

AN ABSTRACT OF THE THESIS OF

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Title: Food Preferences of Thai Adolescents and Their Mothers'
Attitudes and Knowledge About Foods and Nutrition

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The purpose of this study was to investigate the relationships between adolescents' food preferences and their mothers' attitudes and knowledge about foods and nutrition in Phitsanulok Province, Thailand. Subjects included 30 boys and 35 girls randomly selected from 11th grade classrooms at two high schools in Phitsanulok, and their mothers. An Attitudes Toward Foods and Nutrition Questionnaire (ATFN) and Knowledge About Foods and Nutrition Questionnaire (KAFN) were used to assess mothers' attitudes and knowledge about foods and nutrition, respectively. A Food Preference Questionnaire (FPQ) and a 24-Hour Dietary Recall Interview (DRI) were used to assess adolescents' food preferences and to determine their dietary nutrient intakes, respectively.

Application of path analytic procedures to the data revealed that while fathers' and mothers' education, occupation and family income were significantly related together in complex ways, only mothers' occupation had a direct negative effect on their attitudes toward "food preparation and caring about nutrition". In addition, mothers' attitudes toward the "importance of nutrition and meals" had a direct positive effect on their attitudes toward "food preparation and caring about nutrition".

Furthermore, mothers' "general nutrition knowledge" had a direct positive effect on their knowledge about "food composition", which in turn had a direct positive effect on their knowledge about a "well-balanced diet and protein". Finally, while mothers' attitudes toward "food preparation and caring about nutrition" had a direct positive effect on their adolescents' food preferences, mothers' "general nutrition knowledge" had a direct negative effect on their adolescents' food preferences.

With respect to the relationships between adolescents' food preferences and their nutrient intakes, their preferences for foods in the Meat food group were significantly and positively related to their calorie, carbohydrate, and total fat intakes. In addition, adolescents' preferences for foods in the Vegetable and Vegetable Products food group were significantly and positively related to their total fat intake. Furthermore, adolescents's preferences for foods in the Fats and Oils food group were significantly and positively related to their calorie, carbohydrate, protein, and total fat intakes. Finally, a significant curvilinear relationship was found between adolescents' preferences for foods in the Cereal and Grain Products food group and their iron intake.

**Food Preferences of Thai Adolescents and Their
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**by
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**FOOD PREFERENCES OF THAI ADOLESCENTS
AND THEIR MOTHERS' ATTITUDES AND KNOWLEDGE
ABOUT FOODS AND NUTRITION**

INTRODUCTION

Food preferences of adolescents are important because adolescence is a critical period of physical, physiological, emotional and social change. Food preferences indicate choice and consumption (Randall & Sanjur, 1981; Axelson & Brinberg, 1989) and thus, have been implicated in dietary habits and adequate nutrient intake (Axelson, 1977; Birch, 1980; Contento, Michela, & Goldberg, 1988; Story & Resnick, 1986). Furthermore, some research point to a relationship between food choice and the dietary habits of adolescents (Prättälä, 1988; Contento et al., 1988; Schorr, Sanjur & Erickson, 1972; Wein, Sabry & Evers, 1989).

There are many factors which directly or indirectly influence personal food preferences. These factors include peer groups, nutrition knowledge and beliefs, family unit and characteristics, social and cultural norms and values, parenting practices, mass media, fast foods, personal experiences, and food fads (Farthing, 1991). In addition, many research studies have found a relationship between these factors and food preferences (Story & Resnick, 1986; Birch, Zimmerman, & Hind, 1981; Pliner, 1983; Bell, Stewart, Radford, & Cairney, 1981). Food preferences may affect the growth and development of adolescents. Preference is defined as the

degree of like or dislike for particular foods (Axelson & Brinberg, 1989). Therefore, trends in food preferences do not necessarily reflect the adequate nutrient intake of adolescents. However, adolescent growth and development may be reflected in their eating habits (Anderson, 1991).

Besides nutrition, environmental factors are also very important in affecting growth and maturation during adolescence. For example, adolescents who are members of families with high socioeconomic status are taller than adolescents in families with low socioeconomic status (Gong & Spear, 1988).

Another factor which strongly influences children's eating habits is parents (Bryan & Lowenberg, 1958; Sanjur & Scoma, 1971). There are, however, only a few studies which focus on this issue during adolescence (Pliner, 1983). In addition, several studies are present indicating that food preferences and eating habits of children are influenced by peer groups and a variety environmental factors (Birch et al., 1981; Pliner, 1983; Matheny, Picciano, & Birch, 1987; Michela & Contento, 1986; Randall & Sanjur, 1981).

In Thailand, research on food preferences is very rare. Most studies focus their concern on malnutrition and related issues, since malnutrition is a major problem among Thai children in some parts of the country, particularly among infants and preschool children (Egoramaiphol, Schelp, Sornmanai, & Migasena, 1985; Thanangkul, Damrongsak, Vithayasai, & Olson, 1980; Tontisirin & Valyasevi, 1981; Dhanamitta, Stoecker, Manceechine, & Valyasevi, 1983; Dhanamitta, Virojailee, & Valyasevi, 1981; Temcharoen, Laungintim, & Dhavidej, 1988). A few years ago,

however, some studies were conducted on the food habits of particular groups of individuals such as pregnant women, lactating mothers of infants, and pre-school children (Veerawong, 1989; Viriyapanich, Vichaidittha, & Thongvittayachuti, 1984; Khonkaen University, 1988; Limtrakool & Chantaraprachoom, 1980). Several documents are available indicating that factors which affect food habits include: (1) lack of nutrition knowledge; (2) misconceptions about food and nutrition; (3) lack of cooking experience; (4) poor environment; and (5) misleading attitudes (Khonkaen University, 1988; Veerawong, 1989). According to Pliner and Pelchat (1986), knowledge, attitudes, and habits related to any issue can arise from two different sources: (1) one's common membership in a family, and (2) one's common membership in a particular subcultural group. Furthermore, different cultures can have different patterns of socialization for their adolescents. For example, Asian adolescents are dependent on their parents for guidance, particularly their mothers. Mothers are a major influence in their growth and development. Mother's attitudes, and their emotional and behavioral states are significant concerns in a Thai adolescent's life (Suvannathat, Bhanthumnavin, Bhuapirom, & Keats, 1985). A study of the relationships between Thai adolescent's food preferences and their mothers' attitudes and knowledge about foods and nutrition, therefore, would be of considerable importance at this time.

Purpose of the Study

The primary purpose of this study was to investigate the relationships between food preferences of adolescents and their mothers' attitudes and knowledge about foods and nutrition in Phitsanulok Province, Thailand.

Definition of Terms

- (1) Food preferences refer to attitudes toward a given type of food, as compared with other foods, on the basis of favorable physiological reaction, sociological norms, or pleasant sensations (Food Agriculture Organization [FAO], 1987). This variable is measured in Thai adolescents through a Food Preference Questionnaire designed for this study. The questionnaire focuses on assessing the degree of like or dislike for given food items, and a 24-Hour Dietary Recall Interview.
- (2) Mother's attitudes and knowledge. Mother's attitudes refer to a mother's feelings toward and evaluation of food items and their nutrition contents. Mother's knowledge is defined as the degree to which a mother's beliefs about foods and nutrition coincide with beliefs perceived by most people in a community (i.e., community of Thai nutritionists) as having an object-attribute association of high probability. These variables are assessed through the Attitudes Toward Foods and Nutrition

Questionnaire, and Knowledge About Foods and Nutrition Questionnaire, designed for this study. These questionnaires use a five-point agreement/disagreement and a three-point yes/no scale to assess mothers' attitudes and knowledge, respectively.

Assumptions

- (1) The Food Preference Questionnaire can be used as a measure of food preferences among Thai adolescents (Pliner, 1983; Schorr et al., 1972).
- (2) The Attitudes Toward Foods and Nutrition Questionnaire and Knowledge About Foods and Nutrition Questionnaire can be use as measures of attitudes and knowledge about foods and nutrition among Thai mothers (Byrd-Bredbenner, O'Connell, Shannon, & Eddy, 1984; Newell, Fox, Brewer, & Johnson, 1985).
- (3) A 24-Hour Dietary Recall Interview can be used as a measure of Thai adolescents' daily food intake.

Hypotheses

Hypothesis I : There will be no correlation between the two different aspects of mother's attitudes toward foods and nutrition examined in this study.

Hypothesis II : There will be no correlation between the different aspects of mother's knowledge about foods and nutrition examined in this study.

Hypothesis III : There will be no correlation between mother's attitudes toward foods and nutrition and their knowledge about foods and nutrition.

Hypothesis IV : There will be no correlation between Thai adolescents' preferences for foods in the five food groups examined in this study.

Hypothesis V : There will be no correlation between mothers' attitudes toward foods and nutrition and Thai adolescents' food preferences.

Hypothesis VI : There will be no correlation between mothers' knowledge about foods and nutrition and their adolescents' food preferences.

Hypothesis VII : The relationships between Thai adolescents' food preferences and their nutrient intakes are linear in nature.

In addition to testing these hypotheses, path analyses were used to test various models describing the relationships between the variables found in Hypothesis I, II, III, V and VI.

REVIEW OF LITERATURE

This review of literature is organized into six major sections: (1) Definition; (2) Factors Influencing Food Preferences; (3) Studies of Children's and Adolescents' Food Preferences; (4) Family and Parental Influences on Food Preferences; (5) Contributions of Attitudes and Knowledge to Foods and Nutrition- related Behavior; and (6) Theoretical Framework.

Definitions

Food Preference

The conceptualization of food preference proposed by many investigators such as Rozin and Vollmecke (1986) indicate that

"The sensory-affective motivation for acceptance is basically equivalent to liking or disliking a food. Individual differences on sensory-affective grounds (e.g., liking or disliking lima beans) probably account for most variation in food preference within a culture" (p.439).

Another definition of food preference points out that

"Preference assumes the availability of at least two different items, and refers to the choice of one rather than the other. Liking refers to a set of hedonic (affective) reactions to a food, usually indexed directly by facial expressions. Preference is ordinarily taken to be synonymous with liking, but this is not necessarily the case.

Liking is only one of the motivations that may account for a preference. Perceived health value, convenience, and economic factors are potent influences on preference but may not affect liking" (Rozin & Vollmecke, 1986, p. 434).

In addition, Randall and Sanjur (1981) state that

"Food preference ..., the degree of like or dislike for a food... Clearly ... is a phenomenon that rests predominantly on consumption" (p. 151).

Therefore, food preference can exist within individuals and can be assessed by rating the liking or pleasantness of food items (Birch, 1980a; Randall & Sanjur, 1981; Shepherd, Stockley, Schyns & Taylor, 1988; Wien et al., 1989; Cardello & Maller, 1982).

Attitudes and Knowledge

Both attitudes and knowledge toward foods and nutrition are very important in food preference because they affect food choice and practice (Schwartz, 1975).

Attitude refers to *"a person's feelings toward and evaluation of some object, person, issue or event"* (Axelson & Brinberg, 1989, p. 32). *"Attitudes are inferred from characteristic, consistent, and selective modes of behavior directed toward or against relevant objects and events"* (Carruth & Anderson, 1977, p. 42). The

conceptualization of attitudes toward foods and nutrition, therefore, can be assessed in terms of the degree of agreement/ disagreement with respect to food items (Schwartz, 1975; Byrd-Bredbenner et al., 1984; Carruth & Anderson, 1977; Axelson & Brinberg, 1989). Furthermore, attitudes can be predictive of behavior (Johnson,

1985; Lohr & Carruth, 1979; Schwartz, 1976). They have a directional quality to them which may influence an individual's behavior (Carruth & Anderson, 1977).

Knowledge is defined as *"those beliefs which are perceived by most people in a community (e.g., a community of nutritionists) as having an object-attribute association with a high probability. There is really no substantial difference between knowledge and beliefs on a conceptual level. There is, however, a difference between knowledge and beliefs on an operational (measurement) level"* (Axelson & Brinberg, 1989, p. 36). Therefore, foods and nutrition-related behavior is often reported to involve both attitudes and knowledge (Johnson, 1985; Byrd-Bredbenner et al., 1984; Emmons & Hayes, 1973). Nevertheless, both knowledge and attitudes may not cause changes in behavior except under certain limited conditions (Johnson, 1985). However, attitudes and knowledge can be good predictors of behavior if the criterion identified in the instrument that is used to measure attitudes correspond closely in level of specificity with the behavioral criterion (Johnson, 1985; Ajzen & Fishbein, 1977). In spite of these ideas, there are significant relationships between attitudes, knowledge and behavior related to foods and nutrition.

Factors Influencing Food Preferences

Differences in food preferences depend upon many factors. Some investigators categorize these factors into three categories, including the individual, food characteristics, and environmental factors (Randall & Sanjur, 1981). Others,

such as Rozin and Vollmecke (1986), however, categorize them into the biological, cultural and individual factors. It is clear that all of these factors are important to food preferences in individuals.

Based on individual factors, the measurement of food preferences seem to focus on an individual's sensory evaluation of foods (Axelson & Brinberg, 1989). In fact, these investigators view food preferences in terms of the affective domain, such as the liking or pleasantness of various foods (Cardello & Maller, 1982; Shepherd et al., 1988; Axelson & Brinberg, 1989). Findings from these studies indicate that there are no significant differences between genders in food preferences and taste acuity (Rozin & Vollmecke, 1986; Randall & Sanjur, 1981). Nevertheless, gender is still accounted for in studies of food preferences. Other individual factors which have often been studied in food preference research include age, education, income, race or ethnicity, nutrition knowledge, attitudes toward foods and health, and cooking skills (Randall & Sanjur, 1981; Axelson & Brinberg, 1989).

Aside from individual factors, social-environmental factors are also important in food preferences, involving choice and consumption (Birch, 1980; Birch et al., 1981; Yetley, Yetley & Aguirre, 1981; Randall & Sanjur, 1981; Pliner, 1983; Michela & Contento, 1986; Rozin & Vollmecke, 1986). These variables include such factors as season, employment, mobility, degree of urbanization, size of household and family (Randall & Sanjur, 1981). Typically, the family can be viewed as a consumption unit (Yetley et al., 1981), and parents are the primary socializers who may influence the development of children's food preferences (Birch, 1980).

However, several research documents point out that the family's contribution to the food likes or preferences of parents and children to be very low (i.e., correlations often lower than .15), if culture is not taken into account (Rozin & Vollmecke, 1986). Therefore, many studies in this area have often focused on factors other than the family (Phillips, Bass, & Yetley, 1978; Birch et al., 1981; Yetley et al., 1981; Birch, 1983).

Studies of Children's and Adolescents' Food Preferences

The food preferences of children and adolescents have been well studied throughout the years. Early experiences with food are assumed to persist into adulthood (Birch, 1980). Food preferences are presumed to be established during the early childhood years. Birch studied peers' social influence on preschoolers' food preferences. Thirty-nine children who preferred vegetables were assessed. Children were served preferred and non-preferred vegetable pairs at lunch and asked to choose between them. Children sat together with peers for four days. Peers chose the children's non-preferred vegetables. The investigator found that target children significantly increased their preferences for the non-preferred vegetables by the fourth day. Younger children were more influenced by peer modeling than the older children. Age then, was an important factor in the imitation of food preferences among preschoolers.

In another study, Birch et al. (1981) studied the impact of various social-affective contexts on children's food preferences. Sixty-four preschool children were given

some foods in various social-affective contexts. In one context, food was given as a reward, in another, food was paired with adult attention, in another, the context was nonsocial, and still another food was served at snack time. Results revealed that presenting food as a reward enhanced children's preferences for that food. Similarly, the pairing of food with adult attention also enhanced preferences for foods.

However, neither the nonsocial context nor snack-time did lead to significant increases in food preferences. Research studies such as these indicate that social factors influence the food preferences of young children.

While food preferences are evident during the early childhood years, many investigators have also realized that food preferences play a critical role in food choice and intake among adolescents (Story & Resnick, 1986). Contento et al. (1988) asked 355 students, ages 11 and 18 years, about their food choice motivation. Results revealed that preadolescents and adolescents had different motivations for their food choices. There was an increase differentiation in food choice motivation with age. Adolescents, aged 13-18, were found predominantly in two groups: (1) the parent-supported health group (the most healthful eating patterns group) and the hedonistic group (the least healthful eating patterns group). Moreover, findings indicated that the food choice motivations of younger subjects were more influenced by social and environmental factors than by personal motivational factors.

In addition to studies of food choice motivations, studies focused on the effects of adolescents' food habits on dietary complexity, food preferences and nutritive intake variables have been conducted. In one study 118 adolescents completed

questionnaires and were found to like a wide variety of foods. These subjects liked foods that were good sources of all nutrients, except vitamin A. Also, the complexity of adolescents' diets significantly increased with an increase in their mother's and father's occupational level, mother's education, the adolescents' social participation, and employment, but not their gender, age, family size, and nutrition information (Schorr et al., 1972).

Family and Parental Influences on Food Preferences

Of all the factors which influence the food preferences of adolescents, family and parents are most important (Farthing, 1991), since they are the primary socialization agents of children. Therefore, many research studies focused on the relationship between food preferences of children, adolescents and their parents have been conducted (Sanjur & Scoma, 1971; Burt & Hertzler, 1978; Yperman & Vermeersch, 1979; Birch, 1980; Pliner, 1983; Phillips et al., 1978). Family members are in intimate social contact with each other. The long term exposure and interaction among family members can powerfully influence their food preferences (Pliner & Pelchat, 1986).

Sanjur and Scoma's (1971) study confirmed that there is a relationship between children's food preference and those of their parents. They assessed the degree of agreement between mothers' and children for selected food items. Findings indicated a high degree of agreement between mothers and their children. In addition, these investigators also found that a high incidence of children's unfamiliarity with and

dislike of foods corresponded with the unfamiliar and disliked foods of their mothers. Moreover, Burt and Hertzler (1978) explored food preferences among mothers, fathers, and children. Their findings revealed that fathers' food likes were the most important menu planning factor in the family. Most of the father's influence over the family's food preferences occurred via the mother. In addition, mothers did not significantly contribute to their children's food preferences more than their fathers.

There are several other studies focused on the family's contribution to children's food preferences. Birch (1980) investigated 128 preschool children's food preferences and those of their parents. Children were asked to taste food items and their facial expressions were recorded. Parents were asked to taste the food, and then ranked them according to their preferences. Furthermore, parents completed a food preference questionnaire, and mothers completed a form estimating their children's food preferences. Finally, children were asked to assess their parents' most and least preferred foods. The results indicated that neither fathers' nor mothers' food preferences were significantly related to those of their children. However, there were low positive correlations among mother-child and father-child pairs. Although a few of the correlations were significant, the distributions of mother-child and father-child pairs did not differ from the distribution obtained for unrelated adult-child pairs.

Another study of family resemblance in food preferences provided contrasting results. Pliner (1983) explored food preferences among adolescents and their parents. These 105 college students and their parents were asked to complete a food preference questionnaire. The questionnaire consisted of 47 food items which were organized

into four groups: (1) meat, fish, poultry, and eggs; (2) dairy products; (3) vegetables; and (4) cereal and grain products. The results clearly indicated that food preferences of students resembled those of their real parents more than their pseudo-parents. Moreover, the findings revealed that the female students more closely resembled their real and pseudo-mothers than their fathers.

Pliner and Pelchat (1986) studied 55 families with one target child in each family, ranging in ages from 24 to 83 months, with one sibling, and two parents. Mothers were asked to complete a questionnaire on the feeding problems, and food preferences of the target child, their husbands, and themselves. The Food Preference Questionnaire for children consisted of 26 food items selected randomly from the names of 139 foods which were most likely to be served to young children. The investigators found that young children preferred foods more similar to their siblings than their parents. They also found that young children were more likely to imitate the food preferences of siblings who were close in age to them. The target children also significantly disliked a greater proportion of the foods than either their mothers or fathers, although this dislike was not significantly different from their siblings.

Rozin and Millman (1987) explored the impact of family environment on the food preferences of twins. They studied food preferences in 37 monozygotic and same-sex dizygotic twin pairs by using a food preference questionnaire and phone interview. The questionnaire was specifically related to hot foods (i.e., chili pepper and others). Results indicated that genetic predisposition was only minimally related to food preferences. Moreover, they suggested that genetic effects could not be

related to preference for specific foods.

From a review of studies just summarized, it is clear that many factors may contribute to the food preferences of children and adolescents. These factors include individual differences, family environments, and other social factors. A study of how they might directly or indirectly contribute to the food preferences of adolescents would be worthwhile at this time.

Contributions of Attitudes and Knowledge to Foods and Nutrition-Related Behavior

An individual's attitudes are also of great importance in foods and nutrition studies. As a result, food- and nutrition-related attitudes have often been assessed in research. According to Axelson and Brinberg (1989, p. 31):

" 1) people in some meaningful way, ... differ in their attitudes and beliefs as well as in the strength with which their attitudes and beliefs are held, and

2) people who hold different attitudes and beliefs will behave in different ways; that is, these concepts should be determinants of behavior"

Generally, investigators have assessed foods and nutrition-related attitudes, beliefs, and knowledge because they wanted to explore an individual's level of understanding of nutrition concepts, and the adequacy of a person's diet. Although, the concepts of beliefs and knowledge are similar, differences between them are present. While beliefs and knowledge consists of strongly held views, knowledge involves

views that are widely accepted by a community of experts. Nutrition knowledge then is used as the focal point for many studies. However, reliability and validity issues are equally applied to knowledge as to beliefs (Axelson & Brinberg, 1989).

