Cooking

The majority of the Malaysian Students (N=106, 69%) cooked meals once a day. Only 24% (N=37) cooked more than twice per day, while 10 students (6.5%) did not cook at all.

Frequency of Eating in Malaysia versus in the United States

Just like any college students, Malaysian students frequently ate at fast food restaurants. Almost all of the students indicated that they ate at fast food restaurants while living in Malaysian, (N=143, 95%), and while studying in the United States (N=146, 96%).

Types of Food Eaten at Fast Food Restaurant

While in Malaysia, students who frequented fast food restaurants ate chicken, Chinese food, street vendor foods and hamburger. Street vendor foods include Satay (meat on skewers), boiled corn, boiled or roasted peanuts, soups or other (Table V).

TABLE V

TYPE OF FOOD EATEN IN FAST FOOD RESTAURANTS

Malaysia			United States		
	N	%		N	%
Chicken	125	81.70	Hamburger	114	74.50
Chinese Food	102	66.70	Chinese Foods	102	66.70
Street Venders	101	66.00	Chicken	93	60.80
Hamburger	98	64.00	Pizza Buffet	80	52.30
Pizza Buffet	59	38.60	Sandwich(i.eSubway, Arby's)	78	51.00
Fish/Shrimp/Oyster	52	33.90.	Fish/Shrimp/Oyster	44	28.80
Bar-B-Que	38	24.80	Bar-B-Que	34	22.20
Sandwich(i.e. Subway, Arby's	20	13.10	Mexican	32	20.90
Food Bar	16	10.50	Food Bar	31	20.30
Delicatessen	13	8.50	Delicatessen	12	7.80
Other(Please Specify)	6	3.90	Street Venders	10	6.50
Mexican	1	1.30	Other(Please Specify)	5	3.30

Offensive Food by Culture or Religion

The majority (N=120, 78.4%) of the Malaysian students did not find any western food offensive by their culture or religion. Thirty-two of the students (21%), however, indicated that they found some of the Western foods offensive because of their religious beliefs (Table VI). Some Buddhists are vegetarians, while Muslims cannot eat pork and pork products for religious reasons.

TABLE VI

LIST OF FOODS OFFENSIVE TO MALAYSIAN STUDENTS' CULTURE OR RELIGION

Foods	N	%	Foods	N	%
Beef	14	9.2	Chicken	3	
Pork	12	7.8	Meat	3	
Poultry	8	5.2	Fish	1	0.7
Bacon	6	3.9	Chinese Foods	1	0.7
Hamburger	4	2.6	Pizza	1	0.7
Non Kosher	4	2.6	Waffles	1	0.7

*Multiple answers were allowed.

Western Foods Liked and Disliked by Malaysian Students

Western foods well liked by almost all of the Malaysian Students are shown in Table VII. The foods very well liked in rank order were: Fruits, Fried Chicken, Vegetables, Seafood, Chinese Foods, Pizza and Milk/Ice Cream. This result is similar to what Kuo (1996) found among Taiwanese students. Least liked foods were Breakfast Cereal and Cheese. Kuo (1996) also reported the same foods not liked by Taiwanese students The only food from the list which was disliked by Malaysian Students was Pasta. Asians eat noodles but usually in soups or stir-fried in combination with vegetables and spices. Perhaps students did not like pasta because they are least familiar with Italian spices in Spaghetti or lasagna, with cheese same serve as in macaroni and cheese, and pasta as a salad item.

TABLE VII

WESTERN FOODS LIKED AND DISLIKED BY MALAYSIAN STUDENTS

Liked			Disliked		
List of Foods	N	%	List of Foods	N	%
Fruits	140	91.55	Pasta	67	46.90
Fried Chicken	139	90.80			
Vegetables	139	90.80			
Seafoods	138	90.20			
Chinese Foods	137	89.50			
Pizza	126	82.40			
Milk/Ice Cream	126	82.40			
Steak	119	77.80			
Sandwiches	119	77.80			
French Fries	115	75.20			
Hot dogs	114	74.50			
Hamburger	105	68.60			
Salads	104	67.90			
Stir-fry	102	66.70			
Breakfast Cereal	87	56.90			
Cheese	87	53.60			

Foods Obtained from Home

A question was asked as to "Which foods the students obtained from home that they ate a lot of." The researcher meant foods ordered directly from Malaysia such as dried fish or prawns, Chinese spices, Chinese Medicine etc. This question was misinterpreted by the students to mean foods at homes that they ate a lot of and indicated poultry, whole milk, cheese, beef, pork, hamburger, vegetables, and many other western type foods.

Daily Consumption of Beverages in Malaysia and in the United States

Malaysian Students consumed almost the same amount of beverage per day while they were at home and while they were in the United States. While in the United States, however, some drank less water and more cold drinks (Table VIII).

TABLE VIII

DAILY CONSUMPTION OF BEVERAGES IN MALAYSIA AND IN THE UNITED STATES

Beverages	Malaysian (Cups)	United States(Cups)
Hot Drinks	1-2	1-2
Cold Drinks	1-2	1-3
Other Alcoholic Beverages(i.e. Beer, Whiskey)	0	0
Water	3-8	3-6

Foods that students Consumed More Since Arriving in the U. S.

Poultry, whole milk, cheese, beef, pork, and hamburger were consumed more since arriving in the United States (Table IX). More than half of the students (N=85, 56%) also indicated that they were willing to try an unfamiliar food product.

TABLE IX

FOODS CONSUMED MORE BY MALAYSIAN STUDENTS
SINCE COMING TO THE UNITED STATES

Foods	N	%
Poultry	83.	54.20
Whole Milk	59	38.60
Cheese	24	15.70
Beef	21	13.70
Pork	18	11.80
Hamburger	18	11.80
Eggs	14	9.20
Noodles/Pasta	14	9.20
Soft Drink	14	9.20
Pizza	12	7.80
Hot Dogs	11	7.20
Rice	9	5.90
Bread	9	5.90
Fish	8	5.20
Ham	8	5.20
Salad	8	5.20
Potato	4	2.60
Beer	4	2.60
Fruit Juice	4	2.60
Shrimp	3	2.00
Skim Milk	2	1.30
Cereal	2	1.30
Chips	2	1.30
Wine	1	0.70
Cheese Foods	1	0.70

Nutrition and Health Knowledge of Malaysian Students

Food Guide for Healthy Eating

Almost all the respondents (N=145, 95.4%) have not taken a nutrition course at the University. When asked about the food guide for healthy eating (Food Guide Pyramid) in terms of number of servings to be consumed per day, the students answered 1-2 or 1-3 per servings on all the food groups (Table X). The majority of the students did

not know the suggested servings for healthy eating, however, if they consumed, the higher range of serving size they have indicated, they have met most of the requirements, except for bread. Breads also include rice, noodles, peas, lima beans, high carbohydrate desserts and others, and perhaps the students did not know that they could count these foods as bread. Malaysian students eat rice almost daily and this should be counted as bread, therefore, the researcher believes that most of the students actually consumed the appropriate number of servings for bread as suggested in the Food Guide Pyramid.

TABLE X

NUTRITION KNOWLEDGE OF
MALAYSIAN STUDENTS:

Food Guide Pyramid		Malaysian Students' Responses		
Food Groups	Recommended No. of Servings	Number of Servings	N	%
Meat	2-3	1-2	122	79.7
Vegetables	3-5	1-3	115	75.2
Bread	6-11	1-2	112	73.2
Dairy Products	2-3	1-2	98	64.1
Fruits	2-4	1-2	90	58.8

Foods that Malaysian Students Try to Limit Consumption

Almost 1/2 of students limit consumption of food high in sodium, sugar, cholesterol, fat and alcoholic beverages. Less than 1/2 of the students were trying to limit consumption of highly processed foods, carbonated beverages, and snack food (Table XI).