Attitude- and knowledge-related nutrition have been the subject of many investigations. These variables can affect food preferences and practices. Jalso, Burns, and Rivers (1965) attempted to determine the relationship between nutrition beliefs and practices among a wide age range of subjects (i.e., approximately 30 to +60 years) in New York State. These 340 subjects were asked to complete the Nutritional Opinion Questionnaire and the Nutrition Practices Questionnaire. The Nutrition Opinion Questionnaire consisted of 30 statements, arranged into eight categories. The responses to each question were used to classify a person into either a "faddist" or "nonfaddist" category. The Nutrition Practices Questionnaire was composed of 20 questions on nutritional practices. Subjects were interviewed to obtain demographic data, determine their specific food practices and beliefs, and sources of nutritional information. The results indicated a high positive correlation between opinion scores and practice scores. This indicated that nutritional opinions are related to practice. In addition, subjects held more valid nutritional opinions and practices as their educational level increased. Furthermore, nutritional opinions and practices decreased as the age of subjects increased.

Another way of looking at nutritional attitudes and knowledge has been a study conducted by Schwartz (1975) with adolescents. In this study attitudes toward foods and nutrition, and nutritional knowledge and practices among high school graduates in

Ohio were investigated. Findings obtained supported the relationships between attitudes and knowledge, and attitudes and practices, but not the direct relationship between nutritional knowledge and practices. These results were interpreted as indicating adolescent women were not applying their nutritional knowledge in their food choices.

In another study, the beliefs toward foods and food preferences were investigated. Wein et al. (1989) explored the food health beliefs and preferences of northern native people in the region of Wood Buffalo National Park, Canada. They found that these people not only preferred traditional foods, but also believed that their traditional foods were high in health value. Also, they believed that country meat and fish, wild berries, and store-bought fruits and vegetable had the highest value for health. Among the traditional foods they liked best were moose, bannock and caribou. Among store-bought foods, orange juice and apple were best liked. Interestingly, they also found that young people preferred soft drinks and chocolate bars, and were less fond of caribou, local fish, birch syrup, carrots and evaporated milk.

Cohen (1964) and Wicker (1970), from their studies, indicated that attitudes, as one among many factors, influenced behavioral outcomes. Others, however, have proposed that attitudes are an intermediate phase between knowledge and action. In attempting to clarify the relationships between these variables, Sims (1978) attempted to test the validity of two models regarding the relationships between nutritional knowledge, attitudes and dietary practices (see Figure 1). The first model suggests

that attitudes are intervening variables between knowledge and behavior. The second model, however, proposes that knowledge acts to intervene between attitudes and behavior. Using sixty-one lactating women, with a mean age of 28 years, a questionnaire and food records were administered to obtain information on these variables. Results clearly indicated that the second model was more appropriate than the first in explaining the relationships between attitudes, knowledge and behavior.

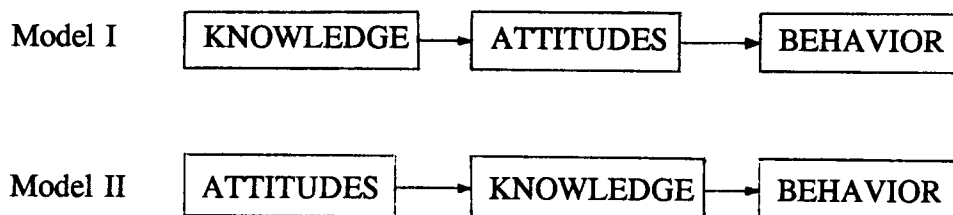


Figure 1. Sims's Models

Finally, Eppright's study (Eppright, Fox, Fryer, Lamkin, & Virian, 1970) also provided evidence in support of the relationships between nutritional knowledge, attitudes, and practices. They interviewed mothers of preschool children in twelve North Central states regarding certain family characteristics and eating behavior of their children. Findings revealed that the quality of the preschool children's diets

tended to be more adequate when their mothers had favorable attitudes toward nutrition concepts. Furthermore, mothers' nutritional attitudes were found to be significantly and positively related to their nutrition knowledge.

Based on the studies summarized above, it is clear that relationships do exist between nutritional attitudes, knowledge and practices. Food preferences of children and adolescent have been the subject of many investigations. These studies suggest that food preferences may be affected by the attitudes, knowledge and practices of parents. However, studies investigating the relationships between adolescents food preferences, and the nutritional attitudes and knowledge of their parents in Thailand are very rare.

Theoretical Framework

Presently, there are no specific theoretical frameworks directly relating mothers' nutritional attitudes, and knowledge and their adolescents' food preferences. Several investigators, however, have proposed various theories which combined together can indirectly explain this relationship. Two of these theories include Fishbein and Ajzen's (1975) Theory of Reasoned Action, and Bandura's (1977) Social Learning Theory.

According to Fishbein and Ajzen (1975), intention to perform a behavior is the best predictor of that behavior. However, both attitudes toward the behavior and subjective norms are major determinants of intentions. Attitudes toward behavior refer to the degree to which a person has a favorable or unfavorable evaluation of the behavior

in question. Subjective norms refer to the perceived social pressures that cause one to perform or not to perform a behavior (Ajzen & Madden, 1986). This social psychological theory has been applied to a variety of behaviors in a variety of fields, including foods and nutrition. Axelson and Ajzen (1989) described Fishbein and Ajzen's model through the statement "*an individual is likely to perform a behavior if he (she) thinks that the behavior is good and if people important to him (her) think that the behavior should be performed*" (p. 105).

Fishbein and Ajzen's theory of reasoned action has been applied to many studies in foods and nutrition, such as breast feeding and formula-feeding; consumption of nonfat milk, low-fat milk, and regular-fat milk; fat consumption; low-salt bread consumption; and eating at a fast food restaurant (Axelson & Brinberg, 1989). With respect to eating at a fast food restaurant, Axelson, Brinberg, and Durand (1983) asked 252 students to complete a questionnaire associated with variables of Fishbein and Ajzen's theory. Findings obtained indicated that a student's attitude toward eating at the fast-food hamburger restaurant rather than subjective norm contributed significantly to the prediction of such a student's intention. This finding suggested that changing an individual's attitude more than subjective norms is likely to lead to changes in intention.

Similarly, Matheny et al. (1987) studied attitudinal and social influences on infant-feeding preference among 53 pregnant women. They attempted to determine the predictive values of attitude and subjective norms on infant-feeding intention and behavior of low-income pregnant women. Data were obtained by having women

complete questionnaires regarding their beliefs, advantages, disadvantages of breast feeding and formula feeding. Results indicated that personal attitude was more important than subjective norm in influencing mothers' intention and the performance of a method of infant feeding. In addition, data analysis suggested that mothers' attitudes were to some degree influenced by subjective norms. Therefore, subjective norms does play a role in influencing the decision making process.

According to these studies, mothers' behavior regarding foods and nutrition are affected by their attitudes and knowledge about foods and nutrition, with personal attitudes more significant than subjective norms. Subjective norms, however, are still important in determining behavior. How these attitudes and knowledge contribute to adolescents food preferences, however, requires further theoretical consideration. It is related to this latter concern that Bandura's social learning theory is useful.

According to Bandura (1977) behavior can be shaped by environmental factors. He states that people often learn much more rapidly by simply observing the behavior of others in social situations. In addition, he argues that persons learn a great deal through imitation. Accordingly, individuals will imitate models who are rewarded, are powerful, friendly, or similar to the observer (Grusec & Brinker, 1972). In social situations, however, behavior is strengthened through positive reinforcement (reward) and avoidance of negative reinforcement (punishment). In addition, the behaviors' effects will be under the influence of family and peer-friendship groups, since these groups can control an individual's major sources of reinforcement, punishment and exposure to behavioral models (Akers, Krohn,

Lanza-Kaduce, & Radosevich, 1979).

In terms of social learning theory, the family directly influences the food-related behavior of individuals because of its obligation to provide the individual with the needed-foods in sufficient quantities. This implies an indirect influence, since the family's transmission of food attitudes and preferences can influence the dietary practices of individuals (Sims, Paulucci, & Morris, 1972).

There are many research studies which demonstrate that food-related behavior of individuals are strongly influenced by their social environment. Harper and Sander (1975) found that children are more likely to eat a novel food when the adult modeled such a behavior than when the model only offered food to the children. They also indicated that mothers are more successful models than strangers. Based on social learning theory, then, it is obvious that food-related behavior can be influenced by family, friends, media, and health experts (Lewis, Sims, & Shannon, 1989).

In addition, the cultural context in which a person lives is also important in understanding food-related behavior. Studies are available indicating differences in food-related behavior, between various cultural groups (Axelson & Brinberg, 1989). Netland and Brownstein (1984) found that Asian people consume higher amounts of carbohydrate, but lower amounts of fat, riboflavin, calcium, and vitamin A than Caucasians. Culture can lead to differences in food beliefs and preferences. Wein et al. (1989) found that northern natives (Indians and Metis) in the Wood Buffalo National Park region not only believed that their traditional foods were high in health value, but also preferred these foods (i.e., country meat -moose, bannock, calibou,

fish, and wild berries).

In fact, the impact of culture on food preferences is immense and varied (Rozin & Vollmecke, 1986). Many studies on food habits and determinants of food behavior among different cultural groups have pointed out the complexity of the problem, and the difficulty in obtaining quantitative, unambiguous answers (Bell, Stewart, Radford, & Cairney, 1981; Day, Lentner, & Jaques, 1978; Grivetti & Paquette, 1978). Nevertheless, within a given culture, there is considerable variation in food preferences.

Therefore, the present study was designed to investigate the relationships between food preferences of adolescents and their mothers' attitudes and knowledge about foods and nutrition in Thailand. More specifically, of major interest was whether mothers' attitudes toward foods and nutrition were intervening variables between their knowledge about foods and nutrition and their adolescents' food preferences, or whether mothers' knowledge were intervening variables between mothers' attitudes and their adolescents' food preferences. Since Bandura (1977) suggested that parents and families play a major role in influencing children behavior via modeling, reinforcement and power, and Fishbein and Ajzen (1975) and Sims (1978) suggested that attitudes, rather than knowledge may be more powerful in predicting a person's behavior, then the latter model appears a more reasonable explanation of the relationships between mothers' foods and nutrition attitudes and knowledge, and their adolescents' food preferences than the former. It was these two models that the present investigation attempted to test among Thai adolescents

and their mothers.

METHODS

Overall Study Design

Prior to data analyses, two major phases characterized the overall design of this study. These phases included: (1) Instrument Development, and (2) Data Collection.

Instrument Development Phase

In the Instrument Development Phase, three instruments were developed for this study. First, six nutrition experts in Thailand were asked to review and approve the Attitudes Toward Foods and Nutrition Questionnaire (ATFN) that was developed for this study. The ATFN was developed by combining portions of questionnaires previously developed by Axelson and Penfield (1983), Byrd-Bredbenner et al., (1984), Eppright et al. (1970), O'Connell, Shannon, and Sims (1981), and Sims (1978). Following this review and approval, a sample of 30 nursing students was used to obtain estimates of validity and reliability for this scale.

Second, the same six nutrition experts were also asked to review and approve the Knowledge About Foods and Nutrition Questionnaire (KAFN) that was developed for this study. The KAFN was developed by combining portions of questionnaires previously developed by Eppright et al. (1970), Petersen and Keis (1972), and Sims (1978). Following this review and approval, a sample of 29 nurses/ physicians and 29

housewives with high school diplomas were used to obtain estimates of validity and reliability for this scale.

Finally, a Food Preference Questionnaire (FPQ) was developed, consisting of foods found in the Nutrition Composition Tables of Thai Foods (Nutrition Division, 1987). A pilot study utilizing a sample of 39 Thai university students was employed to obtain estimates of validity and reliability for this scale.

A 24-Hour Dietary Recall Interview (DRI) was also used to obtain information on adolescents' food intake for an analysis of the nutritional components of their diets. Although a number of limitations are present associated with this technique, studies are available indicating its usefulness in the dietary assessment of individuals from less literate groups (FAO, 1980), and rural populations in less industrialized countries such as Thailand. Some of these limitations will be discussed in the "Instruments" section of this dissertation. A test-retest reliability study was conducted using a random sample of 32 subjects in the dissertation sample to obtain an estimate of stability for the 24-Hour DRI.

Data Collection Phase

Once pilot studies for the instruments were completed, and adequate validity and reliability estimates were obtained, they were used in obtaining data from subjects used for this dissertation research. A random sample of 11th-grade Thai students was selected and administered the FPQ, with an attached Demographic Questionnaire. These high school students were then asked to take home the ATFN and KAFN

Questionnaires and have their mothers complete them. In addition, the 24-Hour DRI was conducted with the high school students during a lunch hour period to obtain information on their food intake.

Throughout the instrument development, data collection and analyses phases, advisors in Thailand were employed to ensure that this research project was conducted according to the rigors of scientific research. These advisors included: (1) Pachitjanut Siripanich, Ph.D., Associate Professor of Statistics, National Institute of Development Administration, (2) Visith Chavasit, Ph.D., Institute of Nutrition, Mahidol University, (3) Thara Viriyapanich, Assistant Professor, Institute of Nutrition, Mahidol University, and (4) Somsan Wongyounoi, Ph.D., Associate Professor of Curriculum Research and Development, Srinakharinwirot University.

Dissertation Sample

The subjects for this study included 65 11th-grade student-mother pairs, randomly selected from a population of approximately 200 high school students enrolled at two high schools located in the Phitsanulok Province in the lower northern part of Thailand. These students, 30 boys and 35 girls, were living with their parents in Phitsanulok Province at the time of this study, and had no physical or health problems that might affect their performance on the instruments used in this investigation. All subjects were from the intact families. In addition, information on other personal, parental, and familial demographic variables were collected for sample description, and possible data

analyses purposes. These variables are described in the "Instruments" section, under the heading "Demographic Questionnaire".

There were several considerations which motivated the use of adolescents as subjects for this study. First, researchers would be more likely to obtain finely differentiated information about food preferences among adolescents than among younger children without having to rely on mothers' reports. Second, general differences on dimensions related to food preferences such as taste sensitivity, preferences, and aversions have been reported for individuals from various age groups (Cowart, 1981). Keeping the sample relatively homogeneous with respect to age, therefore, can help to rule out age-related differences that might influence food preference information among individuals, if such a variable was not controlled (Pliner, 1983).

Instruments

Several instruments were used to collect the data for this study. These included the: (1) Attitudes Toward Foods and Nutrition Questionnaire (ATFN), (2) Knowledge About Foods and Nutrition Questionnaire (KAFN), (3) Food Preference Questionnaire (FPQ), (4) 24-Hour Dietary Recall Interview (DRI), and (5) Demographic Questionnaire.

Attitudes Toward Foods and Nutrition Questionnaire (ATFN)

The ATFN Questionnaire was used to assess mothers' attitudes toward foods and nutrition (see Appendix A). It consisted of 50 items selected from a number of previously developed questionnaires, organized into six attitude factors including: (1) "Importance of Nutrition" (9 items) (Epprawright et al., 1970; O'Connell et al., 1981), (2) "Importance of Meal Planning" (8 items) (Epprawright et al., 1970), (3) "Enjoyment of Meal Preparation" (9 items) (Epprawright et al., 1970; Sims, 1978), (4) "Eating New Foods" (9 items) (Byrd-Bredbenner et al., 1984), (5) "Nutrition Affects Health" (8 items) (Axelson & Penfield, 1983; Byrd-Bredbenner et al., 1984), and (6) "Caring About Nutrition" (7 items) (Byrd-Bredbenner et al., 1984). Responses to each item are made on a 5-point Likert scale from "strongly disagree" to "strongly agree". The scoring of each item in the scale differs depending upon whether the strongly disagree or strongly agree response receives five points. However, such responses were summed, creating a range of possible scores for each factor as well as the total scale. Higher scores represented more agreement with a particular factor.

Since the ATFN Questionnaire was developed for this study, a pilot study needed to be conducted to obtain estimates of validity and reliability for the scale. After a panel of six nutritionists in Thailand had reviewed and approved of the questionnaire, a sample of 30 nursing students, not involved in the dissertation sample, was administered the questionnaire. Construct validity for the questionnaire were established by applying factor analysis to the data collected using the SPSS program (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). Factor loading values for

each item in the questionnaire were examined to determine the factor structure of the questionnaire. Those items which loaded highly on a particular factor, but not higher on any other factor were retained. Following this procedure, fourteen factors with eigenvalues greater than 1.0 were extracted and rotated by using principal component and varimax orthogonal rotation (Kim, 1975). All items with factor loadings of greater than the absolute value of .300 were considered to be a "significant loading" (Dillon & Goldstein, 1984). Factors containing less than three items were considered as less important factors (Comley, 1975). As a result only three factors, identified as interpretable emerged. In addition, Cronbach alpha coefficients were also computed to obtain internal consistency estimates for the total scale and the three factors which emerge in the questionnaire (Boren, Dixon, & Reed, 1983). Findings associated with these factor analyses and internal consistency estimates are presented in the "Result" chapter.

Knowledge About Foods and Nutrition Questionnaire (KAFN)

The KAFN Questionnaire was used to assess mothers' knowledge about foods and nutrition (see Appendix B). It consisted of 27 items related to such factors as general knowledge about nutrition concepts (12 items), food composition (7 items), and misconceptions about foods and nutrition (8 items). This questionnaire was modified from similar questionnaires developed by Eppright et al. (1970), Petersen and Keis (1972), Schwartz (1975), and Sims (1978). Responses to items in the questionnaire can be either "true", "false" or "uncertain". A correct response is

given +2 points, an incorrect response a -2 points, and uncertain, 0 points. A sum of points obtained across all items in the questionnaire, as well as within the factors represented a person's knowledge about foods and nutrition scores. Higher positive scores indicated more knowledge about foods and nutrition in the total scale or its factors.

Content validity of the KAFN Questionnaire was assured due to the fact that items in the questionnaire were developed from similar questionnaires in other studies (Eppright et al., 1970; Petersen & Kies, 1972; Schwartz, 1976). In addition, a panel of six Thai nutritionists reviewed and approved the questionnaire as a measure of knowledge about foods and nutrition among Thai mothers (Bryd-Bredbenner, 1981; Linstone & Turoff, 1975). Following this review and approval, a construct validity study was conducted evaluating the questionnaire's ability to differentiate between two known groups of individuals that were expected to differ in their knowledge about foods and nutrition. These groups included a sample of nurses/ physicians ($N = 29$), and another sample of housewives who had graduated from high school ($N = 29$). It was expected that nurses/ physicians would have a higher knowledge score than housewives on the KAFN Questionnaire (Dwyer, Feldman, & Mayer, 1970).

Factor analysis was conducted to assess the factor structure of the scale. Nine factors with eigenvalues of greater than 1.0 were extracted and rotated. All items with factor loadings of greater than .300 were considered to be a "significant" loading. Factors containing less than three items were considered as less important factors. As a result, only four factors were confirmed and labeled as interpretable

factors. Finally, Cronbach alpha coefficients were computed for estimates of internal consistency for the scale and its factors. Findings associated with these factor analyses, internal consistency, and group differentiation studies are presented in the "Results" section.

Food Preference Questionnaire (FPQ)

The FPQ was used to assess adolescents' food preferences. It consisted of a list of 134 food items obtained from the Food Composition Table of Thai Foods (Nutrition Division, 1987), organized into five food groups (see Appendix C): (1) meat, poultry, fish, eggs, and dairy products (39 items), (2) cereals and grain products (18 items), (3) vegetables and vegetable products (37 items), (4) fruits (32 items), and (5) fats and oils (8 items) (Chakpitak, 1986). Adolescents were asked to rate each of these food items using a 7-point scale from extremely dislike (1 point) to extremely like (7 points). A sum of scores obtained across all items found within the five food groups represented an adolescent's preferences for foods within a particular food group. Higher scores in each food group represented greater preference for that food group.

Presently, no known criterion measure exists to establish concurrent validity for the FPQ (Fewster, Bostian, & Powers, 1973). After a revision by the six nutritionists, a sample of 39 university students, not part of the dissertation sample, were used to obtain construct validity estimates for the scale. Data obtained from these students were analyzed using factor analysis. The criterion for judgement of the

remaining items in the final questionnaire were similar to the ATFN, KAFN questionnaires. Factor analyses were separately performed on each food group because these five food groups were entirely different. Fifteen, seven, fourteen, ten, and two factors for food groups I, II, III, IV, and V, respectively, were extracted and rotated. As a result, four, five, three, seven, and one factors of the respective food groups were labeled as interpretable factors. In addition, internal consistency estimates (alpha coefficients) were computed for each food group. Furthermore, 29 students of these 39 university students were readministered the FPQ, with a two-week time interval between testings, for measures of stability. The Pearson-product moment method was used to calculate these test-retest reliability estimates. The findings associated with these factor analyses, internal consistency, and stability estimates for the FPQ are presented in the "Results" section.

The 24-Hour Dietary Recall Interview (DRI)

A 24-Hour DRI was used to obtain information from adolescents about their food intake on the day proceeding the interview, beginning with breakfast, following the adolescents to the interview day just prior to breakfast. The focus of the interview was on gathering information on the types and quantity of foods consumed by adolescents during breakfast, lunch, and dinner as well as various snacks that may have been eaten between meal times. Information on the types and quantity of foods consumed was then used to calculate the nutrient quantities of foods consumed through use of the Nutritionist III (Menu-D) Computer Software Package at the

Institute of Nutrition at Mahidol University. When foods consumed were not found in the Nutritionist III (Menu-D) Computer Software Package, the Food Composition Table of Thai Foods (Nutrition Division, 1987) was used to calculate their nutrient quantities. The nutrient quantities to be calculated for this study included calories, protein, total fat, and carbohydrates, plus iron, since iron deficiency appears to be a problem in some areas of Thailand at the present time (Wasi, 1972; Tonphaichitr, 1979). Nutrient quantities were calculated on the basis of the amount of nutrients present per 100 grams of food.