TABLE XI

FOODS THAT MALAYSIAN STUDENTS TRY TO LIMIT CONSUMPTION

Food Types	Yes(%)
Foods high in sodium(salt)	52.3
Foods high in sugar	64.1
Foods high in cholesterol	69
Foods high in fat	73
Highly processed foods(bologna, sausage, etc.)	45.8
Alcoholic beverages	74.5
Carbonated beverages	49.7
Snack food(cookies, cake, pie, etc.)	41.2

Nutrition and Health Habits of Malaysian Students

Since coming to the United States, almost 2/3 (N=92, 60.1%) of the Malaysian students described their appetite as fair, while about 1/3 (N=46, 30.3%) considered their appetite as good (Table XII). With regards to concern about nutrition, about half of the students (N=70, 46%) said there was no real change, however more than 1/3 (N=55, 36.2%) of Malaysian students were more concerned about nutrition. Although 37.3% (N=57) of the students did not change their eating habits, 29% indicated that they ate more nutritiously in the United States. More than half of the Malaysian Students believed that they are fairly informed about general nutrition, while, almost 30% were not well

informed (Table XII). Nutrition information was obtained mostly from friends and family, television and radio. Other sources mentioned were doctor/nurses, dentist and dietitians. Almost 1/2 of the students engaged in physical activity, from 30 minutes to 1 hour, twice per week, while 31% of the students did physical activity only once per week. Most of the activity described were: volleyball, swimming, bicycling, tennis, table tennis, aerobics, ballet dancing, jogging, walking, soccer, and weight-lifting. Students indicated that they were taking multi-vitamins, Calcium, Magnesium and herbs. Only 33 of the students reported that they were taking ginseng. Half of the students would like to know more about basic nutrition, while about 20-25% of the students wish to know more about the food guide pyramid, food labels and healthy diets. An overwhelming member of students (N=130, 86%) indicated that what you actually eat makes a difference in how an individual feels and looks (Table XII).

TABLE XII

NUTRITION AND HEALTH HABITS OF
MALAYSIAN STUDENTS

Nutrition and Habits	N	%
Appetite since coming to United State:		
Good	46	30.30
Fair	92	60.10
Poor	14	9.20
Concern about Nutrition:		
More concerned	55	36.20
Less concerned	18	11.80
Not a real change	70	45.80
Not sure	9	5.90
Eating Habits:		
Eat more nutritiously	44	28.90
Eat less nutritiously	36	23.70
Not a real change	57	37.30
Not sure	15	9.90

TABLE XII Continued

General nutrition:		
Very well informed	13	8.60
Fairly informed	86	56.20
Not that informed	45	29.60
Not sure	8	5.30
Professional Journal	31	20.30
Television	92	60.10
How to obtain Nutrition information		
Course	18	11.80
Radio	39	25.50
Friends and Family	111	72.50
Doctor/Nurse	37	24.20
Dietitian/Nutrition	6	3.90
Dentist	11	7.20
Other	20	13.10
Physical Activity:		
None	27	17.60
Once	48	31.40
Twice	75	49.00
Nutrition Topics that Students were interested in:		
Basic nutrition facts	81	53.00
Food Pyramid	32	21.00
How to read food labels	31	20.30
How to select a healthy diet	38	24.80
Not interested in nutrition	21	13.70
Supplements:		
Vitamins/Minerals:		
Yes	67	43.80
No	79	52.00
Ginseng		
Yes	33	21.60
No	93	60.80
What you eat actually makes a difference in how you feel and look:		
Yes	130	86.10
No	20	13.20
May be	1	0.70

Statistical Analysis

H1: There will be no significant association between food consumption behavior (Section II of the questionnaire), and selected personal variables (Section I).

Meal Pattern

Meal pattern was significantly associated with age, ethnic background, marital status, major and religion (Table XIII). There was a significant association (P=0.024) between age and breakfast consumption. The older students (26 and older) tended not to miss breakfast. Chi Square analysis indicated that ethnic background was significantly associated with breakfast (P=0.05) and dinner (P=0.0001). One third of the students with Chinese background ate breakfast daily compared with one sixth of those who were of Malay, Indians or other ethnic backgrounds. Almost all the students with Chinese background (91%) ate dinner five times a week while only 72% of those with other backgrounds ate dinner five times a week and almost 30% ate dinner only once a week.

Marital Status was significantly associated with consumption of breakfast (P=0.006) and lunch (p=0.012). There were only seven out of the 10 married students who answered the question regarding breakfast. Of these seven, three ate breakfast daily. In contrast, only 40 out of 124 students who were single ate breakfast daily. Six of the seven married students ate lunch daily, while of the single students, only 89 of 123 did the same. So percent wise, married students ate more breakfast and lunch.

Dinner consumption was significantly associated with major (P=0.023) and religion (P=0.001) of Malaysian students. Students who were enrolled in the College of Engineering and Technology, ate from 5-9 dinners per week when compared with those

from other colleges. Perhaps this has to do with gender, since there are more males enrolled in the Engineering College.

Buddhists and Christians consumed from 5-9 dinners per week. In contrast, Muslims and students who did not have religious preferences only ate dinners five times per week. Although not significant at the $p \leq 0.05$ level, men tended to eat more dinner (8-12 times per week) than females who only ate dinner 7 times a week. Perhaps this can be explained by the fact that 11 out of the 83 males, may have eaten dinner twice by eating a full dinner early, and consuming instant soup or another light meal later

Malaysian Students who were older and married tended to eat more meals than the younger, single students. Perhaps, the older students have more control over their time management, may have more classes early, and if married, have someone to eat a meal with.

Those whose ethnic background was Chinese, and who were Buddhists also ate more regularly than others. There were more students of Chinese descent, and with the same religion and they may socialize more, hence more meals were eaten together. More men are enrolled in the College of Engineering, hence they tended to eat more dinners than those from other colleges.

TABLE XIII

CHI SQUARE VALUES ON ASSOCIATION BETWEEN MEAL PATTERN AND DEMOGRAPHICS

Age:	Breakfast	Lunch	Dinner
X^2	11.289	-	-
df	4	NS	NS
P	0.024	-	-
Ethnic:			
X^2	15.563	-	21.365
df	8	NS	2.000
P	0.049	-	0.000
Marital Status			
X^2	21.260	19.668	-
df	8	8	NS
P	0.006	0.012	-
Major:			
X^2	-		
df	NS	NS	4
P	-	-	0.023
Religion:			
X^2	-	-	22.979
df	NS	NS	6
P	-	-	0.001

Missed Meals

Under food consumption behavior, students were asked to check reasons for missing meals. Of the nine reasons listed, seven were significantly associated with selected personal variables. The reason "not applicable" was significantly associated with age ($p=0.018$) and length of stay in the U S ($p=0.019$). Almost all students older than 21 indicated that they did not miss meals. About 1/2 of the students who were between 21 and 25 indicated that they missed meals because they preferred to sleep, hence "prefer to sleep" as a reason was significantly associated with age. Eighty five percent of those who have been in the US 1-2 years do not miss meals, however, only 69% of those who have been here less than one year answered in the same way. "Too little time" as a reason for missing meals was significantly associated with family living with students ($p=0.029$) and length of stay in US ($p=0.005$). Almost 1/2 of the single students missed meals because of "too little time". In contrast, only 1/5 of those with family members used the same reason and slightly more than half of those who have lived in the US from 1-2 years indicated that they missed meals because of "too little time". Students who have only lived in the US less than one year (49 out of 72) tended not to use this reason, for missing meals. "Dieting to lose weight" was significantly associated with gender ($p=0.048$) and religion ($p=0.020$). Sixteen percent of the females missed meals because they were on a diet, while only six percent of the males answered in the same way. One fifth of the Christians and 1/6 of those without religious preferences used "dieting to lose weight" as a reason for missing meals. Only 3-4% of the Buddhists or Moslems used this reason.

"No Transportation" was significantly associated with education level ($p=0.002$) of Malaysian students. Two of the 25 freshman/sophomores missed meals because they did

not have transportation. In contrast, all 126 upper classmen did not use this reason for missing meals.

"Working at mealtimes" as a reasons for missing meals were significantly associated with age (p=0.027) and gender (p=0.024). A few of the students, age 21-25, and about 1/2 of those older than 26 missed meals because they work during meal times. None of the students under 20 years of age worked. Eight out of 48 women worked during mealtimes while only four out of 93 males did the same. According to Marjon & Choo (1986), Females tend to skip meals more than males, many reason given for skipping meals namely, not hungry, not used to the food and weight conscious.

"Hate to Cook" was used by 41% of the married students as a reason for missing meals, whereas only 17% of the single students felt the same way. Therefore, "hate to cook" was significantly associated with family size. In general, older students who have been in the US over one year and who have family members living with them did not miss meals. The single, younger students tended to miss meals because they prefer to sleep. Upper class students and older students take more classes and may have more commitments, hence they used "too little time" as a reason to miss meals.

As anticipated, more females, and Christians/Catholics missed meals because they were on a diet. Contrary to expectations, however, more females worked during the meal periods, therefore, they missed meals. Hopefully, they ate at other times. Based on these results shown in Table XIV, the researcher rejected the H1.