Prior to interviewing the adolescents, an interview room at the high school was set up with the interview materials, including food models, some food samples, measuring cups, balances, plates (i.e., one for rice, and two for main dishes), measuring spoons, paper towels, and the Data Collection Sheet. All of these materials were used in estimating the types and quantity of foods consumed during the 24-hour dietary recall period.

When an adolescent arrived at the interview room, the interviewer introduced herself, allowed the adolescent to introduce him/herself, got settled in the interview room, and proceeded to explain the purpose of the interview to the adolescent. Once the purpose of the interview was understood by the adolescent, the interviewer asked the adolescent to recall the types and quantity of foods he/she had eaten during the 24-hour dietary recall period, beginning with breakfast, moving on to lunch and dinner, as well as between these meal times. All responses made were recorded on a Data Collection Sheet (see Figure 2). For a completed Data Collection Sheet

containing the record of the types and quantity of foods consumed by an adolescent in one day (see Appendix F). In the first column of the Data Collection Sheet is a list of meal times commonly participated in by adolescents in Thailand each day. Other meal times may be added to this list if they are not present, and are identified by the adolescent as occurring during the 24-hour dietary recall period. The second column includes spaces to be filled in by the interviewer on the types of specific foods (dish) consumed by the adolescent during meal times, followed by the total volume of specific foods consumed (third column), the food ingredients (fourth column), quantity of each food ingredient (fifth column), the quantity of cooked foods in grams (sixth column), the food code for specific foods to be used in computer analysis of the nutrient quantities of foods eaten (seventh column), and raw weight of foods in grams (eighth column). It was during the collection of these data that the food models, food samples, measuring cups, balances, measuring spoon, and plates were important in estimating the quantity of foods consumed by the adolescent.

Column 9 was a column for the interviewer to make whatever notes she deemed important that occurred during the interview and data recording process. Once these data were collected, the nutrient contents of foods consumed during the 24-hour dietary recall period were analyzed via the Nutritionist III (Menu-D) Software Package, and the Food Composition Table of Thai Foods.

In collecting the data on the food intake of adolescents using the 24-Hour DRI, the interviewer was aware of a number of issues during the interview process which might have affected the food intake information obtained from the adolescents. Some

of these included (Nutrition Division, 1987): (1) the present physical and health status of the adolescent (i.e., those who were ill, had specific medical health problems, or special dietary requirements were not interviewed), (2) special events which occurred during the period for which dietary recall was asked (i.e., birthday parties or traditional celebrations or vegetarian), (3) the method of preparing the food consumed (e.g., fresh, boiled or fried), and (4) the use of special ingredients in preparing a particular meal (e.g., fried rice or Thai noodles prepared with or without eggs; the presence or absence of coconut milk in curries; cucumbers and green onions in fried rice; seasonings such as garlic in foods; amount of noodles in soup; amount of sweetening used in foods; use of tapioca or cornstarch with noodles; use of ground beef gravy; size of dessert, brand names of snacks, etc.). All of these and other unique qualities of Thai foods had to be considered in determining the nutrient quantities of Thai adolescents' food intake.

The 24-Hour DRI was chosen as the instrument to assess Thai adolescents' food intake in this study because of its relatively easy administration procedures, and the fact that it could be used with less literate groups of people (FAO, 1980). It is one of the most commonly used dietary assessment techniques with rural populations in less industrialized countries like Thailand. Furthermore, the uniqueness of Thai foods makes this approach to dietary assessment more reasonable. For example, main dishes served in Thailand are generally not served in individual portions, but are served from one common serving. The amount of food consumed, therefore, can be difficult for a third party to record without the help of the individual consuming the

Dietary Intake Form

Date _____

Individual 24-Hour Food Recall

Name of Subject _____ Age _____ Sex _____

Time	Dish	Total Vol.	Ingredients	Measure each item (vol)	Cooked wt. (gm)	Food code	Raw wt. (gm)	Note
Breakfast								
Between Meal								
Lunch								
Between Meal								
Dinner								
Between Meal								

Figure 2. Data Collection Sheet

food. In this circumstance, third party estimates can considerably lower the validity and reliability of dietary data collected.

A number of validity studies have been undertaken for the 24-Hour DRI. Madden, Goodman, & Guthrie (1976) studied the 24-hour dietary recall of 76 elderly subjects (60 years or older) and found no significant differences between the means of their actual and recalled food intake values for seven of the eight nutrient parameters studied (i.e., protein, calcium, iron, Vitamin A, thiamin, riboflavin, and ascorbic acid), with the exception of kilocalories. Regression analyses, however, indicated that subjects tended to over-report small quantities and under-report large quantities of food consumed with the recall. These findings were also supported by Gersovitz, Madden, and Smicikalas-Wright (1978) with similar aged subjects. In addition, Gersovitz et al. (1978) found no differences between the results obtained using a 24-Hour and a 7-day DRI. Furthermore, Karvetti & Knuts (1985) found that age was a factor which contributed to the accuracy of dietary recall, with younger children demonstrating less accurate recalls.

Reliability information for the 24-Hour DRI is also available. Emmons & Hayes (1973) in studying the food intake of children, found mothers and children did not significantly differ in their estimates of their children's food consumption. Mothers were found to report that their children consumed smaller numbers of food servings than their children only about 10% of the time, and larger numbers of servings about 17% of the time. However, mothers and children did not differ in their recall of foods consumed by their children such as meat, salad, yellow

vegetables, milk, ice cream, eggs, cereal, potato, rice, dessert, legumes, brown beans, peanut butter, juice, and mixed protein portions. However, Carter, Sharbaugh, & Stapell (1981), using 28, 10-12-year-old children as subjects, found a significant difference between the mean recall and observed food intakes of these children for both calories and protein. They interpreted these findings to indicate that age may be an important factor to consider when using the 24-Hour DRI. Children, preadolescents or younger, may not provide as reliable results as adolescents or adults.

For the present study, a random sample of 32 students in the dissertation sample were re-interviewed using the 24-Hour DRI approximately two days after the first interview. Pearson product-moment correlation coefficients were calculated to obtain stability (test-retest reliability) estimates for the 24-Hour DRI used in this study. These findings are reported in the "Results" section.

Demographic Questionnaire

In conjunction with the FPQ, adolescents were also asked to complete a Demographic Questionnaire, asking them for information about themselves, their parents, and their families (see Appendix D). Information obtained from this questionnaire was used primarily for sample description or control purposes, and, if warranted, possible data analyses.

Information about the adolescents included their sex, age, physical health status, physical disabilities or illness, special dietary practices, and present living

accommodations. Information about the adolescents' parents included their age, education level, occupation, and marital status. Information about the adolescents' families included monthly family income, and other family members living within the same household.

Table 1 describes the sample relative to Thai adolescents' age, physical health status, physical disabilities, and whether or not they were living with their parents. Data in the table are presented in percentages unless otherwise specified. There were no significant differences between the age, $\chi^2 (3, N = 65) = 5.53, p > .05$, and physical health status, $\chi^2 (3, N = 65) = 1.23, p > .05$, of boys and girls in the sample. The mean age of boys was 16.2 years, while for girls it was 16 years. Approximately 3/4th of the boys (75%) and girls (77.5%) rated their health status as good or excellent, while approximately 1/4th of them (i.e., boys = 25%; girls = 22.5%) rated their health status as fair. No one rated their health status as poor. In addition, 100% of the adolescents indicated they had no physical disabilities, and were all living with their parents at the time of the study.

Table 2 describes the sample relative to Thai adolescents' parents' and family characteristics, including parents' age, educational level, occupation, marital status, family income, and other members in the family. Data in the table are also presented in percentages unless otherwise specified. The ages of fathers of boys ($M = 48.9$) and girls ($M = 47.5$), and mothers of boys ($M = 43.8$) and girls ($M = 44.0$) were not significantly different from each other, $t (63) = .81; t (63) = 1.93, p > .05$. However, the differences between the ages of fathers and mothers of boys, $t (63) =$

3.04, $p < .05$, and fathers and mothers of girls, $t(63) = 2.34$, $p < .05$, were significant. Mothers in both groups were significantly younger than fathers.

In reference to parents' educational levels, no significant differences were found between fathers of boys and girls, $\chi^2(4, N = 65) = 3.38$, $p > .05$, and between mothers of boys and girls, $\chi^2(4, N = 65) = 2.44$, $p > .05$. In addition, no significant differences were found between fathers and mothers of boys, $\chi^2(4, N = 65) = .58$, $p > .05$, and between fathers and mothers of girls, $\chi^2(4, N = 65) = 3.92$, $p > .05$, in their educational levels. With respect to parents' occupation, no significant differences were found between fathers of boys and girls, $\chi^2(5, N = 65) = 2.89$, $p > .05$, and between mothers of boys and girls, $\chi^2(5, N = 65) = 6.50$, $p > .05$. However, significant differences were found between fathers and mothers of boys, $\chi^2(5, N = 65) = 17.72$, $p < .05$, and between fathers and mothers of girls, $\chi^2(5, N = 65) = 12.09$, $p < .05$, in their occupations. A larger percentage of fathers had careers as military personels, pilots and police officers than mothers (i.e., 25% and 25.8% for fathers vs. 0% and 3.2% for mothers). Furthermore, a larger percentage of mothers had no careers than fathers (i.e., 35.7% and 16.1% for mothers vs. 0% and 3.2% for fathers). Overall, a majority of fathers and mothers in the sample had occupations in the entrepreneurs/trade and professional/technical /administration workers categories (i.e., 57.2% and 64.4% for fathers; 53.6% and 64.2% for mothers). All parents in the sample were married, and no differences were found between the family incomes of parents of adolescent boys and girls, $\chi^2(4, 65) = .75$, $p > .05$. More than half of families in the sample had incomes of

Table 1. A Description of the Sample of Thai Adolescents by Age, Physical Health Status, Physical Disabilities, and Living with Parents.

Variable	Boys (N=30)	Girl (N=35)
Age		
15 years	28.6	22.6
16 years	32.2	54.8
17 years	28.6	22.6
18 years	10.6	00.0
Mean	16.2	16.0
S.D.	.99	.68
Physical Health Status		
Excellent	14.3	6.5
Good	60.7	71.0
Fair	25.0	22.5
Poor	00.0	00.0
Physical Disabilities		
Yes	00.0	00.0
No	100.0	100.0
Living with Parents		
Yes	100.0	100.0
No	00.0	00.0

Table 2. Description of Thai Adolescents' Parents' and Family Characteristics

Variable	Boys		Girls	
	Father	Mother	Father	Mother
I: Parents				
Age: Mean	48.9	43.8	47.5	44.0
S.D.	6.8	5.7	6.4	5.3
Educational level				
< High school	53.6	60.7	32.2	51.6
High school	17.8	14.3	19.4	9.7
Some College/ Technical school	3.6	3.6	3.2	6.5
Bachelor's degree	17.8	17.8	35.5	29.0
Masters/Doctorate	7.2	3.6	9.7	3.2
Occupation				
Entrepreneurs/Trade	28.6	25.0	32.2	35.5
Military/Pilot/Police	25.0	0.0	25.8	3.2
Farmer	14.2	7.1	6.6	0.0
Prof./Technical/ Admins. Workers	28.6	28.6	32.2	38.7
Service Workers	3.6	3.6	0.0	6.5
No career	0.0	35.7	3.2	16.1
Marital status				
Married		100.0		100.0
Single		0.0		0.0
Divorced/Separated		0.0		0.0
II: Family				
Income				
< 5,000 Baht		14.2		9.7
5,000 - 9,999 Baht		25.0		29.0
10,000 - 14,999 Baht		25.0		25.8
15,000 - 20,000 Baht		17.9		22.6
> 20,000 Baht		17.9		12.9
Sibling: Mean Number		2.4		1.9
S.D.		1.7		1.5
Range		1 - 7		0 - 7
Mean of age		20.0		18.7
S.D.		6.3		6.3
Males		48.4		53.0
Females		51.6		47.0
Other Family Members				
Mean Age		52.7		71.4
S.D.		24.3		5.7
Mean number		2.0		1.3
S.D.		1.8		0.5

10,000 Baht or above (i.e., 60.8% for families with adolescent boys and 61.6% for families adolescent girls), suggesting that the sample was predominantly middle-class. Generally, income levels below 6,000 Baht are considered poor in Thailand.

A significant difference, $t(63) = 9.16, p < .05$, was found between the number of siblings in the families of adolescent boys ($M = 2.4$) and girls ($M = 1.9$), with adolescent boys having more siblings. The range of the number of siblings in families with adolescent boys, however, was 1 to 7 siblings, while for girls it was 0 to 7. The mean ages of siblings in these groups (i.e., 20 years vs. 18.7 years) was not significantly different, $t(120) = .15, p > .05$. In addition, the sex composition of siblings within these groups was also not significantly different, $\chi^2(1, N = 65) = .30, p > .05$. Close to half of the siblings in each group were boys, while the other half were girls.

Finally, with respect to other members beside parents, adolescents, and siblings living in the family, no significant age difference, $t(17) = 1.67, p > .05$, was found between other family members living in families with adolescent boys ($M = 52.7$) and girls ($M = 71.4$). Inspection of the list of these other family members present, however, revealed that adolescent boys had more uncles and aunts living with them (thus, the slightly lower mean age for these family members), while adolescent girls had more grandparents present in the home (thus, the slightly higher mean age for these family members). There was no significant difference, $t(17) = .84, p > .05$, between the number of other family members living in the home of adolescent boys ($M = 2.0$) and girls ($M = 1.3$).

Procedures

In order to collect the data from Thai adolescent and their mothers for this study, initial contact with principals and classroom teachers at two high schools located in Phitsanulok Province, Thailand were undertaken for permission to conduct this study. After approvals were granted 65 out of 200, 11th grade students from families attending these schools were randomly selected for participation in this study. These students were asked to complete the Demographic questionnaire, previously described and appointment was made with each of them for individual interviews to complete the 24-Hour DRI. The DRI took approximately 30-45 minutes to complete for each subject. However, during times when the interview could not be completed within the allotted time, since students had to return to class, a second session was scheduled to complete the interview on the same day.

Once the interview was completed for each student, such a student was asked to take home the three separate questionnaires to be answered. These questionnaires included the ATFN, KAFN, and FPQ. The FPQ was completed by the student to obtain information on his/her food preferences, while the ATFN and KAFN were to be completed by the students' mothers for an assessment of their attitudes and knowledge about food and nutrition. The FPQ took students about 20 to 30 minutes to complete, while the ATFN and KAFN combined, took mothers' approximately 30 to 45 minutes to complete. Students returned the completed FPQ, ATFN and KAFN approximately 3 days after they were distributed.

RESULTS

The primary purpose of this study was to investigate the relationships between food preferences of adolescents and their mothers' attitudes and knowledge about foods and nutrition in Phitsanulok Province, Thailand. In order to accomplish this purpose, three new instruments were developed for this study, and a 24-Hour Dietary Recall Interview (DRI) was used to obtain information from adolescents about their food intake on the day proceeding the interview. The new instruments included Mothers' Attitudes Toward Foods and Nutrition Questionnaire (ATFN), Mothers' Knowledge About Foods and Nutrition (KAFN), and Adolescents' Foods Preference Questionnaire (FPQ).

In this chapter, construct validity and reliability estimates for the new instruments are presented first, followed by reliability estimates for 24-Hour Dietary Recall Interview (DRI). Once these estimates are summarized, hypotheses related to the primary purpose of this study were tested, and results presented.

Construct Validity and Reliability Estimates for Instruments

Mothers' Attitudes Toward Food and Nutrition Questionnaire (ATFN)

The 50 items previously developed for the ATFN on the basis of previous research (Axelson & Penfield, 1983; Byrd-Bredbenner et al., 1984; Eppright et al., 1970; O'Connell et al., 1981; Sims, 1978) were submitted for review by a panel of

six nutritionists in Thailand, who judged their applicability to Thai culture. As a result of this review, one question (i.e., I: Importance of Nutrition, Item #1 - "I feel that if I drink milk, I don't have to worry about nutrition") was eliminated from the questionnaire because it (i.e. milk drinking) was not a practice familiar to the Thai culture in the past. In fact, such a practice conflicted with mothers' attitudes and ideas about foods and nutrition in Thai culture.

Following this elimination procedure, the remaining 49 items in the ATFN were submitted to a sample of 30 nursing students, not involved in the dissertation sample, for completion. A varimax factor analysis procedure was then applied to subjects' responses to the 49 items, yielding three factors which explained 40% of the variance. These three factors and their factor loadings are summarized in Tables 3, 4, and 5. Please note that items selected to represent each factor following factor analysis included those that either loaded positively or negatively on a factor.

Factor I: Importance of Nutrition and Meals included items ($n = 16$) emphasizing foods as a vehicle for good health and a source of enjoyment. Factor loadings for items in this factor ranged from .431 to .692. Factor II: Food Preparation and Caring About Nutrition included items ($n = 9$) associated with meal planning and preparation, cooking and nutrition. Factor loadings for items in this factor ranged from .454 to .696. Factor III: Eating Habits included items ($n = 6$) reflecting practices in food behavior that had become routine or are customarily (regularly) followed by an individual. Factor loadings for items in this factor ranged from .523 to .692.

As indicated in Table 6, Factor I accounted for 19% of the variance, Factor II 12% of the variance, and Factor III 9% of the variance for a total of 40% of the variance accounted for by these factors, including a total of 31 items. The eigenvalues associated with these factors are also found in Table 6. The remaining 18 questions not included in the final ATFN did not load on any of three factors described above by more than .430 for Factor I, .450 for Factor II, and .510 for Factor III.

Alpha coefficients calculated for these three factors combined and separately revealed internal consistency reliability estimates of .65 for the three factors combined, .58 for Factor I, .26 for Factor II, and -.35 for Factor III. The alpha coefficients for the three factors combined and for Factor I were moderate, but for Factor II and III were very low. For Factor III, the alpha coefficient was in a negative direction, so it was dropped from further consideration in this dissertation. Factor II, although quite low, since it was in a positive direction, was kept for further exploratory analyses.

Mothers' Knowledge about Foods and Nutrition Questionnaire (KAFN)

The 27 items developed for KAFN on the basis of previous research (Eppright et al., 1970; Petersen & Kies, 1972; Schwartz, 1975; Sims, 1978) were also submitted for review by the same six nutritionists in Thailand used to develop The ATFN. These nutritionists judged the applicability of items found in the KAFN to Thai culture. As a result of this review, five items were dropped from the questionnaire. These included four items found in the "I: General Knowledge About

Table 3. ATFN Questionnaire: Factor I: Importance of Nutrition and Meals.

Statement	Factor Loading		
	I	II	III
I think nutrition is important to my health.	<u>.431</u>	.173	-.010
I feel that as long as I am maintaining my weight, I don't have to worry much about nutrition.	<u>-.505</u>	.080	-.049
Changing the ingredients in a recipe makes me feel that the final product is really my own.	<u>.513</u>	-.487	.026
Time devote to planning meals is well invested.	<u>.519</u>	.029	-.322
I can use my time more efficiently if I plan ahead the order of preparing foods for a meal.	<u>.540</u>	-.026	-.111
Time plans annoy me. I want to feel free to hurry or loiter as I please.	<u>-.566</u>	.006	.191
I feel the foods I eat now will affect my future health.	<u>.568</u>	.497	.219
I believe that person who gets the most satisfaction out of eating is the one who sticks to foods that are familiar.	<u>-.571</u>	.429	.114
I would fix more nutritious meals if I know what to prepare.	<u>.571</u>	-.003	.323

Table 3. (continued)

Statement	Factor Loading		
	I	II	III
Planning meals for several days at a time makes it possible to buy food more efficiently.	<u>.589</u>	.227	-.177
I eat what I want regardless of what is good for me.	<u>-.592</u>	-.255	-.233
I prepare special foods on holidays.	<u>.612</u>	-.033	-.001
I only like to eat foods I know about.	<u>-.624</u>	-.018	.423
I believe that diet is a major control factor when it comes to maintaining health and controlling diseases.	<u>.649</u>	.533	.067
If I don't like a food prepared in a certain way, I would not try it prepared in a different way.	<u>-.691</u>	.179	-.181
I am too busy to concern myself with nutrition.	<u>-.692</u>	.279	.133
Eigenvalue	8.98		
Percentage of variance explained by factor	19.00		

Table 4. ATFN Questionnaire : Factor II: Food Preparation and Caring About Nutrition.

Statement	Factor Loading		
	I	II	III
The foods I eat now will help keep me healthy.	.398	<u>.454</u>	-.408
I seldom think about my eating habits.	-.328	<u>.491</u>	-.227
I could learn to eat fruits rather than desserts.	.445	<u>.505</u>	.227
Cooking is an important creative art.	.487	<u>-.513</u>	.180
I do not care about the foods I eat.	-.328	<u>-.529</u>	.226
It is fun to make my own recipes.	.382	<u>-.534</u>	-.075
I like to eat foods I haven't seen before.	.368	<u>-.557</u>	-.358
I often prefer to plan meals a day at a time rather than planning for longer periods of time.	-.040	<u>.681</u>	.304
I am concerned about eating nutritious foods throughout the day.	.177	<u>.696</u>	.068
Eigenvalue	5.73		
Percentage of variance explained by factor	12.73		

Table 5. ATFN Questionnaire : Factor III : Eating Habits.

Statement	Factor Loading		
	I	II	III
If I am satisfied with the foods I eat, I see no reason for me to change.	-.386	-.276	<u>.523</u>
I like my family to stick to the old favorite meals, rather than mess them up with new and different kinds of foods.	.266	-.403	<u>.530</u>
Knowing that a food is good for me has little influence on what I choose to eat.	-.164	.009	<u>-.589</u>
I stop eating only when I cannot eat anymore.	-.372	.002	<u>.601</u>
I usually will not taste a food if its appearance is similar to somethinges, I dislike.	-.228	-.127	<u>-.616</u>
Eating well can help prevent diseases.	-.127	.483	<u>-.692</u>
Eigenvalue	4.43		
Percentage of variance explained by factor	9.00		

Table 6. ATFN Questionnaire : Eigenvalues and Percentage of Variance Accounted for by Factors.

Factor	Eigenvalue	Percentage of Variance	Cumulative Percentage
I: Importance of Nutrition and Meals	8.98	19	19
II: Food Preparation and Caring about Nutrition	5.73	12	31
III: Eating Habits	4.43	9	40

Nutrition Concepts," and one item from the "III: Misconceptions About Foods and Nutrition" sections of the KAFN. The four items in the I: General Knowledge section included "Item #2 - Knowing something about foods that is good for me has little or no influence on what I choose to eat", "Item #3 - In actual practice, my nutrition knowledge has little influence on what I select to eat", "Item #9 - Two glasses of milk per day are not adequate for a child", and "Item #12 - Pantothenic acid will prevent the graying of hair". "Items #2, 3, and 9 were eliminated because they were unclear and too general for Thais to understand. Item #12 was eliminated because it required a much higher level of nutrition knowledge than Thai mothers have. With respect to the single item associated with the Factor III : Misconceptions section of the KAFN (i.e., "Diet is not necessarily adequate when appetite is satisfied"), such an item was eliminated because it was thought that such a statement might cause some misunderstanding related to its meaning as a result of its translation into Thai language. In addition to eliminating the above items, two items were added to the KAFN. These included (1) "Undermilled or home-pounded rice prevents beriberi," and (2) "Iron which is found in liver, green leaves, and meat prevents iron-deficiency anemia." These items were added because of the iron-deficiency problem in Thailand and because of the consumption of home-pounded rice in some rural areas of Thailand.

Furthermore, in the "II: Food Composition" and "III: Misconception" sections of the KAFN, different kinds of foods and words used to describe a particular physical condition were added or substituted for those initially found in the

questionnaire. For example, Ivygourd leaves was substituted for ripe papaya (II, Item #2), soy bean was added to soy bean products (II, Item #6), and hormones was added to glandular problems (III, Item #6). These substitutions and additions were made to fit Thai food practices and knowledge.

Once these eliminations, additions, and substitutions were made, the remaining 24 items of the KAFN were submitted to a sample of 29 housewives and 29 nurses/physicians for completion. A varimax factor analysis procedure was then applied to subjects' responses to the 24 items, yielding four factors which explained 51% of the variance. These four factors and their loading are shown in Table 7. Please note that items selected to represent each factor after the factor analysis all loaded positively on that factor.

Factor I: General Knowledge About Foods and Nutrition included items (n = 4) emphasizing the importance of the basic food groups, and the relationship of certain foods to the prevention of some diseases. Factor loadings for items in this factor ranged from .680 to .905. Factor II: Food Composition included items (n = 3) emphasizing knowledge of the nutritional composition of selected foods. Factor loadings for items in this factor ranged from .636 to .816. Factor III: Vitamin included items (n = 3) emphasizing knowledge of vitamin composition of selected foods. Factor loadings for items in this factor ranged from .485 to .769. Factor IV: Well-Balanced Diet and Protein included items (n = 3) associated with a well-balanced diet, and foods containing protein. Factor loadings for items in this factor ranged from .620 to .825.

As indicated in Table 8, Factor I accounted for 19% of the variance, Factor II 13% of the variance, Factor III 10% of the variance, and Factor IV 9% of the variance, for a total of 51% of the variance accounted for by these factors, including a total of 13 items. Table 8 also summarizes the eigenvalues associated with these factors. The remaining 11 items not included in the final KAFN did not load on any of the above factors by more than .680 for Factor I, .626 for Factor II, .475 for Factor III, and .610 for Factor IV.

Alpha coefficients calculated for these four factors combined and separately revealed internal consistency reliability estimates of .70 for the four factors combined, .59 for Factor I, .59 for Factor II, -.06 for Factor III, and .23 for Factor IV. The alpha coefficients for the four factors combined, and for Factor I and II were moderate, but for Factor III and IV were very low. For Factor IV, the alpha coefficient was in a negative direction, so it was dropped from further consideration in this dissertation. The alpha coefficient for Factor IV, although quite low, since it was in a positive direction, was kept for further exploratory analyses.

Finally, in order to obtain a further estimate of construct validity for KAFN, data collected using the questionnaire with 29 housewives and 29 nurses/physician were analyzed to determine whether the KAFN could successfully differentiate between these two known groups of individuals in the predicted direction. It was expected that nurses/physicians would have higher KAFN scores than housewives. Table 9 summarizes the means and standard deviations of the KAFN scores associated with these two groups of individuals. Application of t-test revealed a significant

**Table 7. KAFN Questionnaire : Factor I: General Knowledge About Nutrition;
Factor II: Food Composition; Factor III: Vitamins; and Factor IV: Well-
Balanced Diet and Protein.**

Statement	Factor Loading			
	I	II	III	IV
<u>Factor I General Knowledge About Nutrition</u>				
Iron which is in liver, green leaves, and meat prevents anemia(iron-deficiency anemia).	<u>.680</u>	.310	.050	.033
The basic five food groups are the only usable tools for planning an adequate diet.	<u>.737</u>	-.167	.363	.084
Vitamin D develops normal bones and prevents rickets.	<u>.749</u>	-.032	-.142	-.320
Vitamin C prevents scurvy.	<u>.905</u>	.131	.149	-.090
<u>Factor II Food Compositions</u>				
Pork liver and eggs provide iron.	.604	<u>.636</u>	.287	.132
Milk is a good source of calcium.	.420	<u>.806</u>	.025	.083
Plant fats are better for the body than animal fats.	-.270	<u>.816</u>	-.009	.194
<u>Factor III Vitamins</u>				
Green leafy vegetables meet vitamin A needs.	-.083	.094	<u>.485</u>	.280
Rice should be eliminated from the diet of someone trying to lose weight.	.097	.052	<u>.727</u>	-.045
Guava, sweet orange, kale or collard leaves are good sources of vitamin C.	.317	.110	<u>.769</u>	-.064

Table 7. (continued)

Statement	Factor Loading			
	I	II	III	IV
<u>Factor IV Well-Balanced Diet and Protein</u>				
The term "well-balanced" means that the diet includes food groups in the amounts recommended.	.140	-.139	-.252	<u>.620</u>
Soy bean and soy bean products can be substituted for meat.	-.099	.329	-.281	<u>.753</u>
Protein-rich foods provide liberal amounts of nutrients for growth.	-.166	.118	.240	<u>.825</u>

Table 8. KAFN Questionnaire : Eigenvalues and Percentage of Variance Accounted for by Factors.

Factor	Eigenvalue	Percentage of Variance	Cumulative Percentage
I: General Knowledge About Foods and Nutrition	4.44	19	19
II: Food Composition	3.00	13	32
III: Vitamins	2.44	10	42
IV: Well-Balanced Diet and Protein	2.10	9	51

difference ($p < .05$) between nurses/physicians and housewives in their knowledge about foods and nutrition. Nurses/physicians had significantly higher KAFN scores than housewives, indicating that housewives knew significantly less about foods and nutrition than nurse/physicians.

Adolescents' Food Preferences Questionnaire (FPQ)

The same six nutritionists in Thailand who helped in the development of the ATFN and KAFN Questionnaires were also used to develop the FPQ. These nutritionists were asked to review the list of 134 food items found in the initial FPQ, which were organized into the five food groups (i.e., I: Meat, Poultry, Fish, Eggs, and Dairy Products, II: Cereal and Grain Products, III: Vegetables and Vegetable Products, IV: Fruits, and V: Fats and Oils) obtained from the Nutrition Composition Table of Thai Foods (Nutrition Division, 1987), for their familiarity to Thai adolescents. On the basis of the nutritionists recommendations several revisions were made in the FPQ.

First, in preparation for pilot testing the FPQ, the rating scale was changed to include an "unknown" category, and the number "8" was used to represent this category. This category was added because it was thought that some foods in the FPQ might be unknown to students from different geographical areas in Thailand.

In addition, foods were added or dropped from the original list of 134 foods representing various food groups, depending upon their familiarity, expense, and use in various areas in Thailand. In Food Group I (Meat, Poultry, Fish, Eggs and Dairy

Table 9. Means, Standard deviations, and t-value Associated with the KAFN Scores of Housewives and Nurses/Physicians.

	<u>N</u>	Mean \pm S.D.	t-test	p-value
Group 1: Housewives	29	16.21 \pm 6.98		
			2.53*	.015
Group 2: Nurses and Physicians	29	20.00 \pm 4.04		

* p < .05

Products), familiar foods such as frog meat, pond shell, dried shrimp, pork sausage with soy bean sauce and spices, pork sausage with garlic and cooked glutinous rice, goose meat, and cheese were added. Likewise, in Food Group II (Cereal and Grain products), boiled taro, boiled sweet potato, potato chips, yambean, cassava, small sago, and Chi-kreab (thin slices of crisp rice cracker) were added. However, cracker was dropped from this food group because it might not be known among students from rural areas, or difficult to identify from among other foods that look similar.

For Food Group III (Vegetables and Vegetable products), celery cabbage, kidney bean seeds, boiled mung bean seeds, boiled peanut, rice bean seeds, chapeau seeds, soy bean, and large cucumber were added. Carrot was dropped because of its unfamiliarity among Thai people from some rural areas and because it was too expensive for some Thais to purchase. For Food Group IV (Fruits), two kinds of banana were added to the list, and for Food Group V (Fats and Oils), coconut milk and palm oil were added, while sesame oil and vegetable oil were dropped. The latter two oils were dropped because sesame oil is seldom consumed in Thailand, and vegetable oil is a collective term used to represent all kinds of oils made from plant products.

Once the food list was developed, it was submitted to a sample of 39 university students, not part of this dissertation sample, for pilot testing. During this stage of the FPQ development, if less than 90% of the students in the pilot study indicated that a food was known to them, these food items were eliminated from the FPQ. Food items that were known by less than 90% of the university students are

presented in Table 10.

Following elimination of the above food items from the FPQ, responses of subjects relative to items related to each food group that were retained in the questionnaire were analyzed using factor analyses. In these analyses, the original 7-point Likert-type scale was used in scoring subjects' responses to each food item. This was possible since items known by less than 90% of the university students were previously eliminated from the food list. Furthermore, each food group was analyzed separately because they represented five different food groups.

Table 11 summarizes the major interpretable factors which emerged relative to foods in each food group. For Food Group I (Meat, Poultry, Fish, Eggs, and Dairy Products), four major factors covering 20 food items emerged. A review of the foods included in each of these factors, however, did not appear to represent a particular subtype of foods in this category. Factor loadings related to Factor I in this food group ranged from .536 to .740, Factor II from .447 to .734, Factor III from .394 to .621, and Factor IV from .392 to .513. Only the food item "pork sausage with soybean sauce and spices" in Factor II and "duck egg" in Factor III loaded negatively on their respective factors.

With respect to Food Group II (Cereal and Grain Products), six major factors, covering 18 food items, emerged. A review of the foods included in Factors I through V appeared to represent a particular subtype of foods in this category. However, this was not the case for Factor VI. Factor VI contained only one food item, "rice". However, since rice is a main dish of Thai food, it was retained in the

Table 10. Food Items Known by Less Than 90% of University Students Eliminated From FPQ.

Group	Food Item	Percentage of Students Familiar with the Food Item
<u>Group I:</u>	Catfish	89
	Ham (smoked, medium fat)	73
	Snapper, red malabar	79
	Featherback fish	87
	Black pomfret	71
	Pickled anchovy	76
	Black banded kingfish	57
	Squid or octopus	84
	Bean clam	63
	Ant egg	76
	Pond shell	89
	Goose meat	79
	Cheese	89
<u>Group II:</u>	Sorghum	81
	Oatmeal	76
	Macaroni, spaghetti	89
	Millet	79
<u>Group III:</u>	Kidney bean seed	89
<u>Group IV:</u>	Ripe persimmon	57
<u>Group V:</u>	Peanut oil	87
	Palm oil	81
	Margarine	73

final questionnaire with a factor loading of .789. Factor loadings related to Factor I in this food group ranged from .653 to .913, Factor II from .662 to .821, Factor III for .633 to .829, Factor IV from .638 to .800, and Factor V from .508 to .773. All food items in each of these factors loaded positively on their respective factors.

In reference to Food Group III (Vegetables and Vegetable Products), three major factors, covering 33 food items, emerged. A review of the foods included in these factors did not appear to represent a particular subtype of foods in this category. Factor loadings related to Factor I in this food group ranged from .418 to .707, Factor II from .489 to .690, and Factor III from .485 to .695. Only two food items found in Factor II (i.e., yard long beans and wide ginger) loaded negatively on this particular factor. In addition, several food items which loaded on Factor I at higher level than .418, were included in Factor II (i.e., soybean = .436, yard long bean = -.478, wide ginger = -.506, cowpea seeds = .512) and Factor III (i.e., bamboo shoots = .482), because they loaded on these latter factors at a higher level than on Factor I.

Regarding Food Group IV (Fruits), seven factors covering 27 food items emerged. A review of the foods included in each of these factors did not appear to represent a particular subtype of foods in this category. Factor loadings related to Factor I in this food group ranged from .762 to .821, Factor II from .635 to .794, Factor III from .508 to .845, Factor IV from .593 to .832, Factor V from .760 to .913, Factor VI from .593 to .832, and Factor VII from .370 to .797. All food items in each of these factors loaded positively on their respective factors. In addition, one

food item which loaded on Factor III at a higher level than .508 (i.e., sugarapple = .555) was placed in Factor IV because of its higher loading on Factor IV than Factor III.

Finally, relating to Food Group V (Fats and Oils), only one major interpretable factor emerged, covering four food items. These food items all loaded positively on the factor, with factor loadings ranging from .499 to .734. Another factor emerged, but these same food items loaded on that factor at such a low level, that it was not considered useful for this study.

Eigenvalues and the percentage of variance accounted for by each factor within each food group is summarized in Table 12. For Food Group I (Meat, Poultry, Fish, Eggs, and Dairy Products), the four factors accounted for 38.4% of the variance, for Food Group II (Cereals and Grain Products), the six factors accounted for 69.1% of the variance, for food Group III (Vegetables and Vegetable Products), the three factor accounted for 43.2% of the variance, for Food Group IV (Fruits), the seven factors accounted for 68.5% of the variance, and for Food Group V (Fats and Oils), the only one factor accounted for 36.6% of the total variance.

Alpha coefficients computed for each of the food groups, providing internal consistency estimates for the FPQ, is presented in Table 13. These coefficients included .74 for Food Group I (Meat, Poultry, Fish, Eggs, and Dairy Products), .86 for Food Group II (Cereals and Grain Products), .92 for Food Group III (Vegetables and Vegetable Products), .87 for Food Group IV (Fruits), and .65 for Food Group V (Fats and Oils). These coefficients are relatively high for all groups except for Food

Table 11. FPQ: Factor Loadings of Food Items in the Five Food Groups.

<u>Group I</u>	<u>Factor 1</u>	<u>Factor 2</u>	<u>Factor 3</u>	<u>Factor 4</u>
Beef	<u>.536</u>	.021	.464	.089
Snakehead fish	<u>.565</u>	-.167	.064	.012
Oyster	<u>.593</u>	.403	.413	-.172
Frog meat	<u>.682</u>	-.177	-.315	-.048
Roe	<u>.690</u>	.001	-.158	-.031
Salt-water mussel	<u>.726</u>	.202	.295	-.120
Sheat fish	<u>.740</u>	-.234	-.038	-.169
Soybean milk	-.004	<u>.447</u>	-.082	-.380
Carper shell	.383	<u>.478</u>	.365	-.247
Pork	.055	<u>.489</u>	.195	.157
Hen egg	.152	<u>.544</u>	-.106	.140
Sausage (western style)	-.110	<u>.590</u>	-.141	.002

Table 11. (continued)

Pork sausage with soybean sauce and spices	.199	<u>-.734</u>	.088	.132
Duck egg	.303	.040	<u>-.394</u>	.242
Ark shell	.360	-.054	<u>.574</u>	-.078
Shrimp	-.021	-.073	<u>.621</u>	.268
Canned sardine	.313	.047	.134	<u>.392</u>
Pork sausage with garlic and cooked glutinous rice	.209	.335	-.172	<u>.422</u>
Duck	.385	-.265	-.082	<u>.487</u>
Chicken	-.133	-.218	.464	<u>.513</u>

Table 11. (continued)

Group II

	<u>Factor 1</u>	<u>Factor 2</u>	<u>Factor 3</u>	<u>Factor 4</u>	<u>Factor 5</u>	<u>Factor 6</u>
Potato chip	<u>.653</u>	.247	.194	.415	-.061	-.295
Boiled taro	<u>.686</u>	.009	.125	.074	.471	-.159
Cassava	<u>.811</u>	.180	.051	-.090	.267	.053
Sweet potato	<u>.913</u>	.086	-.050	.093	.226	.008
Biscuit	.080	<u>.662</u>	-.030	.191	.441	-.145
Bread	.199	<u>.703</u>	.180	.260	.042	.131
Doughnut	.127	<u>.797</u>	-.123	.079	.331	.017
Cake	-.052	<u>.821</u>	.059	.278	-.245	.146
Small sago	.227	.149	<u>.633</u>	.441	.093	-.330
White glutinous rice	-.117	.102	<u>.784</u>	.113	-.013	.307
Black glutinous rice	.079	-.168	<u>.829</u>	-.043	.332	.041

Table 11. (continued)

Wheat noodles	-.102	.218	-.062	<u>.638</u>	.085	.053
Rice noodles	.063	.219	-.107	<u>.786</u>	.193	.065
Fermented rice noodles	.084	.265	.231	<u>.800</u>	.035	.082
Yambean	.194	.460	.311	.140	<u>.508</u>	-.269
Wafer	.167	.186	.032	.272	<u>.604</u>	.102
Corn	.233	.002	.176	-.040	<u>.773</u>	.243
Rice	-.016	.137	-.107	.133	.216	<u>.789</u>

Group III

	<u>Factor 1</u>	<u>Factor 2</u>	<u>Factor 3</u>
Collard leaves and stems	<u>.418</u>	-.129	.285
Sesbania flowers	<u>.465</u>	.059	.239
Garlic bulbs	<u>.492</u>	-.475	-.207

Table 11. (continued)

Chinese leek	<u>.497</u>	-.273	.233
Tomato	<u>.503</u>	-.165	-.434
Ginger	<u>.526</u>	-.448	-.308
Young pepper	<u>.528</u>	.257	-.064
Cassia flowers and leaves	<u>.555</u>	-.265	-.080
Galangal	<u>.559</u>	-.468	-.315
Sweet pepper	<u>.588</u>	.092	.029
Large cucumber	<u>.650</u>	.072	.343
Water mimosa	<u>.441</u>	-.188	.169
Squash	<u>.454</u>	-.045	.122
Onion	<u>.522</u>	.327	-.370
Egg plant	<u>.610</u>	-.475	-.049
Sugar pea	<u>.633</u>	-.210	.216
Waxgourd	<u>.642</u>	.083	.027

Table 11. (continued)

Ivygourd leaves	<u>.663</u>	.237	-.157
Cucumber	<u>.672</u>	.010	.195
Green onion	<u>.673</u>	-.204	-.244
Angled-type gourd	<u>.673</u>	-.118	.153
Winged bean	<u>.681</u>	-.139	-.045
Shallot	<u>.707</u>	.045	-.226
Soybean	.436	<u>.489</u>	-.365
Yard-long bean	.478	<u>-.494</u>	.155
Chinese swamp cabbage	.357	<u>.521</u>	-.120
Wild ginger	.506	<u>-.562</u>	-.241
Rice bean seeds	.307	<u>.594</u>	-.047
Boiled peanut	.352	<u>.631</u>	.037
Cowpea seeds	.512	<u>.690</u>	-.085

Table 11. (continued)

Pickled chinese mustard	.356	-.184	<u>.485</u>
Chinese cabbage	.318	-.126	<u>.644</u>
Bamboo shoots	.482	.306	<u>.695</u>

Group IV

	<u>Factor 1</u>	<u>Factor 2</u>	<u>Factor 3</u>	<u>Factor 4</u>	<u>Factor 5</u>	<u>Factor 6</u>	<u>Factor 7</u>
Sweet tamarind	<u>.762</u>	.260	.056	.055	-.021	.275	-.006
Apple	<u>.774</u>	.235	-.089	.186	.067	.149	.180
Grape	<u>.821</u>	-.020	.043	.231	.069	-.099	.248
Rambutan	-.119	<u>.635</u>	-.017	.062	-.231	-.006	.196
Longan	.111	<u>.694</u>	.215	.135	-.221	.011	.067
Durian	.182	<u>.770</u>	-.162	.149	.137	.212	-.133
Litchi	.173	<u>.794</u>	.050	.302	-.042	.123	.029

Table 11. (continued)

Roseapple	.096	.209	<u>.508</u>	.310	-.254	.393	.087
Santol	.011	-.161	<u>.736</u>	.134	-.035	.103	-.036
Sugar-plum	-.120	.185	<u>.746</u>	.162	.131	-.125	.029
Jackfruit	.050	-.136	<u>.845</u>	.040	.158	.022	.185
Sugarapple	.121	.225	.555	<u>.593</u>	-.090	-.097	-.018
Water melon	.323	.271	.106	<u>.668</u>	-.223	.129	.143
Guava	.229	.208	.159	<u>.803</u>	.056	.260	-.029
Jujube	.082	.245	.167	<u>.832</u>	.116	.100	.167
Nam Wa banana	.096	-.178	.078	.062	<u>.760</u>	.183	.022
Khai banana	-.047	.091	.037	.039	<u>.850</u>	.016	.165
Hom banana	.119	-.080	.045	-.068	<u>.913</u>	-.063	.055
Ripe papaya	-.220	-.093	-.005	.497	.189	<u>.593</u>	.290
Tangerine	.321	.103	-.054	-.073	.047	<u>.607</u>	-.335
Pineapple	.326	.273	.068	.114	.079	<u>.661</u>	.261
Mango	-.027	.075	.014	.170	.017	<u>.832</u>	.156

Table 11. (continued)

Mangosteen	.230	.331	-.135	.297	-.306	.314	<u>.370</u>
Bovea	.009	.261	.430	.007	-.106	.429	<u>.580</u>
Langsat	.362	.033	-.033	.061	.070	.159	<u>.797</u>
Cantaloupe	.208	.201	.085	.173	.324	.001	<u>.489</u>
Sapodilla	.102	-.106	.398	.180	.269	.158	<u>.707</u>

Group V

	<u>Factor 1</u>	<u>Factor 2</u>
Coconut oil	<u>.499</u>	.264
Coconut milk	<u>.716</u>	.028
Butter	<u>.688</u>	.175
Lard	<u>.734</u>	-.388

Group V (Fats and Oils), which is moderate.