TABLE XIV

CHI-SQUARE VALUES BETWEEN REASONS FOR MISSING MEAL AND DEMOGRAPHIC VARIABLES

	Don't apply to me	Too little time	Dieting to lose weight	No trans-portation	Work at mealtime	Prefer to sleep	Hate to cook
Age:							
X^2	7.981	-	-	-	7.192	6.652	-
df	2	NS	NS	NS	2	2	NS
P	0.018	-	-		0.027	0.036	-
TimeUS:							
X^2	5.464	7.754					
df	1	1	NS	NS	NS	NS	NS
P	0.019	0.005	-	-	-	-	-
Famsize:							
X^2	-	4.758	-	-	-	-	6.668
df	NS	1	NS	NS	NS	NS	1
P	-	0.029	-	-	-	-	0.010
Educ:							
X^2	-	-	-	9.457	-	-	-
df	NS	NS	NS	1	NS	NS	NS
P	NS	NS	NS	0.002	NS	NS	NS
Gender:							
X^2	-	-	3.924	-	5.072	-	-
df	NS	NS	1	NS	1	NS	NS
P	-	-	0.048	-	0.024	-	-
Religion:							
X^2	-	-	9.821	-	-	-	-
df	NS	NS	3	NS	NS	NS	NS
P	-	-	0.020	-	-	-	-

H2: There will be no significant association between food consumption behavior (Section II-Favorite Snacks) and nutrition and health knowledge (Section III-avoidance of foods detrimental to health).

Sweet Snacks

Sweet snacks included candy, cookies, cakes, pudding, ice cream, yogurt and gum. There were significant associations between favorite snack (sweet) and avoidance of foods detrimental to health. Students who indicated that they tried to limit their sugar consumption ($p=0.053$) and amount of snacks eaten ($p=0.041$) chose candy bars as their

favorite snack food. Those who tried to limit foods high in cholesterol (p=0.005), high in fat (p=0.017), and alcoholic beverages (p=0.023), selected gum as their favorite snack. Students trying to limit intake of carbonated beverages (p=0.024) selected pudding as their favorite snack, while those limiting foods high in fat(p=0.028) and amount of snacks eaten (p=0.023) selected yogurt (0.023) (Table XV).

Salty Snacks

Salty snacks included chips, nuts, cheese, crackers and pretzels. There were significant associations between favorite snacks (salty) and avoidance of food high in fat and highly processed foods. Students who tended to avoided highly processed foods selected pretzels as a favorite snack (p=0.006), while those who avoid foods high in fat selected cheese (p=0.042).

In general, the students like gum as a snack food, especially those trying to avoid foods high in cholesterol, fat and alcoholic beverages. Nutrition wise, gum only has a few calories, or may have no calories at all, however, chewing gum in public is impolite. Pudding and yogurt were also favorite snacks of Malaysian students. Yogurt has recently been accepted in the School Foodservice Program as a protein food, therefore, this is an excellent choice for snacks food. Some Asians who may be lactose intolerant and not consuming snack can provide calories to their diet by eating yogurt.

Malaysian Students also selected pretzels and cheese as favorite snack foods. These can be healthy snacks as long as the pretzels are baked and not fried and have less salt coating. Regular cheese is high in fat and sodium content, therefore, students need to

know this information and should select low fat cheeses. Cheese, however, provides calcium and again for the non-milk drinkers; cheese can provide calcium in their diet.

Malaysian students liked carrots, celery and grapes, perhaps, more nutritious snacks should be made available at the University Cafeterias, vending machines and fast food outlets.

Nutritious Snacks

Nutritious snacks included fresh and dried fruits, and fresh vegetables. There were significant associations between favorite nutritious snacks and avoidance of food high in sugar, high in fat, carbonated beverages and amount of snacks consumed. Students who tried to avoid foods high in sugar chose carrots ($p=0.022$) as their favorite snack food, which those who tried to limit consumption of carbonated beverages selected celery ($p= 0.024$). Grapes were selected by the students who indicated that they tried to avoids foods high in fat ($P=0.043$) and tried to limit their total snack consumption ($p=0.040$).

Discussion

As discussed in Chapter II, Nutrition Knowledge may not necessarily influence food consumption behavior. Results in this study showed that students who indicated that they try to avoid foods high in sugar, for example, selected candy and celery as favorite snack foods. Hopefully the candy bars were not frequently eaten. Fruits and Vegetables are perishable, may not always be available in vending machines. Perhaps students need nutrition education to encourage them to consume more fruits and vegetables. Some tropical fruits are now available in the supermarkets need to be

encouraged to try new kind of fruits and vegetables available in grocery stores and supermarkets. Based on results, shown in Table XV, the researcher rejected H2.

TABLE XV

SIGNIFICANT CHI-SQUARE VALUES ON ASSOCIATION BETWEEN SNACKS, AND NUTRITION AND HEALTH KNOWLEDGE

	↑Sugar	↑Chol	↑Fat	HPF	Alc. Bev.	Car. Bev.	Snack
Sweet Snacks:							
Candy Bars:							
X^2	3.750	-	-	-	-	-	4.156
df	1	NS	NS	NS	NS	NS	1
P	0.053	-	-	-		-	0.041
Gum:							
X^2	-	7.792	5.696	-	5.199	-	-
df	NS	1	1	NS	1	NS	NS
P	-	0.005	0.017	-	0.023	-	-
Pudding:							
X^2	-	-	-	-	-	5.118	-
df	NS	NS	NS	NS	NS	1	NS
P	-	-	-	-	-	0.024	-
Yogurt:							
X^2	-	-	4.044	-	-	-	5.193
df	NS	NS	1	NS	NS	NS	1
P	-	-	0.028	-	-	-	0.023
Salty Snacks:							
Pretzels:							
X^2	-	-	-	7.488	-	-	-
df	NS	NS	NS	1	NS	NS	NS
P	-	-	-	0.006	-	-	-
Cheese:							
X^2	-	-	4.122	-	-	-	-
df	NS	NS	1	NS	NS	NS	NS
P	-	-	0.042	-	-	-	-
Nutri. Snack:							
Grapes:							
X^2	-	-	4.083	-	-	-	4.214
df	NS	NS	1	NS	NS	NS	1
P	-	-	0.043	-	-	-	0.040
Carrots:							
X^2	5.232	-	-	-	-	-	-
df	1	NS	NS	NS	NS	NS	NS
P	0.022	-	-	-	-	-	-
Celery::							
X^2	-	-	-	-	-	5.118	-
df	NS	NS	NS	NS	NS	1	NS
P	-	-	-	-	-	0.022	-

CHAPTER V

SUMMARY, RECOMMENDATIONS AND IMPLICATIONS

Summary of Results

This study determined the food consumption behavior, nutrition and health knowledge and dietary changes among Malaysian students enrolled in a land-grant university. Survey questionnaires were sent to 398 students enrolled during fall 1996, and the response rate was 38 percent (N=153). Chi square was used to determine the associations between meal pattern and selected personal variables, and between snacks selected, and nutrition and health knowledge.

Malaysian students were predominantly males (63%), 21-25 years of age (82%), single (93%), of Chinese ancestry (83%), and Buddhist (42%). Many were city dwellers and have only been in the US less than a year. Students were mostly juniors and seniors (77%) majoring in business (45%), or engineering (44%) (Table 1). Meals consumed daily were breakfast (43%), lunch (63%), dinner (77%) and one snack (69%) (Table II). Meals were missed due to lack of time (45%), inconvenience meal hours (35%), need for sleep (34%) and no cooking skills (34%) (Table III). Chicken, Chinese foods and hamburgers were preferred both in Malaysia and US, however, street vendor foods (satay, soups, corn-on-cob, roasted/boiled peanuts) were also preferred in Malaysia (Table V).Except for bread, students consumed the suggested number of servings for other foods

in the Food Guide Pyramid (Table X). Nutrition information was obtained from friends, family and TV/radio. About 50% did physical activity of 30 minutes or more duration twice a week (Table XII). Meal pattern and reason for missing meals were significantly associated with selected personal variables, while nutrition and health knowledge were associated with types of snacks selected (sweet, salty, nutritious, others). Nutrition information and simple meal preparation techniques using local foods need to be widely disseminated to all International students through various food outlets on and off campus to promote healthy lifestyles for all students.

Statistical Analysis

H1: There will be no significant association between food consumption behavior (Section II of the question 1 and 2), and selected personal variables (Section I). Based on results shown in Table XIII and XIV, the researcher rejected the H1.

H2: There will be no significant association between food consumption behavior (Section II-Favorite Snacks) and nutrition and health knowledge (Section III-avoidance of foods detrimental to health). Based on results shown in Table XV, the researcher rejected the H2.

Recommendations

The questionnaire was five pages long and could perhaps be streamlined to less pages requiring more check marks instead of short answers. Addresses for new international students were incomplete in September, and the list obtained from the International students office included those enrolled in the spring semester who already have graduated. Perhaps the questionnaires should have been mailed in October or

November to have an up-to-date listing of students. Due to financial constraint, a second mailing was not done. The response rate could be higher perhaps if a second mailing was possible.

Future studies should utilize a random sample of Malaysian students enrolled in all land-grand institutions nationwide, or, perhaps, by region of the country to gain additional perspectives on food consumption behavior of this group of students. A 24-hour recall or a food record could also be a part of the questionnaire to gain more insight regarding dietary changes happening while students are in the United States.

Implications

The results of this study should be shared with food service administrators and/or nutritionist/dietitians employed in Residential Life who are responsible for the residence halls cafeterias and vending. Informational materials about resource on campus are generally provided for students living in the married housing apartments but single students in the residence halls or those in privately-owned apartments to not get the same materials. Information about the Food Guide Pyramid, how to Read the Label, Basic Nutrition, Food Purchasing in supermarkets or Farmers Market (open between April and October on Wednesdays and Saturdays), and Simple meal Preparation Techniques should be made available to all International students arriving on campus. Students are assessed fees for the Wellness Center and Colvin Center but very few go to these facilities for exercise, fitness, nutrition counseling and cooking classes. Special programs need to be advertised to encourage international students to use these facilities for fitness and to attend healthy cooking demonstrations. The department of Nutritional Sciences also offer

and credit how courses such as Food Experiences for Children and Nutrition Survival Skills for Busy Lifestyles during weekends which should be promoted widely among new students.

Bibliography

Abbott, M. E. (1957). A study of eating habits of selected Oklahoma Teenagers. Unpublished master's degree, Oklahoma State University, Stillwater.

Alexandria, A. N. (1969). Changing food habits. Journal of Nutrition Education, 10-11.

Bass, M. A., Wakefield, L., & Kolasa, K.(1979). Community nutrition and individual food behavior. Minneapolis, Mn: Burgess Publishing Company.

Best, J. W. (1981). Research in Education. Englewood Cliffs, NJ.: Prentice-Hall, Inc.

Betts, N. M., Amos, R. J., Georgiou, C., Hoerr, S. L., Ivaturi, R., Keim, K. S., Tinsley, A. & Voichick, J. (1995). What young adults say about factors affecting their food intake. Ecology of Food and Nutrition, 34, 59-64.

Blair, R. A. (1988). Opinions, Practices, Beliefs, Altitudes and consumption of fruits and vegetables By Oklahoma Homemakers. Unpublished master's thesis, Oklahoma State University, Stillwater.

Brown, C. M.(1945). The diets of high school students and factors influencing food habits. Community Basis for postwar planning, 4, 1-10.

Byrant, K. R. (1994). Nutrition Awareness and meat consumption of College Student. Unpublished master's thesis, Oklahoma State University, Stillwater

Chau, P., Lee, H. S., Tseng, R. & Downes, N. J. (1990). Dietary habits, health beliefs, and food practices of elderly Chinese women. Journal of the American Dietetic Association, 90(4), 579-580.

Chong, Y. H. (1969). Food and Nutrition in Malaysia. Kuala Lumpur, Malaysia Perchitakan Lai than Fong.

Chou, M. (1994). America's changing eating habits. Cereal Foods World, 39(6),452-453.

Devaney, B. L., Gordon, A. R., & Burghardt, J. A. (1995). Dietary intakes of students. American Journal of Clinical Nutrition, 61(Suppl), 205S-212S.

Einstein, M. A. & Hornstein, I. (1970). Food preferences of college students and nutritional implications. Journal of Food Science, 35, 429-436.

Elizabeth, A. E. J. (1976). Food preferences, nutritional knowledge, and nutrient intake of university women. Unpublished master's thesis, Oklahoma State University, Stillwater.

Eppright, E. S. (1947). Factors influencing food acceptance. Journal of the American Dietetic Association, 23, 579-587.

Frank, J. (1987). U K and International food consumption patterns: changing demand for food. (pp. 2-3). Bradford, Yorkshire: Horton publishing limited. Vo.2.

Frank, J. (1987). UK and International Food Consumption Patterns: Demographic and Socio-Economic factors Affecting Food Consumption. (pp. 31-33). Bradford, Yorkshire: Horton publishing limited. Vo.5.

Guthe, C. E. & Mead, M. (1943). The problem of changing food habits. Washington D. : The National Research Council.

Guthe, C. E. & Mead, M. (1945). Manual for the study of food habits. Washington D. : The National Research Council.

Hartog, A. P. & Taveren, W. A. (1985). Manual for Social Surveys on food habits. Wageningen, Netherlands: PUDOC.

Hasenauer, L. A. (1988). Purchasing Habits, Consumption Patterns & Altitudes of Oklahoma Homemakers toward Wheat products. Unpublished master's thesis, Oklahoma State University, Stillwater.

Heimendinger, J. & Duyn, M. A. S. V. (1995). Dietary recasting the behavior change: the challenge of recasting the role of fruit and vegetables in the American diet. American Journal of Clinical Nutrition, 61(Suppl), 1397S-1401S.

Hochbaum, G. M. (1981). Strategies and their rationale for changing people's eating habits. Journal of Nutrition Education, 13(1) Supplement, 59S-65S.

Hunt, S. K. (1973). An analysis of the food and nutrient intakes of preadolescent girls living in Langston, Oklahoma. Unpublished master's thesis, Oklahoma State University, Stillwater.

Irons, W. B. (1974). A study of college students' food habits to ascertain nutrient intake and factors influencing food habits. Unpublished doctoral dissertation, Purdue University, Indiana.

King, S. (1983). Trends in meal planning and eating habits. In Turner, M.R. in (Ed.). Food and People. (pp. 43-65). London, UK: John Libbey and Company Limited.

Ko. S., Lee, W. TK. Guldan, G. S., Chan. U., Chan, M., Hui, W., Khor, S., Kim, Yt., Lok. J., Ng, S., & Shing, S. (1995). Dietary intake, Food habits and nutrition knowledge of adults - A telephone survey in Hong Kong. Nutrition Research, 15(50), 633-645.

Langenhoven, M. L., Wolmanrans, P., Jooste. P. L., Dhansay, M. A., & Benade', A. J. S. (1995). Food consumption profile of the South African adult population. South African Journal of Science, 91; 523-528.

Marjon, Z. M., & Choo, P. S. (1986). In S. Mohamed, Mohd. N. Azadin, and M. I. A. Karim in (Ed.). Seminar on Advances in Food Research in Malaysia. (pp. 175-181). Singapore: Chopmen Publishers.

Melby, C. L., Femea, P. L. & Sciacca, J. P.(1986). Reported dietary and exercise behaviors, belief and knowledge among university undergraduates. Nutrition Research, 6; 799-808.

Mead, M. (1949). Cultural patterning of nutritionally relevant behavior. Journal of the American dietetic association, 25, 677-680.

Mead, M.(1943). Dietary patterns and foods Habits. Journal of the American dietetic association, 19(1), 1-5.

Mead, M. (1964). Food habit research: problems of the 1960's. Washington, D. C. The National Research Council.

Mckay, D. A. (1980). Food illness, and folk medicine: insights from Ulu Trengganu, West Malaysia. In Robson, J. R. K. in (Ed.). Food ecology and Culture Readings in the Anthropology of Dietary practices. (pp. 61-66). New York: Gordon and Breach Science publishers.

Mujeib, Z. (1949). Methods and procedures for studying food habits with special emphasis on survey to be utilized in Pakistan. Unpublished master's thesis, Oklahoma State University, Stillwater.

Peterkin, B. B. (1994). USDA food consumption research: parade of survey greats American Institute of Nutrition, 1836S-1842S.

Plato, R. S. (1993). Altitudes, Knowledge, and Consumption of fruits and vegetables by College Students. Unpublished master's thesis, Oklahoma State University, Stillwater.

Popkin, B. M., Paeratakul, S., Ge, K., & Fengying, Z. (1995). Body weight patterns among the Chinese results from the 1989 and 1991 China health and nutrition surveys. American Journal of Public health, 85(5), 690-694.

Popkin, B. M. (1994). Social change and its nutritional Impact: the China health and Nutrition Survey. China Exchange News, 22(2), 9-11.

Postel, R. T., McComber, D., Hinz, P., & Finley, D. (1993). Regional differences in food consumption patterns of university students: implications for the food service Industry. National Association of College & University Food Services, 37-48.