In addition to estimates of internal consistency, a test-retest reliability study, with a two-week interval between testings, using a subsample of 29 of the 39 students used in the developing The FPQ was also conducted. Pearson product-moment coefficients describing the relationships between test-retest scores of these subjects for each of the food groups in the FPQ are presented in Table 14. These reliability coefficients ranged from a low of .58 to a high of .79. These coefficients were all statistically significant ($p < .001$), and indicated a moderate to moderately high stability for the FPQ.

The 24-Hour Dietary Recall Interview (DRI)

On the basis of previous research in this area, the 24-Hour DRI was used to obtain information from Thai adolescents about their food intake which occurred on the day preceding the interview (FAO, 1987; Madden et al., 1976; Gersovitz et al., 1978; Emmons & Hayes, 1973; Carter et al., 1981). Information about food intake obtained via the DRI were then analyzed for nutrient contents using the Nutritionist III (Menu D) Computer Software Package, and the Food Composition Table of Thai Foods (Nutrition Division, 1987). The nutrient quantities calculated included calories, protein, carbohydrates, total fat, and iron.

To obtain estimates of reliability for the DRI, for use in this dissertation, a test-retest reliability study was conducted using a random sample of 32 students that were part of the final dissertation sample. A two-day time interval between testings

Table 12. FPQ: Eigenvalues and Percentages of Variance Accounted for by Factors in the Five Food Groups.

Food Groups	Eigenvalue	Percentage of Variance	Cumulative Percentage
<u>Group I : Meat and Dairy Products Group</u>			
Factor 1	7.68	16.7	16.7
Factor 2	4.28	9.3	26.0
Factor 3	3.00	6.5	32.5
Factor 4	2.72	5.9	38.4
<u>Group II : Cereal and Grain Group</u>			
Factor 1	6.79	28.3	28.3
Factor 2	3.07	12.8	41.1
Factor 3	2.25	9.4	50.5
Factor 4	1.78	7.4	57.9
Factor 5	1.50	6.3	64.2
Factor 6	1.18	4.9	69.1
<u>Group III : Vegetable Group</u>			
Factor 1	11.22	25.5	25.5
Factor 2	4.71	10.7	36.2
Factor 3	3.10	7.0	43.2
<u>Group IV : Fruits Group</u>			
Factor 1	8.47	24.9	24.9
Factor 2	3.85	11.3	36.2
Factor 3	3.18	9.4	45.6
Factor 4	2.14	6.3	51.9
Factor 5	2.08	6.1	58.0
Factor 6	1.88	5.5	63.5
Factor 7	1.69	5.0	68.5
<u>Group V : Fats and Oils Group</u>			
Factor 1	2.93	36.6	36.6

was used to establish these reliability estimates. Table 15 summarizes the Pearson product-moment coefficients calculated to establish estimates of stability for the DRI relative to the nutrients of interest in this study. The resultant coefficients for Calories was relatively high ($r = .82$), for Protein ($r = .62$) and Carbohydrates ($r = .64$) moderate, and for Total Fat ($r = .38$) and Iron ($r = .31$) relatively low. All coefficients calculated were significant at either the $p < .001$ or $p < .05$ levels, with the exception of Iron, which was not significant.

Test of Hypotheses

Once construct validity and reliability estimates for the instruments were established, a sample of 65 Thai adolescents (i.e., 30 boys and 35 girls) and their mothers were administered the appropriate instruments to obtain data for this study. Adolescents were administered the FPQ and 24-Hour DRI, and their mothers were administered the ATFN and KAFN. Scores from these measures were analyzed to test several hypotheses generated for this study.

Specifically, seven hypotheses were generated for this study. All hypotheses were tested using the Pearson product-moment correlation method. In addition, for Hypothesis VII, a multiple regression procedure and F-tests were used to estimate "curvilinear Rs" and to test the differences between the linear and curvilinear relationships between the variables of interest. Finally, a series of path analytic procedures were applied to the data to test several causal models regarding the relationships among the variables in this

Table 13. Alpha Coefficients for the FPQ (N= 29)

Food group (# of items)	Mean \pm S.D.	Cronbach Alpha
Meat Group (20)	103.63 \pm 13.97	.74
Cereal Group (18)	95.24 \pm 13.39	.86
Vegetable Group (33)	152.32 \pm 28.30	.92
Fruits Group (27)	150.73 \pm 18.45	.87
Fats and Oils Group (4)	17.63 \pm 4.97	.65

Table 14. Test-Retest Reliability Coefficients for the FPQ. (N= 29)

Food group	Test	Retest	Pearson-product moment coefficient
	Mean \pm S.D.	Mean \pm S.D.	
Meat Group	102.86 \pm 13.03	103.70 \pm 14.78	.76***
Cereal Group	94.86 \pm 12.31	93.79 \pm 12.43	.78***
Vegetables Group	151.29 \pm 24.97	158.69 \pm 27.31	.71***
Fruits Group	150.21 \pm 16.86	153.66 \pm 17.45	.79***
Fats and Oils Group	17.97 \pm 4.97	18.28 \pm 3.95	.58***

* p < .05

** p < .01

*** p < .001

Table 15. Test-Retest Reliability Coefficients for the DRI.

Nutrient Intake	Test	Retest	Pearson-product
	Mean \pm S.D.	Mean \pm S.D.	Moment Coefficient
Calories	2202.06 \pm 1379.05	2187.28 \pm 1447.94	.82***
Protein	93.96 \pm 57.24	94.71 \pm 65.67	.62***
Carbohydrate	289.75 \pm 155.42	302.53 \pm 222.57	.64***
Total fat	74.13 \pm 74.47	70.68 \pm 60.54	.38*
Iron	18.81 \pm 11.93	24.55 \pm 23.37	.31

* $p < .05$

** $p < .01$

*** $p < .001$

study.

It should be noted at this point that due to the limited sample size and the nature of some of the statistical procedure used, sex groups were combined in all analyses. Preliminary analyses of data revealed no significant differences between the food preferences of the boys and girls in this sample. Table 16 summarizes the means, standard deviations, F- and p-values associated with the food preferences of boys and girls related to the five food groups investigated. In addition, means and standard deviations were computed for all variables in this study prior to hypotheses testing. These are summarized in Appendix G.

Hypothesis I

Hypothesis I : There will be no correlation between the two different aspects of mothers' attitudes toward foods and nutrition examined in this study.

Table 17 summarizes the correlation coefficient computed expressing the relationship between mothers' attitudes regarding the "importance of nutrition and meals" and their attitudes regarding "food preparation and caring about nutrition." This relationship was positive ($r = .37$) and significant ($p < .01$). Evidently, the different aspects of mothers' attitudes toward foods and nutrition examined in this study are significantly and positively related. The null hypothesis related to this relationship, therefore, is not accepted.

Hypothesis II

Hypothesis II: There will be no correlation between the different aspects of mothers' knowledge about foods and nutrition examined in this study.

Table 17 also summarizes the correlation coefficients computed expressing the relationships between different aspects of mother's knowledge about foods and nutrition. Mothers' "general knowledge about foods and nutrition" was significantly and positively related to their "knowledge about food composition" ($r = .53, p < .001$), and "knowledge about a well-balanced diet and protein" ($r = .28, p < .05$). In addition, mothers' "knowledge about a well-balanced diet and protein" was significantly and positively related to their "knowledge about food composition" ($r = .33, p < .01$). Evidently, different aspects of mothers' knowledge about foods and nutrition are all significantly and positively related. The null hypotheses related to these relationships, therefore, is not accepted.

Hypothesis III

Hypothesis III: There will be no correlation between mothers' attitudes toward foods and nutrition and their knowledge about foods and nutrition.

Table 17 further summarizes the correlation coefficients computed expressing the relationships between different aspects of mothers' attitudes toward foods and nutrition and their knowledge about foods and nutrition. Mothers' attitudes about the

Table 16. Comparison of the Food Preferences of Boys and Girls.

Food group	Boys	Girls	F-test	p-value
	Mean \pm S.D.	Mean \pm S.D.		
1. Meat, poultry, fish, eggs, and dairy products	102.55 \pm 10.91	98.25 \pm 15.98	2.686 ^{ns}	.108
2. Cereal and grain products	96.17 \pm 10.33	96.67 \pm 11.97	0.103 ^{ns}	.750
3. Vegetables and vegetable products	153.62 \pm 22.72	157.54 \pm 27.48	0.280 ^{ns}	.599
4. Fruits	155.33 \pm 17.58	157.14 \pm 20.29	0.206 ^{ns}	.652
5. Fats and oils	18.46 \pm 3.68	17.50 \pm 4.46	2.522 ^{ns}	.119

ns = non-significant

"importance of nutrition and meals" was significantly and positively related to their "general knowledge about foods and nutrition" ($r = .25, p < .05$), "knowledge about food composition" ($r = .22, p < .05$), and "knowledge about a well-balanced diet and protein" ($r = .32, p < .05$). The null hypotheses related to these variables, therefore, are not accepted. However, no significant relationships were found between mothers' attitudes about "food preparation and caring about nutrition" and the different aspects of mothers' knowledge about foods and nutrition. Therefore, the null hypotheses associated with these variables were not rejected. Interestingly mothers' attitudes toward the "importance of nutrition and meals" was significantly and positively related to all aspects of their knowledge about foods and nutrition, but their attitudes toward "food preparation and caring about nutrition" was not.

Hypothesis IV

Hypothesis IV: There will be no correlation between Thai adolescents' preferences for foods in the five food groups examined in this study.

Table 18 summarizes the correlation coefficients computed expressing the relationships between Thai adolescents' preferences for foods in the five groups.

Results indicated that Thai adolescents' preferences for foods in all five food groups were significantly and positively related ($p < .05$; $p < .01$; $p < .001$). The null hypotheses related to the relationships between Thai adolescents' preferences for foods in the five food groups, therefore, are not accepted.

Table 17. Correlations Between Aspects of Mothers' Attitudes and Knowledge About Foods and Nutrition.

	Mothers' Attitudes		Mothers' Knowledge		
	I	II	I	II	III
Mothers' Attitudes					
I: Importance of Nutrition and Meals	-				
II: Food Preparation and Caring About Nutrition	.37***	-			
Mothers' Knowledge					
I. General Nutrition Knowledge	.25*	.06	-		
II. Food Composition	.22*	-.06	.53***	-	
III. Well-Balanced Diet and Protein	.32*	.17	.28*	.33**	-

* p < .05

** p < .01

*** p < .001

Hypothesis V

Hypothesis V: There will be no correlation between mothers' attitudes toward foods and nutrition and Thai adolescents' food preferences.

Table 19 summarizes the correlation coefficients computed expressing the relationships between different aspects of mothers' attitudes toward foods and nutrition and their adolescents' preferences for foods in the five food groups. Results indicated that mothers' attitudes toward the "importance of nutrition and meals" were not significantly related to their adolescents' preferences for foods in the five food groups. In fact, four of the five correlations computed for these relationships were low, but in the negative direction. The null hypotheses related to these variables, therefore, are not rejected.

However, correlation coefficients computed expressing the relationships between mothers' attitudes toward "food preparation and caring about nutrition" were significantly and positively related to their adolescents' preferences for "vegetables and vegetable products" ($r = .24, p < .05$), and "fruits" ($r = .23, p < .05$). Therefore, the null hypothesis related to these variables were not accepted. In addition, an examination of the coefficients computed associated with this aspect of mothers' attitudes were low, but all in the positive direction.

Hypothesis VI

Hypothesis VI: There will be no correlation between mothers' knowledge about foods and nutrition and their adolescents' food preferences.

Table 18. Correlations Between Adolescents' Preferences for Foods in the Five Food Groups.

Five Food Groups	Five Food Groups				
	I	II	III	IV	V
I: Meat, Poultry, Fish, Eggs, and Dairy Products	-				
II: Cereal and Grain Products	.41***	-			
III: Vegetables and Vegetable Products	.52***	.52***	-		
IV: Fruits	.61***	.65***	.54***	-	
V: Fats and Oils	.38**	.28*	.31**	.40***	-

* p < .05
 ** p < .01
 *** p < .001

Table 19 also summarizes the correlation coefficients computed expressing the relationships between different aspects of mothers' knowledge about foods and nutrition and their adolescents' preferences for foods in the five food groups. Results indicated mothers' "general knowledge about foods and nutrition" were significantly and negatively related to their adolescents' preferences for "cereal and grain products" ($r = -.25, p < .05$), and "vegetables and vegetable products" ($r = -.29, p < .05$). In addition, mothers' "knowledge about food composition" were significantly and negatively related to their adolescents' preferences for "meat, poultry, fish, eggs, and dairy products" ($r = -.24, p < .05$), "cereal and grain products" ($r = -.23, p < .05$), and "fats and oils" ($r = -.28, p < .05$). The null hypotheses related to the relationships between these variables, therefore, are not accepted. Interestingly, however, among the correlation coefficients calculated regarding the relationships between mothers' knowledge about foods and nutrition and their adolescents' food preferences, all but two were in the negative direction. The two positive correlations were very low ($r = .01$) and non-significant.

Hypothesis VII

Hypothesis VII: The relationships between Thai adolescents' food preferences and their nutrient intakes are linear in nature.

In order to test this hypothesis, several statistical procedures were applied to the data. First, to determine the linear relationships between adolescents' food preferences and nutrient intake, Pearson-correlation coefficients were computed. Second, to determine

Table 19. Correlations Between Mothers' Attitudes and Knowledge About Foods and Nutrition and Their Adolescents' Food Preferences.

Adolescents' Food Preferences	Mothers' attitudes		Mothers' Knowledge		
	I:Importance of Nutririon & Meals	II:Food Preparation & Caring about	I:General Nutrition	II:Food Composition	III:Well-Balanced Diet & Protein
.Meat, poultry, fish, eggs, and dairy products	.05	.14	-.15	-.24*	-.02
.Cereal and grain products	-.17	.10	-.25*	-.23*	.01
.Vegetable and vegetable products	-.09	.24*	-.29*	-.02	-.03
.Friuts	-.09	.23*	-.18	-.14	.01
.Fats and oils	-.08	.06	-.16	-.28*	-.08

* $p < .05$

the curvilinear relationships between adolescents' food preferences and nutrient intake, regression analyses were applied to the data, with nutrient intake scores as the dependent variable, and food preferences and square of the food preferences scores as the independent variables. Finally, F-tests were used to determine the difference between the "linear R" and "curvilinear R" computed regarding the relationships between adolescents' food preferences and their nutrient intakes.

Table 20 summarizes the results of these analyses. Based on results computed regarding the linear relationships between Thai adolescents preferences for foods in the five food groups, and specific nutrient intakes, significant positive relationships were found between preferences for foods in the "meat, poultry, fish, eggs, and dairy products" ($r = .27, p < .05$), and the "fats and oils" ($r = .30, p < .05$) food groups and "calorie intake". Preferences for foods in the "fats and oils" ($r = .26, p < .05$) food group was significantly and positively related to "protein intake". In addition, preferences for foods in the "meat, poultry, fish, eggs, and dairy products" ($r = .26, p < .05$) as well as the "fats and oils" ($r = .26, p < .05$) food groups were significantly and positively related to "carbohydrate intake". Furthermore, preferences for foods in the "meat, poultry, fish, eggs, and dairy products" ($r = .31, p < .05$), and "vegetables and vegetable products" ($r = .27, p < .05$), and "fats and oils" ($r = .29, p < .05$) food groups were significantly and positively related to "total fat intake". "Iron intake" was not significantly related to adolescents' food preferences in any of the five food groups. Table 20 also summarizes the "curvilinear R" expressing the relationships between food preferences and nutrient intakes, and F-

values comparing the differences between the "linear Rs" and "curvilinear Rs".

Findings revealed that there was a significant difference between the "linear R" and "curvilinear R" computed for the relationship between preferences for "cereal and grain products" and "Iron intake", $F(1, 59) = 4.372$, $p < .05$. Figure 3 illustrates this trend toward a curvilinear relationship between these variables. Therefore, the null hypothesis is not accepted with respect to this relationship.

Path Analyses

On the basis of a review of past theoretical and research literature, two simple models regarding the relationships between mothers' nutrition attitudes, knowledge, and their adolescents' food preferences were generated (Bandura, 1977; Eppright et al., 1970; Fishbein & Ajzen, 1975; Sims, 1978). One model (Model I) suggested that mothers' nutrition attitudes was an intervening variable between their knowledge and their adolescents' food preferences. In contrast, the other model (Model II) suggested that mothers' nutrition knowledge was an intervening variable between their attitudes and their adolescents' food preferences (see Figure 4).

In order to test the power of both of these models in explaining Thai adolescents' food preferences, a series of two path analytic procedures (Pedhazur, 1982) were applied to the data. The results of these analyses are presented in Table 19. Furthermore, Figure 4 illustrates the path coefficients associated with the relationships between the variables in each of the models. Findings revealed that Model I explained just as much of the variance as Model II, and the R^2 s associated

Table 20. Relationships Between Nutrient Intakes and Adolescents' Food Preferences (N= 65).

Variables	"Linear R" (Pearson-correlation coefficient)	"Curvilinear R" (multiple R with X ²)	Test for Differences (F-values)
<u>Calories intake</u>			
Meat group	.27*	.28	.307
Cereal group	.13	.27	3.709
Vegetable group	.13	.18	1.090
Fruit group	.22	.28	2.266
Fats & oils group	.30*	.30	.124
<u>Protein intake</u>			
Meat group	.20	.22	.564
Cereal group	.07	.18	1.616
Vegetable group	.09	.21	2.174
Fruit group	.24	.31	2.922
Fats & oils group	.26*	.27	.327
<u>Carbohydrate intake</u>			
Meat group	.26*	.26	.045
Cereal group	.13	.24	2.336
Vegetable group	.05	.13	.921
Fruit group	.21	.27	1.936
Fats & oils group	.26*	.26	.067

Table 20. (continued)**Total fat intake**

Meat group	.31*	.32	.649
Cereal group	.19	.30	3.606
Vegetable group	.27*	.28	.483
Fruit group	.23	.25	.711
Fats & oils group	.29*	.29	.154

Iron intake

Meat group	.19	.21	.426
Cereal group	.12	.29	4.372**
Vegetable group	.09	.18	1.399
Fruit group	.21	.26	1.581
Fats & oils group	.17	.19	.415

* $p < .05$ for R^2 linear

** $p < .05$ for the different R^2

with these models were non-significant. Furthermore, the path coefficients associated with the relationships between the variables in both models were quite low and non-significant. Both models, therefore, were not very powerful in explaining the relationships between mothers' nutrition attitudes and knowledge and adolescents' food preferences.

However, after further examination of the results obtained in both models, since mothers' knowledge occurred as a much stronger though non-significant, negative predictor of their adolescents' food preferences ($-.179$) in Model II, than mothers' attitudes was a positive predictor of such food preferences in Model I ($.052$), further analyses of Model II were undertaken after extending Model II, based on an additional review of theoretical and research literature in the field, and current results associated with the development of the instruments used in the present dissertation.

On the basis of an additional review of literature, several other variables were identified for inclusion in the extended Model II for further analyses. These new variables included parental education, occupation, and family income. Past research has indicated that level of education in general is positively related to food consumption patterns and food preferences among individuals (Axelson, 1977; Axelson & Brinberg, 1989; Randall & Sanjur, 1981; Sims, 1978; Yperman & Vermeersch, 1979). In addition, women's educational levels has been found to be related to dietary intake (Axelson, 1977; Sims, 1978; Yperman & Vermeersch, 1979). Moreover, some investigators have found the educational levels of individuals to be related to their nutrition knowledge, opinions, and practices (Jalso et al., 1965;

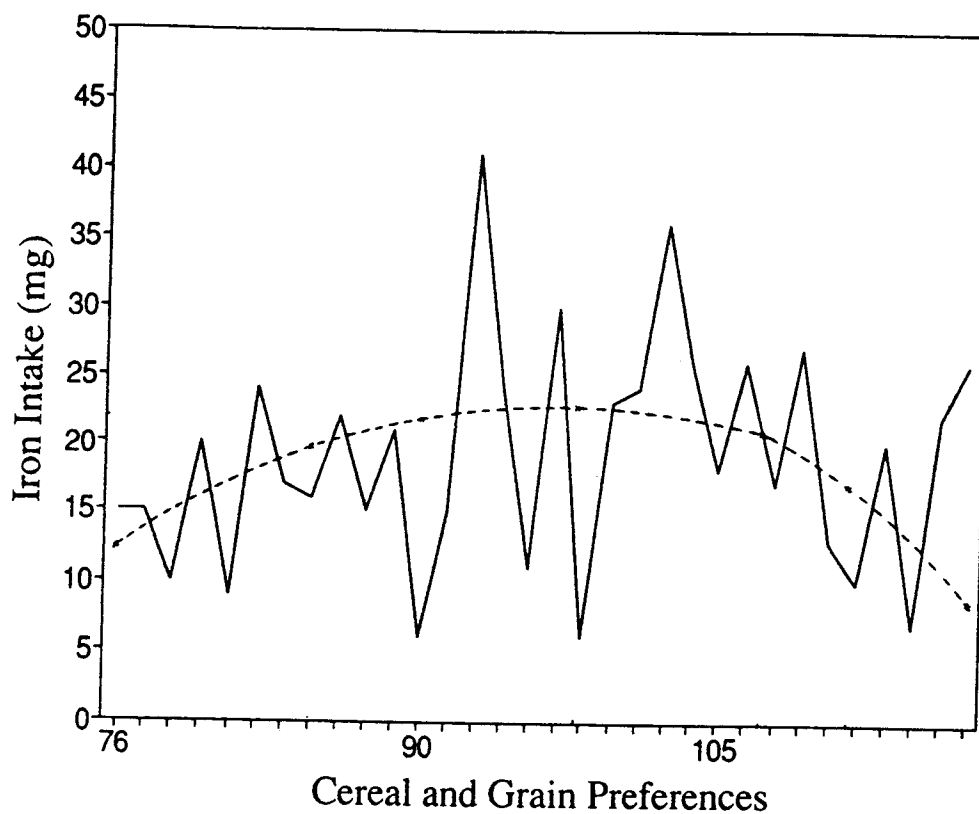


Figure 3. Relationship Between Preferences for Cereal and Grain

Products and Iron Intake. ---- The sample regression equation:

$Y = -193.7355 + 4.4373x - .02267x^2$. The R^2 for the fitted regression model is .0862 or 8.62%.

Phillips et al., 1978; Sims, 1978). Furthermore, the complexity of adolescents' diets have been found to significantly increase with an increase in mothers' educational level (Schorr et al., 1972).

Regarding parental occupation and family income, research indicates mixed results. Axelson and Brinberg (1989) found that family income could either be positively or negatively related to food preferences. Schorr et al. (1972) found mothers' and fathers' occupation to be positively related to the complexity of their adolescents' diets, and Goebal and Hennon (1983) found the extent of mothers' occupation to be negatively related to their involvement in meal preparation.

Whatever the case, parental occupation and family income are important variables to consider in understanding the relationships between parents' nutrition attitudes and knowledge, and their adolescents' food preferences. A review of the literature regarding the variables of parental (mothers' and fathers') education, occupation, and family income, therefore, suggest that these variables can be added to Model II as exogenous variables to create an extended-Model II (i.e., FE = fathers' education, FO = fathers' occupation, ME = mothers' education, MO = mothers' occupation, IN = family income).

Aside from these exogenous variables, on the basis of results obtained in this study relative to the development of the ATFN and KAFN, used to assess mothers' nutrition attitudes and knowledge, additional endogenous variables can be added to Model II for analyses as well. The ATFN consists of two attitude factors with some evidence of construct validity and reliability for use in this study. These include (1)

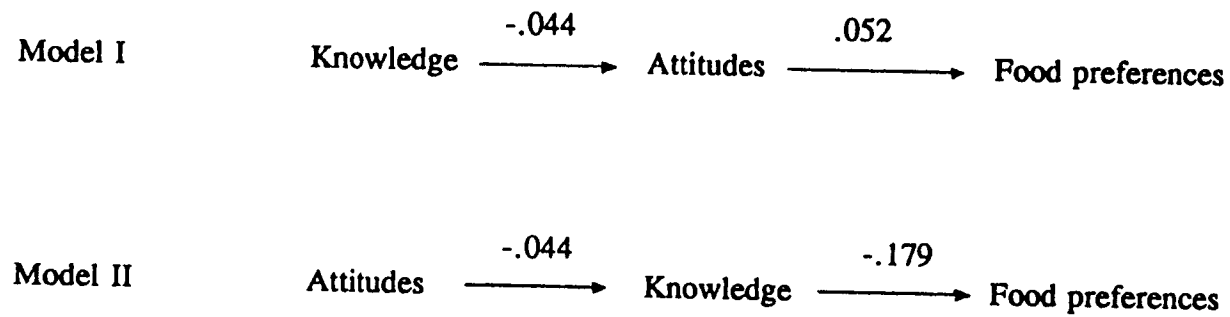


Figure 4. Path Coefficients Associated with the two Models Describing the Relationships Between Mothers' Nutrition Attitudes and Knowledge, and Their Adolescents' Food Preferences.

Table 21. Comparison the R^2 of Two Models of Food Preferences.

Model	Dependent variables	R^2
Model I		
step 1	Food preferences	.118
step 2	Attitudes	.064
step 3	Knowledge	.067
Model II		
step 1	Food preferences	.118
step 2	Knowledge	.069
step 3	Attitudes	.062

Factor I: Importance of Nutrition and Meals (A1), and (2) Factor II: Food Preparation and Caring About Nutrition (A2). The KAFN, however, consists of three knowledge factors with some evidence of construct validity and reliability. These include (1) Factor I: General Knowledge about Nutrition (K1), (2) Factor II: Knowledge About Food Composition (K2), and (3) Factor III: Knowledge About A Well-balanced Diet and Protein (K3). These variables can be added to Model II as additional endogenous variables creating in an extended-model for analyses. Figure 5 illustrates the extended-Model II, containing all of the exogenous and endogenous variables to which path analytic procedures were applied.

Once path analysis was completed for the extended-Model II, path coefficients representing the direct and indirect effects of endogenous variables on food preferences were examined (see Appendix H for all path coefficients computed for the extended-Model II), and only those coefficient with values of .100 or above were retained, to which a second path analysis was applied (see Figure 6).

Results of the second path analysis is illustrated in Figure 7, representing the modified-Model II, containing only the significant path coefficients which emerged from this second analysis. All path coefficients representing the direct and indirect effects of the exogenous and endogenous variables in this modified-Model II is found in Appendix I.

Before the results of these two path analysis could be interpretable, an additional statistic comparing the results of the extended-Model II and modified-Model II had to be undertaken to determine the degree to which results occurring

from application of the path analyses to these two models were significant. The χ^2 statistic was used to test for this difference (Specht, 1975, see Appendix J), and revealed no significant difference between the two models, $W = 7.975$, $p > .05$; $\chi^2(42, N = 65) = 58.1$. The modified-Model II ($R^2 = .9875$), therefore, was similar in its ability to explain the path analytic relationships among the variables as was the extended-Model II ($R^2 = .9934$). As a consequence, significant findings associated with the path analytic relationships found in the modified-Model II was used in the interpretation of data. These significant findings are illustrated in Figure 7.

With respect to the exogenous variables in the model, a number of significant relationships between these variables occurred. Fathers' education (FE) was significantly and positively related to their occupation (FO, $.654$, $p < .05$), mothers' education (ME, $.765$, $p < .05$), and family income (IN, $.768$, $p < .05$), but significantly and negatively related to mothers' occupation (MO, $-.434$, $p < .05$). In addition, fathers' occupation (FO) was significantly and positively related to mothers' occupation (MO, $.418$, $p < .05$), but significantly and negatively related to family income (IN, $-.218$, $p < .05$). Furthermore, mothers' education (ME) was significantly and positively related to their occupation (MO, $.907$, $p < .05$). In spite of the numerous significant relationships between these exogenous variables, however, only mothers' occupation (MO) had a significant negative direct effect on mothers' attitudes toward "food preparation and caring about nutrition" (A2, $-.300$, $p < .05$).

In reference to the path analytic relationships among the endogenous variables related to mothers' attitudes toward foods and nutrition, mothers' attitudes toward the

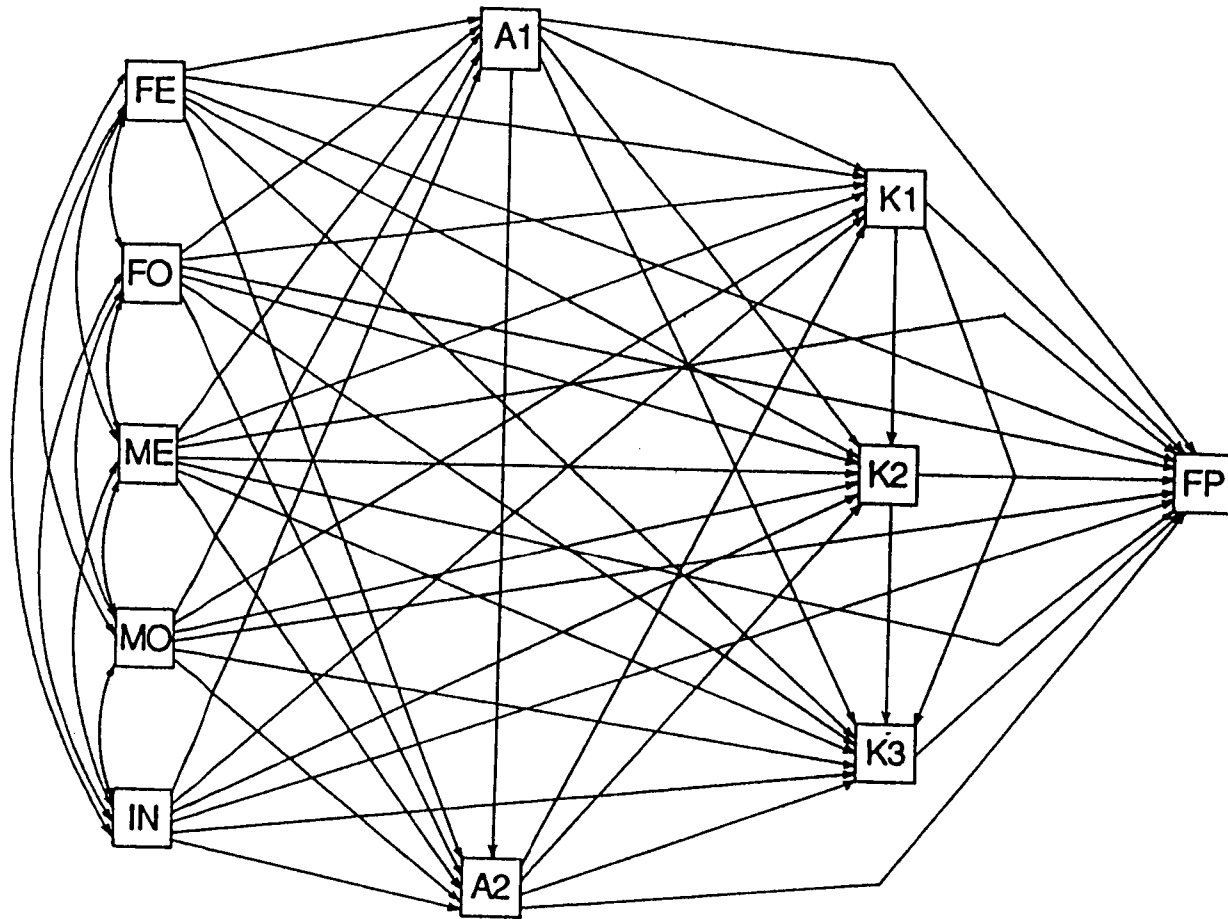


Figure 5. Extended-Model II

"importance of nutrition and meals" (A1) had a significant positive direct effect on their attitudes toward "food preparation and caring about nutrition" (A2, $.372, p < .05$).

Regarding the path analytic relationships among the endogenous variables related to mothers' knowledge about food and nutrition, mothers' "general nutrition knowledge" (K1) had a significant positive direct effect on their "knowledge about food composition" (K2), which in turn has a significant positive direct effect on their "knowledge about a well-balanced diet and protein" (K3, $.425, p < .01$).

Finally, with respect to the path analytic relationships among the endogenous variables related to mothers' nutrition attitudes and knowledge, and their adolescents' food preferences, mothers' attitudes toward "food preparation and caring about nutrition" (A2) had a significant positive direct effect on their adolescents' food preferences (FP, $.327, p < .05$), while mothers' "general nutrition knowledge" (K1) had a significant negative direct effect on their adolescents' food preferences (FP, $-.336, p < .05$).

Overall, therefore, while the exogenous variables were related together in complex ways, none were found to have any significant direct or indirect effects on adolescents' food preferences. However, mothers' occupation had a direct negative effect on mothers' attitudes toward food preparation and caring about nutrition. Furthermore, among the exogenous variables of mothers' nutrition attitudes and knowledge, while these variables appeared to be significantly and positively related together in specific directional ways (i.e., A1 to A2, K1 to K2, and K2 to K3), only

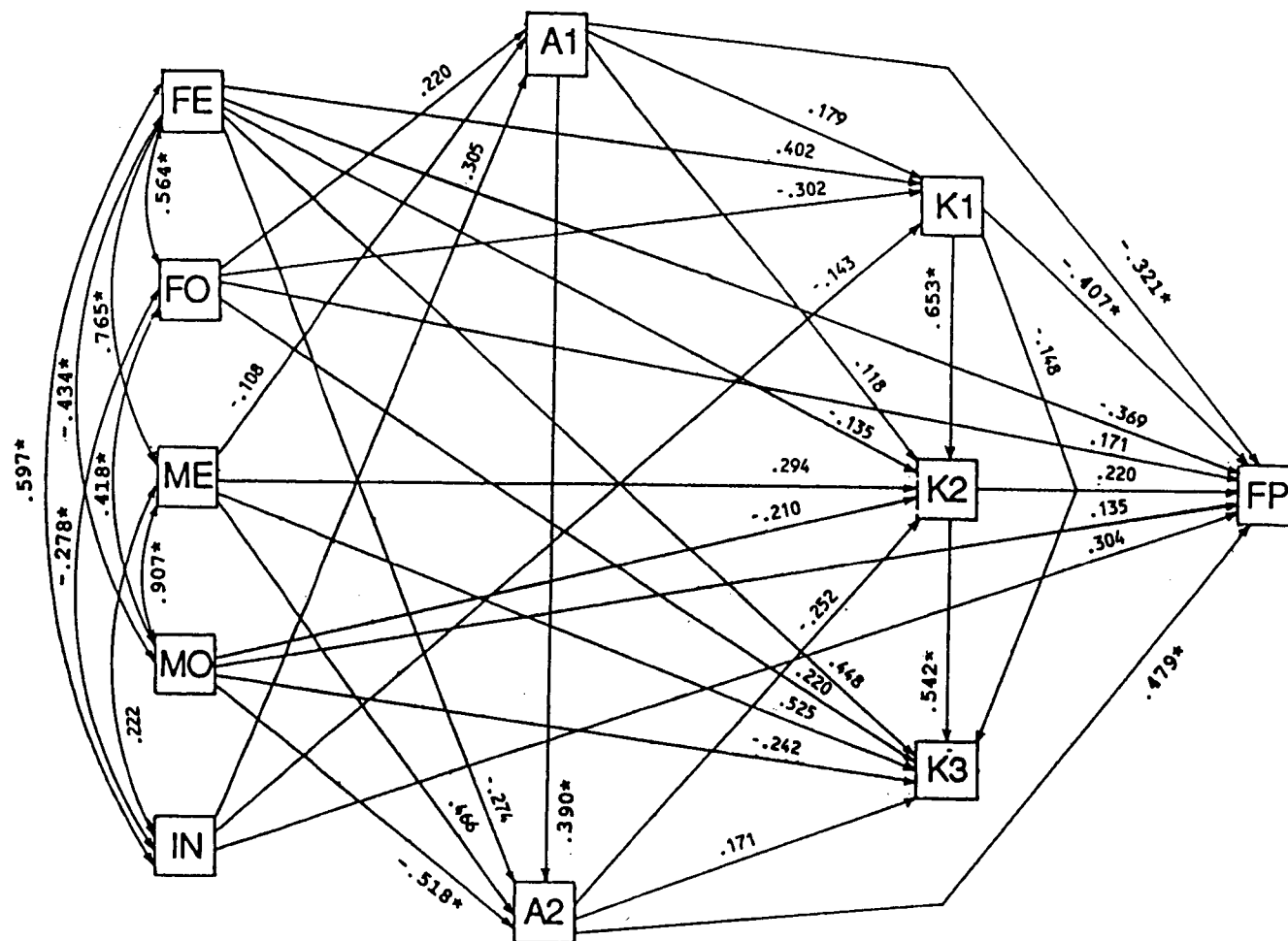


Figure 6. Path Coefficients of Values .10 or Above for the Extended-Model II

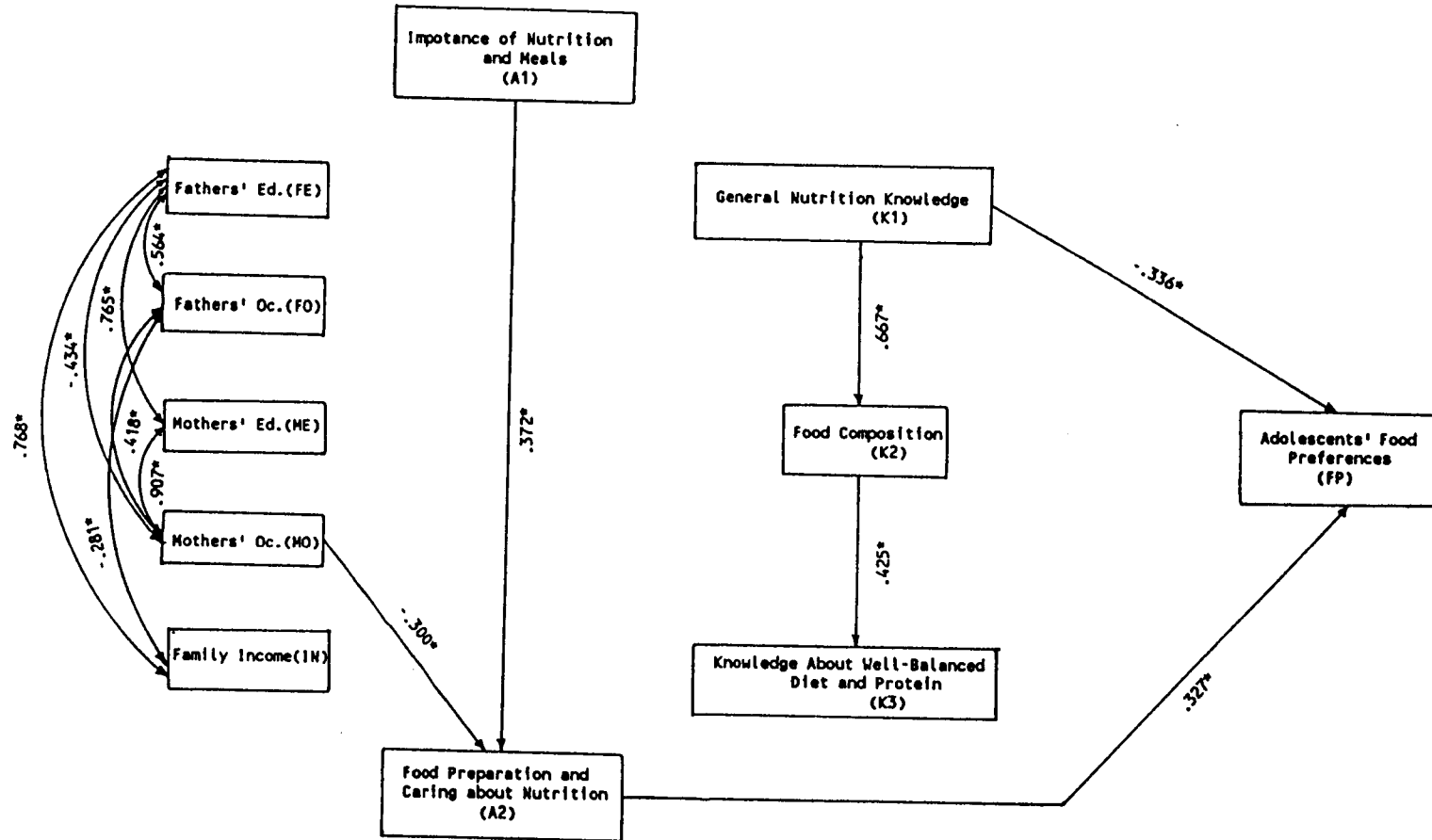


Figure 7. Significant Path Coefficients of the Modified-Model II

select aspects of mothers' attitudes (i.e., A2 - Food Preparation and Caring about Nutrition) and knowledge (i.e., K1 - General Nutrition Knowledge) had significant direct effects on their adolescents' food preferences (FP). However, the select aspect of mothers' nutrition attitudes (A2) had a significant positive direct effect, while the select aspect of mothers' nutrition knowledge (K1) had significant negative direct effect. It appears, therefore, that select aspects of mothers' nutrition attitudes and knowledge affect their adolescents' food preferences directly, and in unique ways. No significant indirect effects were found.