Procter, S. B., Gregoire, M. B., Holcomb, C. A. & Reeves, R. D. (1992). Eating habits and activity levels of university students. National Association of College & University Food Services, 61-67.

Sanjur, D. (1982). Social and cultural perspectives in nutrition. Englewood Cliffs, N. J.: Prentice-Hall, inc.

Shirley, L. T. (1974). Dietary intake study of Oklahoma State University students participating in two systems of Food Service. Unpublished master's thesis, Oklahoma State University, Stillwater.

Siong, T. E. (1986). Advances in nutrition research in Malaysia. In S. Mohamed, Mohd. N. Azudin, and M. I. A. Karim in (Ed.). Seminar on Advances in Food Research in Malaysia. (pp. 153-159). Singapore: Chopmen Publishers.

Snyder, H. (1916). Chapter XVII: Dietary studies. Human Foods. N.Y.: The Macmillan Company.

Stasch, A. R., Johnson, M. M. & Spangler, G. J. (1970). Food practices & preferences of some college students. Journal of the American Dietetic Association, 57, 523-527.

Story, M. & Harris, L.J. (1989). Food Habits & dietary change of southeast asian refugee families living in the United States. Journal of the American Dietetic Association, 89(6), 801-803.

Swati, G. N. & Pushpa, A. (1994). A graduate student viewpoint on nutrition in Southeast Asia. Ecology of Food and Nutrition, 32, 95-98.

Tian, H. G., Nan, Y., Hu, G., Dong, Q. N., Yang, X. L., Pietinen, P. & Nissinen, A. (1995). Dietary survey in a Chinese population. European Journal of Clinical Nutrition, 49, 26-32.

Vemury, M. & Levine, H. (1978). Beliefs and practices that affect food habits in developing countries. A Literature Review. (pp 96-116). New York: Care, Inc. 1-3.

Wakefield, L. M. & Miller, M. C. (1971). Food preferences, habits, and intake. Journal of Home Economics, 63(1), 45-47.

Warren, G. L. (1962). Food preferences of students eating in the dining hall at Langston University. Unpublished master's thesis, Oklahoma State University, Stillwater.

Wellin, E. (1955). Cultural factors in nutrition. Nutrition Review, 13, 129-158.

Whyte, R. O. (1974). Rural nutrition in Monsoon Asia. New York, Melbourne: Oxford University Press, London.

Wilson, C. S. (1980). Food taboos of childbirth: the Malay Example. In Robson, J. R. K. in (Ed.). Food ecology and Culture: Readings in the Anthropology of Dietary Practices. (pp. 67-74). New York: Gordon and Breach Science publishers.

Woody, F. L. (1973). Eating habits of OSU single women students housed in dormitories VS off-campus apartments. Unpublished master's thesis, Oklahoma State University, Stillwater.

Yang, W. & Read, M. (1996). Dietary pattern changes of asian immigrants. Nutrition Research, 16(8), 1277-1293.

Yuen, C. M. C., Caffin, N., Hunter, K., Newton, W., & Haynes, Y. (1994). Consumer consumption patterns, purchasing habit and altitudes to fruit and vegetables. Food Australia, 46(10), 455-458.

Zohra, M. (1949). Methods and procedures for studying food habits with special emphasis on survey to be utilized in Pakistan. Unpublished master's thesis, Oklahoma State University, Stillwater.

APPENDIXES

APPENDIX A

CORRESPONDENCE

OSU

Department of Nutritional Sciences
425 Human Environmental Sciences
Stillwater, Oklahoma 74078-6141
405-744-5040; Fax 405-744-7113
Email nutrsci-i@okway.okstate.edu

September 15, 1996

Dear Malaysian student:

My name is Hii, Siew-Ing, and I am from Sibu, Malaysia. For my master's degree in Nutritional Sciences, I have chosen to study the "Food Consumption Behavior among Malaysian Students at Oklahoma State University". I would like very much for you to assist me in this endeavor by participating in this study.

The attached questionnaire focuses on your food habits and dietary changes since you came to the U.S. Please take 15 minutes of your time to complete the questionnaire. Your cooperation and participation are very much appreciated. Once the questionnaire is completed, please refold, tape and mail back on or before September 30, 1996. Your participation is strictly voluntary and there will be no penalty for non-participation. The name of those individuals participating will not be included in the research thesis. Data will be discussed as an aggregate.

Thank you for your time and willingness to participate in this study. Receiving your views is extremely important to the outcome of this study. If you have any question or need further assistance, please call us at (405)744-8294. We will look forward to hearing from you soon.

Sincerely,

Hii Siew Ing
Hii, Siew-Ing
Graduate Student

Lea L. Ebro
Lea L. Ebro, Ph.D.,RD/LD
Professor & Dietetic Internship Director

APPENDIX B

RESEARCH INSTRUMENTS

A Survey of Food Consumption Behavior Among Malaysian Students at Oklahoma State University

I. GENERAL INFORMATION

Please circle or check the appropriate information about yourself:

1. Gender: (1.) ____ Male
   (2.) ____ Female

2. Age (years): (1.) ____ under 20
   (2.) ____ 21-25
   (3.) ____ 26-30
   (4.) ____ 31-35
   (5.) ____ over 36

3. Ethnic Classification: (1.) _____ Chinese
   (2.) _____ Malay
   (3.) _____ Indian
   (4.) _____ Others(Please Specify.)
   _____

4. Major: _____

5. Educational Level: (1.) _____ Freshman (4.) _____ Senior
   (2.) _____ Sophomore (5.) _____ Graduate
   (3.) _____ Junior (6.) _____ Special Student

6. Marital Status: _____ Single _____ Married

7. Religious Preference: (1.) _____ Buddhist (6.) _____ Moslem
   (2.) _____ Christian (7.) _____ Sikh
   (3.) _____ Hindu (8.) _____ No religious preference
   (4.) _____ Jain (9.) _____ Other (Please Specify)
   (5.) _____ Catholic _____

8. Number of family members living with you.
   (1.) _____ None
   (2.) _____ Spouse
   (3.) _____ Children(#) (Please indicate number of children)
   (4.) _____ Others(Please specify) _____.

9. How long have you been in the U.S.? _____ Years _____ Months

10. In Malaysia, where does your family live? _____ City _____ Town _____ Village

II. FOOD CONSUMPTION BEHAVIOR

Please answer all that apply.

1. Number of meals eaten per week.
   (1.) _____ Breakfast
   (2.) _____ Lunch
   (3.) _____ Dinner/Supper

2. Why do you miss meals? Check all that apply.
   (1.) ____This question does not apply to me
   (2.) ____Too little time
   (3.) ____Dislike food
   (4.) ____Dieting to lose weight
   (9.) ____Hate to cook
   (5.) ____ Inconvenient serving hours
   (6.) ____ No transportation
   (7.) ____ Work at mealtimes
   (8.) ____ Prefer to sleep
   (10) ____ Other (Please Specify)

   _____

3. How many times a day do you have **snacks**?

   _____

4. What are your favorite snack foods?(Check all that apply)
   (1.) ____ Candy bars
   (2.) ____ Cookies
   (3.) ____ Cakes
   (4.) ____ Pudding
   (5.) ____ Ice-Cream
   (6.) ____ Yogurt
   (7.) ____ Gum
   (1.) ____ Chips
   (2.) ____ Nuts
   (3.) ____ Cheese
   (4.) ____ Crackers
   (5.) ____ Pretzels
   (1.) ____ Corn
   (2.) ____ Carrots
   (3.) ____ Cauliflower/Broccoli
   (4.) ____ Celery
   (5.) ____ Green Pepper
   (6.) ____ Grapes
   (7.) ____ Tangerine
   (8.) ____ Orange
   (9.) ____ Apple
   (10.) ____ Dried Fruit

   _____Others (Please Specify) _____

5. How often do you cook per day?
   (1.) _____ Once
   (2.) _____ Twice
   (3.) _____ Three Times
   (4.) _____ Do not cook my meals.

6. How often do you eat at Fast Food Restaurants? Indicate by placing an **X** under each column.

	In Malaysia	In U.S.
Do not eat at fast food restaurants		
1-2 times per month		
1-2 times per week		
3-4 times per week		
5 or more times per week		

7. Place an X under each column for all that apply for "Fast Food" restaurants where you eat.

Fast Food	In Malaysia	In U.S.
Hamburger		
Pizza Buffet		
Chicken		
Food Bar		
Sandwich(i.e. Subway, Arby)		
Fish /Shrimps, oyster		
Chinese		
Mexican		
Delicatessen		
Bar-b-Que		
Street Vendors: Sate, boiled corn, peanut & other foods		
Other (Please Specify)		

8. Do you find any of the Western foods culturally or by religion offensive to you?
   (1.) _____ Yes
   (2.) _____ No.

9. If answer to question 8 is yes, please list 2-3 foods that are most offensive to your culture or religion.

   _____

10. Please **rate** the following foods by **circling** the number corresponding to your choice.

	Strongly Dislike	Dislike	Like	Like a Lot	Never Eaten
Steak	1	2	3	4	5
Fried chicken	1	2	3	4	5
Hamburger	1	2	3	4	5
Sandwiches	1	2	3	4	5
Pizza	1	2	3	4	5
Hot dogs	1	2	3	4	5
Pasta	1	2	3	4	5
Chinese foods	1	2	3	4	5
Seafood	1	2	3	4	5
Breakfast cereal	1	2	3	4	5
Salads	1	2	3	4	5
Cheese	1	2	3	4	5
French fries	1	2	3	4	5
Stir-fry	1	2	3	4	5
Milk/Ice-cream	1	2	3	4	5
Fruits	1	2	3	4	5
Vegetables	1	2	3	4	5

11. What foods do you get from your home that you eat a lot of?

_____

12. How many cups of the different **beverages** do you consume per day.

	In Malaysia	In the U.S.
Hot Drinks: Tea, coffee, chocolate		
Cold Drinks: Tea, coffee, fruit juice, carbonated drinks, wine		
Other Alcoholic Beverages: (i.e. Beer, Whiskey)		
Water		

13. List 2-3 foods you consume **more of** since arriving in the U.S. (Be very specific. e.g. Cheese, Milk, Chicken) _____

_____

14. How willing are you to try an unfamiliar food product in the U.S.? Place an **X** in front of your choice.

(1.) _____ Definitely would not try
(2.) _____ Would not try
(3.) _____ Not sure
(4.) _____ Would try
(5.) _____ Definitely would try

III. NUTRITION AND HEALTH KNOWLEDGE

1. Food Guide for Healthy Eating. How many **servings** of the following should you consume per day? Please **circle** the appropriate number.

1. Meat	0	1	2	3	4	5 or more	-------
2. Dairy Products	0	1	2	3	4 or more	-------	-------
3. Bread	0	1	2	3	4	5	6 or more
4. Fruits	0	1	2	3	4	5 or more	-------
5. Vegetables	0	1	2	3	4	5 or more	-------

2. Have you taken a college course in Nutrition? (1.) _____ Yes (2.) _____ No
If yes, where? _____

3. In my daily consumption, I try to Limit the following: (Please place an X on appropriate columns).

	Yes	No
1. Foods high in sodium (salt)		
2. Foods high in sugar		
3. Foods high in cholesterol		
4. Foods high in fat		
5. Highly processed foods (bologna, sausage, etc.)		
6. Alcoholic beverages		
7. Carbonated beverages		
8. Snack food(cookies, cake, pie, etc.)		

4. How do you describe your appetite since coming to the U.S.?
   (1.) _____ Good (2.) _____ Fair (3.) _____ Poor

5. Compared to when you were in Malaysia, how concern are you about nutrition since living in the U.S.?
   (1.) _____ More concerned (3.) _____ No real change
   (2.) _____ Less concerned (4.) _____ Not sure.

6. Compared to when you were in Malaysia, how do you describe your eating habits now?
   (1.) _____ Eat more nutritiously (3.) _____ No real change
   (2.) _____ Eat less nutritiously (4.) _____ Not sure

7. How informed are you about general nutrition?
   (1.) _____ Very well Informed (3.) _____ Not that well informed
   (2.) _____ Fairly well informed (4.) _____ Not sure.

8. Where do you obtain nutrition information?
   (1.) _____ Course (6.) _____ Doctor/Nurse
   (2.) _____ Professional Journal (7.) _____ Dietitian/Nutritionist
   (3.) _____ Television (8.) _____ Dentist
   (4.) _____ Radio (9.) _____ Others (Please Specify)
   (5.) _____ Friends & Family _____

9. How many times per week do you engage in physical activity between 30 minutes and 1 hour in duration?
   (1.) _____ None (2.) _____ Once (3.) _____ Twice (3.) _____ 3 or more.
   Describe? _____

10. Which of the following nutrition topics would you be MOST interested in learning about? Check all that apply.
    (1.) _____ Food Guide Pyramid (4.) _____ How to select a healthy diet
    (2.) _____ How to read food labels (5.) _____ Not interested in nutrition
    (3.) _____ Basic nutrition facts about the kind of food I eat

11. Do you take any of the following supplements?
    Vitamins/Minerals (1.) _____ yes (2.) _____ no
    Ginseng (1.) _____ yes (2.) _____ no
    Other(s) (1.) _____ yes (2.) _____ no. If yes, please specify
    _____

12. Do you believe that what you eat actually make a difference in how you feel and look?
    (1.) _____ Yes
    (2.) _____ No

***Thank you* for your participation!**

APPENDIX C

CHI SQUARE ANALYSIS DATA

TABLE OF AGE BY BREAKFST

AGE BREAKFST

Frequency Row Pct Col Pct	0	1	5	Total
Under 21	3 20.00 18.75	3 20.00 6.00	9 60.00 13.64	15
21-25	13 12.26 81.25	46 43.40 92.00	47 44.34 71.21	106
> 25	0 0.00 0.00	1 9.09 2.00	10 90.91 15.15	11
Total	16	50	66	132

Frequency Missing = 21

STATISTICS FOR TABLE OF AGE BY BREAKFST

Statistic	DF	Value	Prob
Chi-Square	4	11.289	0.024

TABLE OF ETHNIC BY BREAKFST

ETHNIC BREAKFST

Frequency / Row Pct / Col Pct	0	1	2	3	4	Total
Chinese	13	1	6	12	21	112
	11.61	0.89	5.36	10.71	18.75	
	86.67	25.00	85.71	80.00	87.50	
Other	2	3	1	3	3	18
	11.11	16.67	5.56	16.67	16.67	
	13.33	75.00	14.29	20.00	12.50	
Total	15	4	7	15	24	130

(Continued)

TABLE OF ETHNIC BY BREAKFST

ETHNIC BREAKFST

Frequency / Row Pct / Col Pct	5	6	7	21	Total
Chinese	15	4	39	1	112
	13.39	3.57	34.82	0.89	
	83.33	100.00	92.86	100.00	
Other	3	0	3	0	18
	16.67	0.00	16.67	0.00	
	16.67	0.00	7.14	0.00	
Total	18	4	42	1	130

Frequency Missing = 23

STATISTICS FOR TABLE OF ETHNIC BY BREAKFST

Statistic	DF	Value	Prob
Chi-Square	8	15.563	0.049

TABLE OF MS BY BREAKFST

MS BREAKFST

Frequency / Row Pct / Col Pct	0	1	2	3	4	Total
Single	15 12.10 100.00	4 3.23 100.00	6 4.84 85.71	15 12.10 100.00	23 18.55 95.83	124
Married	0 0.00 0.00	0 0.00 0.00	1 14.29 14.29	0 0.00 0.00	1 14.29 4.17	7
Total	15	4	7	15	24	131

(Continued)

TABLE OF MS BY BREAKFST

MS BREAKFST

Frequency / Row Pct / Col Pct	5	6	7	21	Total
Single	17 13.71 94.44	4 3.23 100.00	40 32.26 93.02	0 0.00 0.00	124
Married	1 14.29 5.56	0 0.00 0.00	3 42.86 6.98	1 14.29 100.00	7
Total	18	4	43	1	131

Frequency Missing = 22

STATISTICS FOR TABLE OF MS BY BREAKFST

Statistic	DF	Value	Prob
Chi-Square	8	21.260	0.006

TABLE OF RELIGION BY DINNER

RELIGION DINNER

Frequency Row Pct Col Pct	1	5	9	Total
Buddhist	2 3.45 25.00	53 91.38 45.69	3 5.17 37.50	58
Christian	0 0.00 0.00	21 84.00 18.10	4 16.00 50.00	25
Moslem	5 27.78 62.50	13 72.22 11.21	0 0.00 0.00	18
Other	1 3.23 12.50	29 93.55 25.00	1 3.23 12.50	31
Total	8	116	8	132