DISCUSSION

The present study investigated the relationships between adolescents' food preferences and their mothers' attitudes and knowledge about foods and nutrition in Phitsanulok Province, located in the northern part of Thailand. Subjects included 30 boys and 35 girls in the 11th grade attending two high schools in Phitsanulok, and their mothers. All subjects were from intact predominantly middle-class families, and none of the of the adolescents indicated any physical/health problems or were vegetarian in their diets.

The instruments used to gather the data were designed for this study, and included the Attitudes Toward Foods and Nutrition Questionnaire (ATFN), Knowledge About Foods and Nutrition Questionnaire (KAFN), Food Preference Questionnaire (FPQ), and a 24-Hour Dietary Recall Interview (DRI). Both the ATFN and KAFN were administered to the adolescents' mothers to obtain information about their attitudes and knowledge about foods and nutrition, respectively. The ATFN consisted of 31 items, representing three factors which emerged following factor analysis, including "Importance of Nutrition and Meals", "Food Preparation and Caring about Nutrition", and "Eating Habits". Alpha coefficients associated with this questionnaire was .65 for the entire questionnaire, .58 for "Importance of Nutrition and Meals", .26 for "Food Preparation and Caring About Nutrition", and -.35 for "Eating Habit". The negative alpha coefficient for "Eating Habits" led to its elimination from further analyses. Although quite low, since the alpha coefficient for

the "Food Preparation and Caring About Nutrition" factor was in a positive direction, it was retained for further exploratory analyses in conjunction with the "Importance of Nutrition and Meals" factor.

The KAFN consisted of 13 items, representing four factors which emerged following factor analysis, including "General Knowledge About Foods and Nutrition", "Food Composition", "Vitamins", and "Well-Balanced Diet and Protein". Alpha coefficients for this instrument was .70 for the entire questionnaire, and .59, .59, -.06, and .23 for the four factors, respectively. The negative and low alpha coefficient for the "Vitamins" factor led to its elimination from further data analyses. Although low, since the alpha coefficient for the "Well-Balanced Diet and Protein" factor was in a positive direction, it was retained for further exploratory analyses in conjunction with the two remaining factors. It should be noted that the KAFN successfully discriminated between housewives and nurses/physicians in their knowledge about foods and nutrition in the expected direction.

The FPQ was administered to the adolescents to obtain information about their food preferences. It consisted of 102 food items, representing five food groups including "Meat, Poultry, Fish, Eggs, and Dairy Products", "Cereal and Grain Products", "Vegetables and Vegetable Products", "Fruits", and "Fats and Oils". Following factor analysis of foods in each food group, alpha coefficients for each food group was computed, revealing coefficients of .74, .86, .92, .87, and .65, respectively.

Finally, the DRI was used to obtain information on adolescents' diets from

which their nutrient intakes were computed, using the Nutritionists III (Menu D) Computer Software Package (Institute of Nutrition, Mahidol University), and the Food Composition Table of Thai Foods (Nutrition Division, 1987). Nutrient quantities computed for this study included calories, protein, carbohydrate, total fat, and iron. Test-retest reliability coefficients of .82 for calories, .62 for protein, .64 for carbohydrate, .38 for total fat, and .31 for iron were computed for the DRI, using a random sample of 32 adolescents from the dissertation sample, with a two-day time interval between testings.

Results and Discussion

Results and discussion of findings associated with this dissertation are presented in the following section. First, findings associated with the application of path analyses to the data, followed by other important findings, and those related to the validity and reliability of instruments are presented and discussed.

Path Analyses Results

With respect to findings associated with the path analyses, results revealed that selected aspects of mother's nutrition attitudes and knowledge were related to their adolescents' food preferences in direct and unique ways. First, in reference to mothers' nutrition attitudes, their attitudes toward "food preparation and caring about nutrition" had a positive direct effect on their adolescents' food preferences. This

finding is reasonable in light of the fact that mothers' attitudes toward food preparation and caring about nutrition would be related to their food preparation practices at home, which in turn would be related to the kinds of foods adolescents' would eat at home, leading them to develop preferences for specific foods. A number of studies are available linking mothers' attitudes and practices about foods and nutrition, and how such practices are related their adolescents' food preferences and consumption (Jalso et al., 1965; Schwartz, 1976; Spindler & Acker, 1963; Burt & Hertzler, 1978; Phillips et al., 1978; Axelson & Brinberg, 1989). Second, in relation to mothers' knowledge about food and nutrition, their general nutrition knowledge had a direct negative effect on their adolescents' food preferences. On the surface, this finding appears puzzling, since it would be expected that mothers' nutrition knowledge would be directly and positively related to their food practices, which in turn would be positively related to their adolescents' food preferences. However, such a proposition was not confirmed in this study. Could it be that mothers were not applying their nutrition knowledge in the preparation of foods for their adolescents? Research is available suggesting that mothers' with limited knowledge about nutrition do not prepare their foods on the basis of their knowledge about foods and nutrition, but on the basis of habit and custom (Emmons & Hayes, 1973a). In the present study, Thai mothers had a relatively reasonable level of nutrition knowledge (i.e., above the midpoint for the entire KAFN, $\bar{M} = 17.93$, see Appendix G). Do these mothers with relatively reasonable levels of nutrition knowledge also prepare their foods on the basis habit and custom rather than knowledge?

On the other hand, adolescence is known to be a time when children are establishing their own autonomy and identity as persons (Erikson, 1968). Parents gradually relinquish some control over their adolescents during these years, and peers become important (Akers et al., 1979). As a result conflicts between parents and their adolescents may occur, leading to what has been described as an "adolescent rebellion". Could it be that adolescents are rebelling against their mothers' knowledge and practices, developing thoughts and preferences opposite that of their mothers in their attempt to establish their own autonomy as persons? The findings of this study suggest that this might be occurring relative to mother's general knowledge about nutrition and their adolescents' food preferences.

Whatever the case, taken together the above two findings do not support the propositions elaborated on by Sims (1978) regarding whether mothers' attitudes or knowledge are intervening variables associated with their adolescents' food preferences. In fact, findings of this study indicated that mothers' attitudes and knowledge about foods and nutrition have their own unique and direct effects on their adolescents' food preferences. While the direct effects of mothers' attitudes toward food preparation and caring about nutrition on their adolescents' food preferences was positive, the direct effect of mothers' general nutrition knowledge was negative. However, a word of caution must be made regarding the above general conclusion, since it was not the totality of mothers' nutrition attitudes or knowledge that was related to their adolescents' food preferences, but only selected aspects of mothers' nutrition attitudes and knowledge. This finding has been supported in previous

research (Sims, 1978), and suggested that in understanding adolescents' food preferences, future studies must focus on selected aspects of their mothers' nutrition attitudes and knowledge rather than generalized notions in this area.

A third significant finding which emerged from application of path analyses to the data indicated that selected aspects of mothers' attitudes toward foods and nutrition were positively related together, but in specific and direct ways. Mothers' attitudes toward the importance of nutrition and meals had a direct positive effect on their attitudes toward food preparation and caring about nutrition, but not vice versa. The direction of effect specified here is reasonable in light of previous research in this area (Byrd-Bredbenner et al., 1984). The kinds of attitudes a person has about the importance of nutrition is more likely to affect their food preparation attitudes and practices. Preparing food in particular kinds of ways and for particular purposes, however, may or may not reflect a person's attitudes about the importance of nutrition and meals.

The fourth area of significant findings associated with the path analyses had to do with how selected aspects of mothers' knowledge about foods and nutrition were related together in specific and direct ways. Mothers' general knowledge about foods and nutrition had a direct positive effect on their knowledge of food composition, which in turn had a direct positive effect on their knowledge about a well-balanced diet and protein. These findings appear logical, since they move from a more global understanding of nutrition concepts to more specific ones associated with food composition, followed by a well-balanced meal and protein. A number of human

development theorists (i.e., Piaget, 1971) have suggested that over time, a person's understanding of concepts becomes more differentiated with experience. At some point, however, such knowledge is integrated into a whole system, allowing a person to also reverse the process, a phenomenon not illustrated in the present study (Piaget, 1971).

Finally, path analytic results indicated that while mothers' and fathers' education, occupation, and family income were related together in complex ways, only mothers' occupation had a direct negative effect on their attitudes about food preparation and caring about nutrition. Numerous studies are available in the area of family and work, which suggests that a mothers' work outside the home does have an impact on her involvement in household tasks (Nickols & Metzen, 1978; Hafstrom & Schram, 1983; Nickols & Fox, 1983; Stafford, 1983; Goebel & Hennon, 1983). Although working mothers continue to undertake a bulk of the household tasks, in spite of the fact that she works, her involvement in household tasks decreases, while those of fathers may slightly increase. More specifically, Alexson & Brinberg (1989) indicated that mothers' involvement in meal preparation was negatively related to their employment. A variety of ready-made foods and fast food restaurants which are available in Thailand are likely to be used by these mothers. The direct negative effect of mothers' occupation on her attitudes about food preparation and caring about nutrition, therefore, is a reasonable finding.

Other Important Findings

Mothers' Nutrition Attitudes and Knowledge. Although path analyses revealed no significant path coefficient between mothers' attitudes and knowledge, Pearson correlation coefficients indicated that certain aspects of mothers' nutrition attitudes were significantly related to aspects of their nutrition knowledge. More specifically, mothers' attitudes toward the importance of nutrition and meals were significantly and positively related to all aspects of their nutrition knowledge, including general nutrition knowledge, knowledge about food composition, and knowledge about a well-balanced diet and protein. However, mothers' attitudes toward food preparation and caring about nutrition were not significantly related to any of the aspects of their nutrition knowledge. These findings provided general support for previous research findings in this area (Sims, 1978; Eppright et al., 1970; Carruth & Anderson, 1977). It seems probable that mothers with strong attitudes regarding the importance of nutrition and meals would also seek to increase their general knowledge about nutrition, food composition, and a well-balanced diet. However, mothers' attitudes about food preparation may or may not be related to their nutrition knowledge.

Adolescents' Food Preferences. Pearson correlation coefficients regarding the relationships between Thai adolescents food preferences in the five food groups were all significantly and positively related. From an American perspective, these findings may appear puzzling since the preparation of foods in many American diets included the cooking of foods as separate entities, exemplified in the "meat, potatoes, and

vegetables" meals (Lounge & Smith, 1986). When foods are prepared in this manner, preferences for specific foods may be related in both negative and positive ways or not at all. From a Thai perspective, however, such separate food preferences are less likely to occur. Cooking in Thai culture most generally occurs with foods from various food groups cooked together in one pot, so that the eating of foods from various food groups are likely to occur together, leading to positive relationships between preferences for foods in various food groups (Nutrition Division, 1991).

Mothers' Nutrition Attitudes and Knowledge and Their Adolescents' Food Preferences. The major findings associated with these relationships were previously discussed under results obtained relative to the application of path analyses to the data. However, Pearson correlation coefficients computed for these relationships also provided several additional results worth discussing. First, no significant relationship were found between mothers' attitudes about the importance of nutrition and meals and their adolescents' preferences for foods in the five food groups, with all but one of the five coefficients computed in the negative direction. In addition, five of the correlation coefficients computed for the relationships between mothers' attitudes about food preparation and their adolescents' preferences for foods in the five food groups were positive, with two of them significant. Perhaps, mothers' attitudes toward food preparation and their adolescents preferences are more closely related together, since such attitudes are related to mothers' actual preparation of food which their adolescents eat daily. The eating of such prepared foods are more likely to

affect Thai adolescents' food preferences. Attitudes related to the importance of nutrition and meals consist of more abstract ideas, and as such are not as closely tied to behavior as attitudes toward food preparation.

Second, the correlation coefficients computed relating aspects of mothers' knowledge about nutrition and their adolescents' food preferences, revealed all but two of the 15 coefficients computed to be in the negative direction. Five of these negative coefficients were significant, but the two positive ones were non-significant. Such findings provided additional support for the negative relationship between mothers' nutrition knowledge and their adolescents' food preferences, discovered in path analyses. Are adolescents' search for autonomy and identity at this time so strong that mothers' knowledge about foods and nutrition are rebelled against or not heeded? It may be, however, that adolescents' search for autonomy leads them into the larger social world in which foods are not prepared in a manner based on traditional Thai culture. This may cause some difference between the foods adolescents eat at home, where traditional Thai foods are more likely to be prepared by their mothers, and those of the larger urban environment, thus influencing adolescents' food preferences in ways counter to that of their home environments.

Adolescents' Food Preferences and Nutrient Intakes. A number of significant relationships were found between Thai adolescents' food preferences and their nutrient intakes. First, significant positive linear relationships were found between adolescents' preferences for foods in the meat, poultry, fish, eggs, and dairy products

group, and their calorie, carbohydrate, and total fat intakes. These findings were expected, since the dietary interview data from adolescents revealed that foods such as pork sausage with soybean sauce and spices, and with garlic and cooked glutinous rice were preferred. In such dishes, pork provided adolescents with their fat sources, and glutinous rice provided with their carbohydrate sources. These fat and carbohydrate sources then contributed to the adolescents' calorie intake (Nutrition Division, 1987).

Second, significant positive linear relationships were found between Thai adolescents' preferences for foods in the fats and oils food groups and their calorie, protein, carbohydrate, and total fat intakes. An analysis of dietary interview data from adolescents revealed that foods such as curry are preferred. In Thailand, coconut milk is often used in making curry. Coconut milk represents an important source of fat, protein, and carbohydrate among people in Thailand. This fat and carbohydrate source (Nutrition Division, 1987), therefore, also contributed to Thai adolescents calorie intake.

Third, a significant positive linear relationships was found between Thai adolescents' preferences for foods in the vegetables and vegetable products food group and their total fat intake. Typically, Thai people consumed a lot of both fresh and cooked vegetables in their meals. Analyses of adolescents' dietary interview data indicated that they consumed these vegetables most commonly in a stir-fried manner. Stir-frying consists of the use of oils in cooking. Vegetables such as Chinese swamp cabbage, yard long beans, and collard greens are often used in Thai foods, and can

absorb oil when they are stir-fried (Viriyapanich, Suansilpong, Chittchang, & Banjong, 1990). It was not unusual, therefore, that preferences for foods in the vegetables and vegetable products group was related to Thai adolescents' total fat intake.

Fourth, no significant linear relationships were found between Thai adolescents' preferences for foods in the five food groups and their iron intake. Analyses of the dietary interview data of adolescents revealed that their diets provided them with more than the necessary amount of iron needed for healthy development (Nutrition Division, 1987). Since many foods contain small amounts of iron in them (Einstein & Hornstein, 1970), Thai adolescents in the present sample apparently obtained their iron from a wide variety of foods, including high energy foods, animal tissue foods, leafy green vegetables, and legumes (Einstein & Hornstein, 1970; Viglietti & Skinner, 1987). This finding appears reasonable since the present sample were of Thai mothers and their adolescents from predominantly middle-class families, where food is relatively abundant. For adolescents from more rural areas, however, mothers' limited knowledge about foods and nutrition, and limited financial resources may contribute to iron deficiency problems which occur in some of these areas.

Finally, a significant curvilinear relationship was found between adolescents' preferences for foods in the cereal and grain products group, and their iron intake. A combination of studies (Viglietti & Skinner, 1987; Exler, 1980) regarding the iron contents of foods can be used to explain this finding. Viglietti and Skinner (1987) indicated that unusually high intakes of high energy foods, animal tissue foods, and

ascorbic acid are associated with high levels of iron intake. Exler (1980), however, indicated that the revised values for the amount of iron in enriched cereal and grain products are much higher than the older values, and lower for meats, fruits, and vegetables. The fact that people in Thailand consume a large amount of enriched cereal and grain products in their diets suggest that Thai adolescents would obtain some their iron from these food products. However, there is a limit as to the amount of iron that Thai adolescents can obtain from these food products, thus foods from others groups such as high energy foods, animal tissue foods, and those with ascorbic acid must also be taken to increase iron intake. On the basis of these facts, therefore, it was not unusual that a curvilinear relationship was found between Thai adolescents' preferences for foods in the cereal and grain products food group and their iron intake.

A word of caution must be made in the interpretation of results regarding the relationships between Thai adolescents' food preferences and their nutrient intakes discussed above. Analyses of data involved establishing relationships between these variables by taking each nutrient and preferences for foods in each food group separately. In real life situations, however, individuals consume a variety of foods together at various meals. A more realistic picture regarding the relationships between food preferences and nutrient intakes, therefore, must take into consideration relating preferences for foods in all food groups and their nutrient intakes together to obtain a more accurate picture of these relationships. Future data analyses, therefore, must attempt to utilize this multivariate approach to obtain a more comprehensive

view of Thai adolescents' food preferences and their nutrient intakes.

Validity and Reliability of Instruments

Since conclusions drawn from the results of this study discussed previously all depended upon the validity and reliability of the instruments used, consideration of issues associated with this aspect of the dissertation needs to be made at this point.

Internal consistency estimates associated with the over all ATFN, KAFN, and FPQ ranged from moderate to moderately high, so instruments used in this study provided the researcher with some sense of confidence that they were assessing the variables in this study in a consistent manner. However, examination of the internal consistency estimates for one factor in the ATFN (i.e., attitudes toward food preparation and caring about nutrition), and one factor in the KAFN (i.e., knowledge about a well-balanced diet and protein) were quite low, making significant results associated with these attitudes and knowledge factors quite suspect. However, the fact that the KAFN did successfully discriminate between the nutrition knowledge of nurses/ physicians and housewives in predicted directions provided some measure of construct validity for the instrument.

In addition, test-retest reliability coefficients for the FPQ and DRI indicated that the FPQ and portions of the DRI were relatively stable (i.e., coefficients range from moderate to high). However, the "total fat" and "iron" intake portions of the DRI revealed relatively low stability coefficients. The low stability of these two portions of the DRI, therefore, makes significant results associated with them also

suspect.

Finally, although attempts were made through factor analyses to clearly differentiate between the factors which emerged within each instrument through a review of the factor loadings of each item, in a few cases, some items which loaded highly on one factor, and also loaded somewhat highly on another. In these circumstances, the factor on which an item loaded the highest was used as the criterion for inclusion in that factor. However, the fact that some items loaded relatively highly on several factors, suggested that there were some overlap between the factors, thus influencing the results obtained.

Limitations and Suggestions for Future Research

Although attempts were made to conduct this study in the most scientific and effective manner possible, a number of major limitations were encountered. These are discussed following with suggestions for future research.

Sample

The sample used in the present investigation was relatively small, limiting the power of statistical procedures such as regression analyses to provide meaningful results for the purposes of generalization to the larger population of Thai adolescents and their mothers. The generalizability of findings was further jeopardized by the limitation of the present sample to predominantly middle-class families from a more

urban area in Thailand. Future study, therefore, need to be conducted using a larger sample, representing a wider cross-section of Thai adolescents and their mothers to obtain a more accurate picture of the relationships between mothers' nutrition attitudes and knowledge and their adolescents food preferences and nutrient intakes. Problems associated with foods and nutrition in Thai middle-class families are not as paramount as those from more rural areas, where limited nutrition knowledge, lack of resources, and adherence to customs and traditions prevail. Thailand is a country with a wide variety of subcultures, spread across various provinces and regions. Variations in food preferences and attitudes toward foods exists within these subcultures and regions. Future studies, therefore, should attempt to study the relationships between foods and nutrition attitudes and knowledge and food preferences among these various subcultures.

Research Design and Procedures

No major problems were encountered relative to obtaining subjects for participation in this study. However, contacting the students' teachers and principals of school prior to data collection greatly enhanced the successful completion of this study. In the data collection phase , questions did arise as to the manner in which data were collected on mothers' nutrition attitudes and knowledge. Adolescents were asked to take home the ATFN and KAFN for their mothers to complete, and to return them within a three-day period. All subjects complied with this request, however, there was no way of knowing whether mothers or someone else in the family

completed the questionnaires. Since in Thailand, it is quite difficult to enter the private homes of individuals to collect data on foods and nutrition attitudes, knowledge, and practices, without being familiar with or a respected member of the community, such data collection procedures could not be employed. Future studies, therefore, should take care in finding a means of ensuring that questionnaires used in studies are completed by persons targeted to complete them.

Instruments

A number of limitations relative to the instruments used in this study were previously discussed in this dissertation. However, because a major portion of this research project focused on designing the instruments for this study, additional limitations associated with them will be pointed to at this time.