Frequency Missing = 21

STATISTICS FOR TABLE OF RELIGION BY DINNER

Statistic	DF	Value	Prob
Chi-Square	6	22.979	0.001

TABLE OF ETHNIC BY DINNER

ETHNIC DINNER

Frequency Row Pct Col Pct	1	5	9	Total
Chinese	2 1.79 28.57	102 91.07 88.70	8 7.14 100.00	112
Other	5 27.78 71.43	13 72.22 11.30	0 0.00 0.00	18
Total	7	115	8	130

Frequency Missing = 23

STATISTICS FOR TABLE OF ETHNIC BY DINNER

Statistic	DF	Value	Prob
Chi-Square	2	21.365	0.000

TABLE OF MAJOR BY DINNER

MAJOR DINNER

Frequency Row Pct Col Pct	1	5	9	Total
2	1 10.00 12.50	9 90.00 8.57	0 0.00 0.00	10
3	7 12.07 87.50	50 86.21 47.62	1 1.72 14.29	58
5	0 0.00 0.00	46 88.46 43.81	6 11.54 85.71	52
Total	8	105	7	120

Frequency Missing = 33

STATISTICS FOR TABLE OF MAJOR BY DINNER

Statistic	DF	Value	Prob
Chi-Square	4	11.360	0.023

TABLE OF MS BY LUNCH

MS LUNCH

Frequency / Row Pct / Col Pct	0	1	2	3	4	Total
Single	1	3	3	6	6	123
	0.81	2.44	2.44	4.88	4.88	
	100.00	100.00	100.00	100.00	100.00	
Married	0	0	0	0	0	7
	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	
Total	1	3	3	6	6	130

(Continued)

TABLE OF MS BY LUNCH

MS LUNCH

Frequency / Row Pct / Col Pct	5	6	7	21	Total
Single	12	3	89	0	123
	9.76	2.44	72.36	0.00	
	100.00	100.00	93.68	0.00	
Married	0	0	6	1	7
	0.00	0.00	85.71	14.29	
	0.00	0.00	6.32	100.00	
Total	12	3	95	1	130

Frequency Missing = 23

STATISTICS FOR TABLE OF MS BY LUNCH

Statistic	DF	Value	Prob
Chi-Square	8	19.668	0.012

TABLE OF AGE BY WORK AT MEALTIME

AGE WORK AT MEALTIME

Frequency Row Pct Col Pct	0	1	Total
Under 21	16 100.00 11.35	0 0.00 0.00	16
21-25	117 92.86 82.98	9 7.14 75.00	126
> 25	8 72.73 5.67	3 27.27 25.00	11
Total	141	12	153

STATISTICS FOR TABLE OF AGE BY WORK AT MEALTIME

Statistic	DF	Value	Prob
Chi-Square	2	7.192	0.027

TABLE OF FAMSIZ BY HATE TO COOK

FAMSIZ HATE TO COOK

Frequency Row Pct Col Pct	0	1	Total
None	108 83.08 89.26	22 16.92 70.97	130
Spouse	13 59.09 10.74	9 40.91 29.03	22
Total	121	31	152

Frequency Missing = 1

STATISTICS FOR TABLE OF FAMSIZ BY HATE TO COOK

Statistic	DF	Value	Prob
Chi-Square	1	6.668	0.010

TABLE OF AGE BY PREFER TO SLEEP

AGE PREFER TO SLEEP

Frequency Row Pct Col Pct	0	1	Total
Under 21	15 93.75 12.61	1 6.25 2.94	16
21-25	93 73.81 78.15	33 26.19 97.06	126
> 25	11 100.00 9.24	0 0.00 0.00	11
Total	119	34	153

STATISTICS FOR TABLE OF AGE BY PREFER TO SLEEP

Statistic	DF	Value	Prob
Chi-Square	2	6.652	0.036

TABLE OF SEX BY WORK AT MEALTIME

SEX WORK AT MEALTIME

Frequency Row Pct Col Pct	0	1	Total
Male	93 95.88 65.96	4 4.12 33.33	97
Female	48 85.71 34.04	8 14.29 66.67	56
Total	141	12	153

STATISTICS FOR TABLE OF SEX BY WORK AT MEALTIME

Statistic	DF	Value	Prob
Chi-Square	1	5.072	0.024

TABLE OF SEX BY DIETING TO LOSE WEIGHT

SEX DIETING TO LOSE WEIGHT

Frequency Row Pct Col Pct	0	1	Total
Male	91 93.81 65.94	6 6.19 40.00	97
Female	47 83.93 34.06	9 16.07 60.00	56
Total	138	15	153

STATISTICS FOR TABLE OF SEX BY DIETING TO LOSE WEIGHT

Statistic	DF	Value	Prob
Chi-Square	1	3.924	0.048

TABLE OF RELIGION BY DIETING TO LOSE WEIGHT

RELIGION DIETING TO LOSE WEIGHT

Frequency Row Pct Col Pct	0	1	Total
Buddhist	62 96.87 44.93	2 3.12 13.33	64
Christian	22 78.57 15.94	6 21.43 40.00	28
Moslem	22 95.65 15.94	1 4.35 6.67	23
Other	32 84.21 23.19	6 15.79 40.00	38
Total	138	15	153

STATISTICS FOR TABLE OF RELIGION BY DIETING TO LOSE WEIGHT

Statistic	DF	Value	Prob
Chi-Square	3	9.821	0.020

TABLE OF FAMSIZ BY TOO LITTLE TIME

FAMSIZ TOO LITTLE TIME

Frequency Row Pct Col Pct	0	1	Total
None	68 52.31 80.00	62 47.69 92.54	130
Spouse	17 77.27 20.00	5 22.73 7.46	22
Total	85	67	152

Frequency Missing = 1

STATISTICS FOR TABLE OF FAMSIZ BY TOO LITTLE TIME

Statistic	DF	Value	Prob
Chi-Square	1	4.758	0.029

TABLE OF TIMEUS BY TOO LITTLE TIME

TIMEUS TOO LITTLE TIME

Frequency Row Pct Col Pct	0	1	Total
< 1 year	49 68.06 56.98	23 31.94 34.33	72
> 1 year	37 45.68 43.02	44 54.32 65.67	81
Total	86	67	153

STATISTICS FOR TABLE OF TIMEUS BY TOO LITTLE TIME

Statistic	DF	Value	Prob
Chi-Square	1	7.754	0.005

TABLE OF EDUC BY NO TRANSPORTATION

EDUC	NO TRANSPORTATION		
Frequency Row Pct Col Pct	0	1	Total
Freshman & Sophomores	25 92.59 16.56	2 7.41 100.00	27
Junior, Senior & Graduates	126 100.00 83.44	0 0.00 0.00	126
Total	151	2	153

STATISTICS FOR TABLE OF EDUC BY NO TRANSPORTATION

Statistic	DF	Value	Prob
Chi-Square	1	9.457	0.002

TABLE OF TIMEUS BY DO NOT APPLY TO ME

TIMEUS DO NOT APPLY TO ME

Frequency Row Pct Col Pct	0	1	Total
< 1 year	50 69.44 42.02	22 30.56 64.71	72
> 1 year	69 85.19 57.98	12 14.81 35.29	81
Total	119	34	153

STATISTICS FOR TABLE OF TIMEUS BY DO NOT APPLY TO ME

Statistic	DF	Value	Prob
Chi-Square	1	5.464	0.019

TABLE OF AGE BY DO NOT APPLY TO ME

AGE DO NOT APPLY TO ME

Frequency Row Pct Col Pct	0	1	Total
Under 21	8 50.00 6.72	8 50.00 23.53	16
21-25	102 80.95 85.71	24 19.05 70.59	126
> 25	9 81.82 7.56	2 18.18 5.88	11
Total	119	34	153

STATISTICS FOR TABLE OF AGE BY DO NOT APPLY TO ME

Statistic	DF	Value	Prob
Chi-Square	2	7.981	0.018

TABLE OF FOOD HIGH IN FAT BY YOGURT

FOOD HIGH IN FAT SNACK3(Yogurt)

Frequency Row Pct Col Pct	No	Yes	Total
No	36 94.74 29.03	2 5.26 8.00	38
Yes	88 79.28 70.97	23 20.72 92.00	111
Total	124	25	149

Frequency Missing = 4

STATISTICS FOR TABLE OF FOOD HIGH IN FAT BY YOGURT

Statistic	DF	Value	Prob
Chi-Square	1	4.844	0.028

TABLE OF SNACK FOOD BY YOGURT

SNACK FOOD SNACK3(Yogurt)

Frequency Row Pct Col Pct	No	Yes	Total
No	73 89.02 60.83	9 10.98 36.00	82
Yes	47 74.60 39.17	16 25.40 64.00	63
Total	120	25	145

Frequency Missing = 8

STATISTICS FOR TABLE OF SNACK FOOD BY YOGURT

Statistic	DF	Value	Prob
Chi-Square	1	5.193	0.023

TABLE OF FOOD HIGH IN CHOLESTEROL BY GUM

FOOD HIGH IN CHOLESTEROL SNACK6(Gum)

Frequency Row Pct Col Pct	No	Yes	Total
No	27 62.79 23.48	16 37.21 48.48	43
Yes	88 83.81 76.52	17 16.19 51.52	105
Total	115	33	148

Frequency Missing = 5

STATISTICS FOR TABLE OF FOOD HIGH IN CHOLESTEROL BY GUM

Statistic	DF	Value	Prob
Chi-Square	1	7.779	0.005

TABLE OF FOODS HIGH IN FAT BY GUM

FOODS HIGH IN FAT SNACK6(Gum)

Frequency Row Pct Col Pct	No	Yes	Total
No	24 63.16 20.87	14 36.84 41.18	38
Yes	91 81.98 79.13	20 18.02 58.82	111
Total	115	34	149

Frequency Missing = 4

STATISTICS FOR TABLE OF FOODS HIGH IN FAT BY GUM

Statistic	DF	Value	Prob
Chi-Square	1	5.696	0.017

TABLE OF FOODS HIGH IN FAT BY CHEESE

FOODS HIGH IN FAT SNACK14(Cheese)

Frequency Row Pct Col Pct	No	Yes	Total
No	32 84.21 23.36	6 15.79 50.00	38
Yes	105 94.59 76.64	6 5.41 50.00	111
Total	137	12	149

Frequency Missing = 4

STATISTICS FOR TABLE OF FOODS HIGH IN FAT BY CHEESE

Statistic	DF	Value	Prob
Chi-Square	1	4.122	0.042

TABLE OF FOODS HIGH IN FAT BY CHEESE

FOODS HIGH IN FAT SNACK14(Cheese)

Frequency Row Pct Col Pct	No	Yes	Total
No	32 84.21 23.36	6 15.79 50.00	38
Yes	105 94.59 76.64	6 5.41 50.00	111
Total	137	12	149

Frequency Missing = 4

STATISTICS FOR TABLE OF FOODS HIGH IN FAT BY CHEESE

Statistic	DF	Value	Prob
Chi-Square	1	4.122	0.042

TABLE OF ALCOHOLIC BEVERAGES BY GUM

ALCOHOLIC BEVERAGES SNACK6(Gum)

Frequency Row Pct Col Pct	No	Yes	Total
No	20 62.50 17.70	12 37.50 36.36	32
Yes	93 81.58 82.30	21 18.42 63.64	114
Total	113	33	146

Frequency Missing = 7

STATISTICS FOR TABLE OF ALCOHOLIC BEVERAGES BY GUM

Statistic	DF	Value	Prob
Chi-Square	1	5.199	0.023

TABLE OF FOODS HIGH IN SUGAR BY CANDY BARS

FOODS HIGH IN SUGAR SNACK7(Candy Bars)

Frequency Row Pct Col Pct	No	Yes	Total
No	33 67.35 29.20	16 32.65 47.06	49
Yes	80 81.63 70.80	18 18.37 52.94	98
Total	113	34	147

Frequency Missing = 6

STATISTICS FOR TABLE OF FOODS HIGH IN SUGAR BY CANDY BARS

Statistic	DF	Value	Prob
Chi-Square	1	3.750	0.053

TABLE OF SNACK FOOD BY CANDY BARS

SNACK FOOD SNACK7(Candy Bars)

Frequency Row Pct Col Pct	No	Yes	Total
No	57 69.51 51.82	25 30.49 71.43	82
Yes	53 84.13 48.18	10 15.87 28.57	63
Total	110	35	145

Frequency Missing = 8

STATISTICS FOR TABLE OF SNACK FOOD BY CANDY BARS

Statistic	DF	Value	Prob
Chi-Square	1	4.156	0.041

TABLE OF CARBONATED BEVERAGES BY PUDDING

CARBONATED BEVERAGES SNACK9(Pudding)

Frequency Row Pct Col Pct	No	Yes	Total
No	68 98.55 50.00	1 1.45 11.11	69
Yes	68 89.47 50.00	8 10.53 88.89	76
Total	136	9	145

Frequency Missing = 8

STATISTICS FOR TABLE OF CARBONATED BEVERAGES BY PUDDING

Statistic	DF	Value	Prob
Chi-Square	1	5.118	0.024

TABLE OF HIGHLY PROCESSED FOODS BY PRETZELS

HIGHLY PROCESSED FOODS SNACK18(Pretzels)

Frequency Row Pct Col Pct	No	Yes	Total
No	74 98.67 54.81	1 1.33 10.00	75
Yes	61 87.14 45.19	9 12.86 90.00	70
Total	135	10	145

Frequency Missing = 8

STATISTICS FOR TABLE OF HIGHLY PROCESSED FOODS BY PRETZELS

Statistic	DF	Value	Prob
Chi-Square	1	7.488	0.006

TABLE OF FOODS HIGH IN SUGAR BY CARROTS

FOODS HIGH IN SUGAR SNACK20(Carrots)

Frequency Row Pct Col Pct	No	Yes	Total
No	44 89.80 37.93	5 10.20 16.13	49
Yes	72 73.47 62.07	26 26.53 83.87	98
Total	116	31	147

Frequency Missing = 6

STATISTICS FOR TABLE OF FOODS HIGH IN SUGAR BY CARROTS

Statistic	DF	Value	Prob
Chi-Square	1	5.232	0.022

TABLE OF CARBONATED BEVERAGES BY CELERY

CARBONATED BEVERAGES SNACK26(Celery)

Frequency Row Pct Col Pct	0	1	Total
No	68 98.55 50.00	1 1.45 11.11	69
Yes	68 89.47 50.00	8 10.53 88.89	76
Total	136	9	145

Frequency Missing = 8

STATISTICS FOR TABLE OF CARBONATED BEVERAGES BY CELERY

Statistic	DF	Value	Prob
Chi-Square	1	5.118	0.024

TABLE OF FOODS HIGH IN FAT BY GRAPE

FOODS HIGH IN FAT SNACK31(Grape)

Frequency Row Pct Col Pct	No	Yes	Total
No	27 71.05 31.76	11 28.95 17.19	38
Yes	58 52.25 68.24	53 47.75 82.81	111
Total	85	64	149

Frequency Missing = 4

STATISTICS FOR TABLE OF FOODS HIGH IN FAT BY GRAPE

Statistic	DF	Value	Prob
Chi-Square	1	4.083	0.043

TABLE OF SNACK FOOD BY GRAPE

SNACK FOOD SNACK31(Grape)

Frequency Row Pct Col Pct	No	Yes	Total
No	53 64.63 63.86	29 35.37 46.77	82
Yes	30 47.62 36.14	33 52.38 53.23	63
Total	83	62	145

Frequency Missing = 8

STATISTICS FOR TABLE OF SNACK FOOD BY GRAPE

Statistic	DF	Value	Prob
Chi-Square	1	4.214	0.040

Vita 2

Siew-Ing Hii

Candidate for the Degree of

Master of Science

Thesis: FOOD CONSUMPTION BEHAVIOR, NUTRITION AND HEALTH KNOWLEDGE AND DIETARY CHANGES AMONG MALAYSIAN STUDENTS AT OKLAHOMA STATE UNIVERSITY

Major Field: Nutritional Sciences

Biographical:

Personal Data: Born in Sarikei, Sarawak, Malaysia, on April 20, 1971.

Education: Graduated from Catholic High School, Sibu, Malaysia in Jan., 1989, received Bachelor of Science degree in Nutritional Sciences (Dietetics option) from Oklahoma State University, Stillwater, Oklahoma in May1994. The Master of Science degree with a major in Nutritional Sciences will be anticipated at Oklahoma State University in July, 1997.

Experience: Computer Lab Technician, Oklahoma State University from January, 1996 - May, 1997.

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 08-21-96 **IRB#:** HE-97-005

Proposal Title: FOOD CONSUMPTION BEHAVIOR, NUTRITION AND HEALTH KNOWLEDGE AND DIETARY CHANGES AMONG MALAYSIAN STUDENTS AT OKLAHOMA STATE UNIVERSITY.

Principal Investigator(s): Lea L. Ebro, Hii, Siew-Ing

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval are as follows:

Signature: 
Chair of Institutional Review Board

Date: August 21, 1996