With respect to the ATFN and KAFN Questionnaires, factor analyses were undertaken to determine the factor structure of each questionnaire. For both instruments a number of factors emerged, indicating the multidimensional nature of each questionnaire. Some of these factors, however, contained relatively few items, resulting in alpha coefficients for some of them to be quite low. Although the overall alpha coefficients for the entire questionnaires were moderate, those associated with each of the factors were quite low. The addition of other items to these factors, therefore, may improve the internal consistency estimates for these factors as well as the entire questionnaires. Future studies, therefore, could focus on further developing these questionnaires in such a direction.

The fact that significant findings obtained in this study revealed that selected nutrition attitudes and knowledge factors were significantly related to adolescents' food preferences, suggest that the multidimensionality of the questionnaires should be preserved. In addition to adding additional items to the factors in the questionnaires, further statistical procedures could be applied to data collected to confirm the construct validity of the questionnaires after factor analyses are completed. These could include the application of discriminant function analysis to see how combinations of factors can be used to discriminate between various groups of respondents along a variety of attitude and knowledge dimensions.

In reference to limitations associated with the FPQ, the manner in which food items were listed in the questionnaire posed some problems. Since food items found in the questionnaire were selected from the Food Composition Table of Thai Foods, many food items included in the questionnaire were listed separately or in uncooked form. In contrast, when adolescents were asked to complete the questionnaire, they encountered difficulty in expressing their preferences, since these food items were consumed cooked or in combination with other foods. Food items found in the FPQ, therefore, did not realistically depict how foods in Thailand were prepared and eaten (i.e., a variety of foods are cooked combined in one pot to make a meal). Future studies, therefore, might wish to develop the FPQ in a way that includes food items that are displayed in the manner that they are commonly consumed in Thailand.

Finally, a number of difficulties were encountered relative to the DRI. The DRI was used in obtain information on Thai adolescents' diets from which an

assessment of their nutrient intakes could be undertaken. First, completion of the DRI was long and cumbersome (i.e., administration time was approximately 30–45 minutes per subject). This was so because of the manner in which foods are combined and consumed in meals in the Thai culture. Asking adolescents to recall the ingredients and their quantities in these combined foods was difficult. Several food items were not familiar to the subjects, while others did not even know the names of some ingredients, particularly boys. Furthermore, although food models from the Institute of Nutrition, Mahidol University were used to determine the quantities of foods consumed at a meal due to their standardized size and weight, models for many foods were not available. At times fresh foods and ready cooked foods were used to obtain information about the diets of adolescents.

The DRI method used to obtain dietary information from adolescents in this study is just beginning to emerge in some parts of Thailand (i.e., the Northeast region). Several foods included in the DRI, however, common in the Northeast region of Thailand are different from those consumed in the area in which this investigation was conducted. The Food Composition Table of Thai Foods, therefore, had to constantly be used as a reference guide in determining the nutrient quantities and content of foods. The raw weight of some foods needed to be determined, others needed to be estimated from the ingredients included in the foods eaten. Future studies, focused on designing a DRI that fits more closely with the Thai culture to obtain a more accurate assessment of their nutrient intakes, therefore, would be worthwhile. A possible way to increase this accuracy might be to have subjects

record the own food intakes immediately following or soon after they are consumed.

Research Intent

The present study focused on determining the relationships between Thai mothers' nutrition attitudes and knowledge, and their adolescents food preferences and nutrient intakes. Significant results were obtained relative to these relationships. Once instruments are further defined, and additional validity and reliability studies conducted, program intervention studies focused on assessing the impact of a variety of nutrition education programs on Thai mothers and their adolescents nutrition attitudes, knowledge and preferences could be undertaken. Such interventions can be helpful in improving the nutrition quality of Thai adolescents' diets.

Summary and Implications

Overall, findings of this study revealed that Thai mothers' attitudes and knowledge about foods and nutrition were significantly related to their adolescents' food preferences in unique and direct ways. Mothers' attitudes toward food preparation and caring about nutrition had a direct positive effect on their adolescents' food preferences. In addition, mothers' knowledge about general nutrition had a direct negative effect on their adolescents' food preferences. Finally, Thai adolescents' food preferences were positively related to aspects of their nutrient intakes.

Findings such as these have important implications for educators in working with families associated with matters concerning foods and nutrition. First, the fact that mothers' attitudes toward food preparation and caring for foods and nutrition had a direct positive effect on their adolescents' food preferences suggest that programs focused on supporting mothers in their attitudes toward food preparation and caring about nutrition can in part help to ensure that the food preferences of adolescents will be healthy and nutritional ones.

Second, the fact that mothers' general nutrition knowledge had a direct negative effect on their adolescents' food preferences suggest that programs which support mothers in their utilization of nutrition knowledge in the development of sound nutrition practices may help to ensure that their adolescents will develop nutritionally sound food preferences. Care must be taken, however, in how this knowledge is communicated to adolescents by their mothers, since adolescents are developing their own unique sense of autonomy as individuals, suggesting that coercive communication techniques may hamper rather than enhance them.

Third, the fact that Thai adolescents' food preferences were positively related to their nutrient intakes, suggest that educators can develop programs in schools, which can help adolescents make sound nutritional food choices. Teachers are looked upon with a great deal of respect in Thailand among parents and adolescents alike. Their role in facilitating the healthy development of adolescents cannot be underestimated.

Finally, adolescence is a period characterized by rapid biological,

psychological, and social change. The consumption of particular foods can greatly influence their physical, psychological and social health. Likewise, an adolescents' psychological and social development can influence their consumption of foods. For educators, therefore, adolescence is significant period during which time they can support adolescents in their attempts at integrating these various aspects of life for more effective, healthful, and meaningful living.

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APPENDICES

APPENDIX A

ATTITUDES TOWARD FOODS AND NUTRITION QUESTIONNAIRE

(Mother's Form)

Directions: Please read each statement carefully and circle the degree to which you agree or disagree with the statement using the following rating scale.

- 5 = Strongly agree
 4 = Moderately agree
 3 = Neither agree nor disagree
 2 = Moderately disagree
 1 = Strongly disagree

I: Importance of Nutrition and Meal

- | | | | | | |
|---|---|---|---|---|---|
| (1) I feel the foods I eat now will affect my future health..... | 1 | 2 | 3 | 4 | 5 |
| (2) I feel that as long as I am maintaining my weight, I don't have to worry much about nutrition..... | 1 | 2 | 3 | 4 | 5 |
| (3) I believe that diet is a major control factor when it comes to maintaining health and controlling diseases..... | 1 | 2 | 3 | 4 | 5 |
| (4) Time devoted to planning meals is well invested..... | 1 | 2 | 3 | 4 | 5 |
| (5) Time plans annoy me. I want to feel free to hurry or loiter as I please..... | 1 | 2 | 3 | 4 | 5 |
| (6) Planning meals for several days at a time makes it possible to buy food more efficiently..... | 1 | 2 | 3 | 4 | 5 |
| (7) I can use my time more efficiently if I plan ahead the order of preparing foods for a meal..... | 1 | 2 | 3 | 4 | 5 |
| (8) Changing the ingredients in a recipe makes me feel that the final product is really my own..... | 1 | 2 | 3 | 4 | 5 |
| (9) I prepare special foods on holidays..... | 1 | 2 | 3 | 4 | 5 |
| (10) I would fix more nutritious meals if I know what to prepare | 1 | 2 | 3 | 4 | 5 |
| (11) If I don't like a food prepared in a certain way, I would not try it prepared in a different way..... | 1 | 2 | 3 | 4 | 5 |
| (12) I only like to eat foods I know about..... | 1 | 2 | 3 | 4 | 5 |
| (13) I believe that the person who gets the most satisfaction out | | | | | |

of eating is the one who sticks to foods that are familiar.....	1	2	3	4	5
(14) I think nutrition is important to my health.....	1	2	3	4	5
(15) I eat what I want regardless of what is good for me.....	1	2	3	4	5
(16) I am too busy to concern myself with nutrition.....	1	2	3	4	5

II. Food Preparation and Caring about Nutrition

(17) I am concerned about eating nutritious foods throughout the day.....	1	2	3	4	5
(18) I often prefer to plan meals a day at a time rather than planning for longer periods of time.....	1	2	3	4	5
(19) It is fun to make my own recipes.....	1	2	3	4	5
(20) Cooking is an important creative art.....	1	2	3	4	5
(21) I like to eat foods I haven't seen before.....	1	2	3	4	5
(22) The foods I eat now will help keep me healthy.....	1	2	3	4	5
(23) I could learn to eat fruits rather than desserts.....	1	2	3	4	5
(24) I seldom think about my eating habits.....	1	2	3	4	5
(25) I do not care about the foods I eat.....	1	2	3	4	5

III. Eating Habbits

(26) I usually will not taste a food if its appearance is similar to something I dislike.....	1	2	3	4	5
(27) I like my family to stick to the old favorite meals, rather than mess them up with new and different kinds of foods...	1	2	3	4	5
(28) If I am satisfied with the foods I eat, I see no reason for me to change.....	1	2	3	4	5
(29) Eating well can help prevent diseases.....	1	2	3	4	5
(30) I stop eating only when I cannot eat anymore.....	1	2	3	4	5
(31) Knowing that a food is good for me has little influence on what I choose to eat.....	1	2	3	4	5

APPENDIX B

KNOWLEDGE ABOUT FOODS AND NUTRITION QUESTIONNAIRE

(Mother's Form)

Directions: Please read each statement carefully and circle the answer that most represents what you think about the statement using the rating categories below.

✓ = True
 X = Not True
 0 = Don't Know or Not Sure
 About the Answer

I: General Knowledge About Nutrition

- | | | | |
|--|---|---|---|
| (1) The Basic Five Food Groups are the only usable tools for planning an adequate diet..... | ✓ | X | 0 |
| (2) Vitamin D develops normal bones and prevents rickets... | ✓ | X | 0 |
| (3) Vitamin C prevents scurvy..... | ✓ | X | 0 |
| (4) Iron which is in the liver, green leaves, and meat prevents anemia (iron-deficiency anemia)..... | ✓ | X | 0 |

II: Foods Compositions

- | | | | |
|--|---|---|---|
| (5) Plant fats are better for the body than animal fats..... | ✓ | X | 0 |
| (6) Pork liver and eggs provide iron..... | ✓ | X | 0 |
| (7) Milk is a good source of calcium..... | ✓ | X | 0 |

III: Vitamins

- | | | | |
|--|---|---|---|
| (8) Guava, sweet orange, kale or collard leaves are good sources of Vitamin C..... | ✓ | X | 0 |
| (9) Green leafy vegetables meet Vitamin A needs..... | ✓ | X | 0 |
| (10) Rice should be eliminated from the diet of someone trying to lose weight..... | ✓ | X | 0 |

IV: Well-Balanced Diet and Protein

- | | | | |
|--|---|---|---|
| (11) The term "well-balanced" means that the diet includes food groups in the amounts recommended..... | ✓ | X | 0 |
| (12) Protein-rich foods provide liberal amounts of nutrients for growth..... | ✓ | X | 0 |
| (13) Soy bean products can be substituted for meat..... | ✓ | X | 0 |

APPENDIX C

FOOD PREFERENCE QUESTIONNAIRE

(Adolescent's Form)

Directions: Food items in this questionnaire refer to foods that are available in your daily life. After you read the name of each food item, please circle your preference for that food item by using the following rating scale.

extremely dislike	moderately dislike	slightly dislike	neither like nor dislike	slightly like	moderately like	extremely like
1	2	3	4	5	6	7

It is assumed that each food item in the questionnaire is prepared according to such basic cooking methods as boiled or fried. As you circle your response, please do not consider any food preparation methods or combination with other foods in rating your preference.

I: Meats, Poultry, Fish, Eggs, and Dairy Products

(1)	Pork sausage with soybean sauce and spices	1	2	3	4	5	6	7
(2)	Chicken.....	1	2	3	4	5	6	7
(3)	Duck.....	1	2	3	4	5	6	7
(4)	Beef (Meat).....	1	2	3	4	5	6	7
(5)	Pork (Meat).....	1	2	3	4	5	6	7
(6)	Shrimp.....	1	2	3	4	5	6	7
(7)	Frog meat.....	1	2	3	4	5	6	7
(8)	Sausage (western style).....	1	2	3	4	5	6	7
(9)	Pork sausage (made of pork, garlic, cooked glutinous rice and salt	1	2	3	4	5	6	7
(10)	Snakeheaded (Murrel).....	1	2	3	4	5	6	7
(11)	Sardine (canned).....	1	2	3	4	5	6	7
(12)	Sheat-fish.....	1	2	3	4	5	6	7
(13)	Ark shell.....	1	2	3	4	5	6	7
(14)	Oyster.....	1	2	3	4	5	6	7
(15)	Salt water mussel.....	1	2	3	4	5	6	7
(16)	Carper shell.....	1	2	3	4	5	6	7
(17)	Hen egg.....	1	2	3	4	5	6	7

(18)	Duck egg.....	1	2	3	4	5	6	7
(19)	Roe.....	1	2	3	4	5	6	7
(20)	Soybean milk.....	1	2	3	4	5	6	7

II: Cereal and Grain Products

(1)	Rice noodles.....	1	2	3	4	5	6	7
(2)	Rice.....	1	2	3	4	5	6	7
(3)	Corn.....	1	2	3	4	5	6	7
(4)	Boiled taro.....	1	2	3	4	5	6	7
(5)	Glutinous rice (white).....	1	2	3	4	5	6	7
(6)	Glutinous rice (black).....	1	2	3	4	5	6	7
(7)	Cake.....	1	2	3	4	5	6	7
(8)	Sweet potato.....	1	2	3	4	5	6	7
(9)	Fermented rice noodles.....	1	2	3	4	5	6	7
(10)	Bread.....	1	2	3	4	5	6	7
(11)	Doughnut.....	1	2	3	4	5	6	7
(12)	Potato chips.....	1	2	3	4	5	6	7
(13)	Biscuit.....	1	2	3	4	5	6	7
(14)	Wafer.....	1	2	3	4	5	6	7
(15)	Wheat noodles.....	1	2	3	4	5	6	7
(16)	Yambean.....	1	2	3	4	5	6	7
(17)	Cassava.....	1	2	3	4	5	6	7
(18)	Small sago.....	1	2	3	4	5	6	7

III: Vegetables and Vegetable Products

(1)	Large cucumber.....	1	2	3	4	5	6	7
(2)	Chinese leek	1	2	3	4	5	6	7
(3)	Wild ginger.....	1	2	3	4	5	6	7
(4)	Garlic (bulbs).....	1	2	3	4	5	6	7
(5)	Boiled peanut.....	1	2	3	4	5	6	7
(6)	Galangal.....	1	2	3	4	5	6	7

(7)	Ginger.....	1	2	3	4	5	6	7
(8)	Cassia (flowers and Leaves).....	1	2	3	4	5	6	7
(9)	Sesbania (flowers).....	1	2	3	4	5	6	7
(10)	Rice bean seeds.....	1	2	3	4	5	6	7
(11)	Ivygourd (leaves).....	1	2	3	4	5	6	7
(12)	Green Onion	1	2	3	4	5	6	7
(13)	Cucumber.....	1	2	3	4	5	6	7
(14)	Cowpea seeds.....	1	2	3	4	5	6	7
(15)	Yard-long beans	1	2	3	4	5	6	7
(16)	Wing beans.....	1	2	3	4	5	6	7
(17)	Sugar peas.....	1	2	3	4	5	6	7
(18)	Angled-type gourd	1	2	3	4	5	6	7
(19)	Water mimosa.....	1	2	3	4	5	6	7
(20)	Chinese cabbage.....	1	2	3	4	5	6	7
(21)	Pickled Chinese mustard.....	1	2	3	4	5	6	7
(22)	Soybean.....	1	2	3	4	5	6	7
(23)	Collard (leaves and stems).....	1	2	3	4	5	6	7
(24)	Chinese swamp cabbage.....	1	2	3	4	5	6	7
(25)	Sweet pepper (green).....	1	2	3	4	5	6	7
(26)	Young Pepper.....	1	2	3	4	5	6	7
(27)	Squash.....	1	2	3	4	5	6	7
(28)	Waxgourd.....	1	2	3	4	5	6	7
(29)	Eggplant.....	1	2	3	4	5	6	7
(30)	Tomatoes.....	1	2	3	4	5	6	7
(31)	Bamboo shoots.....	1	2	3	4	5	6	7
(32)	Shallot.....	1	2	3	4	5	6	7
(33)	Onion.....	1	2	3	4	5	6	7

IV: Fruits

(1)	Khai banana.....	1	2	3	4	5	6	7
(2)	Jackfruit.....	1	2	3	4	5	6	7

(3)	Cantaloupe.....	1	2	3	4	5	6	7
(4)	Rambutan.....	1	2	3	4	5	6	7
(5)	Roseapple.....	1	2	3	4	5	6	7
(6)	Hom banana.....	1	2	3	4	5	6	7
(7)	Water melon.....	1	2	3	4	5	6	7
(8)	Durian.....	1	2	3	4	5	6	7
(9)	Sugarapple.....	1	2	3	4	5	6	7
(10)	Guava.....	1	2	3	4	5	6	7
(11)	Jujube.....	1	2	3	4	5	6	7
(12)	Nam Wa banana.....	1	2	3	4	5	6	7
(13)	Sweet tamarind.....	1	2	3	4	5	6	7
(14)	Tangerine.....	1	2	3	4	5	6	7
(15)	Bovea.....	1	2	3	4	5	6	7
(16)	Mango.....	1	2	3	4	5	6	7
(17)	Ripe Papaya.....	1	2	3	4	5	6	7
(18)	Mangosteen.....	1	2	3	4	5	6	7
(19)	Sapodilla.....	1	2	3	4	5	6	7
(20)	Langsat.....	1	2	3	4	5	6	7
(21)	Longan.....	1	2	3	4	5	6	7
(22)	Litchi.....	1	2	3	4	5	6	7
(23)	Sugar-plum.....	1	2	3	4	5	6	7
(24)	Santol.....	1	2	3	4	5	6	7
(25)	Pineapple.....	1	2	3	4	5	6	7
(26)	Apple.....	1	2	3	4	5	6	7
(27)	Grapes.....	1	2	3	4	5	6	7

V: Fats and Oils

(1)	Coconut oil.....	1	2	3	4	5	6	7
(2)	Lard.....	1	2	3	4	5	6	7
(3)	Butter.....	1	2	3	4	5	6	7
(4)	Coconut milk.....	1	2	3	4	5	6	7

APPENDIX D

DEMOGRAPHIC QUESTIONNAIRE

(Adolescent's Form)

DIRECTIONS: The following questions asks you for information about yourself, your parents, and your family. Please complete all questions asked. Thank you!

INFORMATION ABOUT YOU

(1) What is your sex? (check one)

_____ Male _____ Female

(2) How old are you? (please specify your age) _____

(3) Please rate your present physical health status (check one).

_____ Excellent _____ Good _____ Fair _____ Poor

(4) Do you presently have any physical disabilities or suffer from any illness? (check one)

_____ Yes _____ No

If yes, please describe your disability or illness. _____

(5) Are you presently living with both of your parents? (check one)

_____ Yes _____ No

If no, please describe your present living accomodations. _____

INFORMATION ABOUT YOUR FATHER

(1) How old is your father? (please specify his age) _____

(2) What is your father's level of education? (check one)

- ☐ lower than high school
- ☐ high school
- ☐ college of technical training
- ☐ bachelors degree
- ☐ masters or doctoral degree

(2) What is your father's occupation? (please describe his position)

INFORMATION ABOUT YOUR MOTHER

(1) How old is your mother? (please specify her age) _____

(2) What is your mother's level of education? (check one)

- ☐ lower than high school
- ☐ high school
- ☐ college or technical school
- ☐ bachelors degree
- ☐ masters or doctoral degree

(3) What is your mother's occupation? (please describe her position)

(4) What is your mother's marital status? (check one)

- ☐ married
- ☐ single
- ☐ divorced/separated
- ☐ other, please specify _____

INFORMATION ABOUT YOUR FAMILY

(1) Please estimate your family's monthly income. (check one)

- ☐ less than 5,000 Baht
- ☐ 5,000 - 9,999 Baht
- ☐ 10,000 - 14,999 Baht
- ☐ 15,000 - 20,000 Baht
- ☐ more than 20,000 Baht

APPENDIX E

QUESTIONNAIRES IN THAI

แบบสอบถามทัศนคติเกี่ยวกับอาหารและโภชนาการ

(สำหรับมารดาเป็นผู้ตอบ)

คำชี้แจง : ขอให้ท่านโปรดอ่านและพิจารณาข้อความในข้อต่าง ๆ อย่างถี่ถ้วน แล้วเลือก

วงกลมล้อมรอบคำตอบเพียง 1 คำตอบ

1 = ไม่เห็นด้วยอย่างยิ่ง

4 = เห็นด้วย

2 = ไม่เห็นด้วย

5 = เห็นด้วยอย่างยิ่ง

3 = ไม่มีความคิดเห็น

ข้อความ :

1. ฉันคำนึงถึงเรื่องการกินอาหารที่มีประโยชน์ทุกมื้อ.....1 2 3 4 5
2. ฉันรู้สึกว่าการกินอาหารทุกวันนี้จะส่งผลต่อสุขภาพ
ของฉันในวันข้างหน้า.....1 2 3 4 5
3. ฉันไม่ต้องกังวลมากนักเกี่ยวกับคุณค่าอาหาร
เมื่อฉันรู้สึกว่าน้ำหนักตัวของฉันยังคงที่.....1 2 3 4 5
4. ฉันเชื่อว่าอาหารเป็นสิ่งสำคัญมากสำหรับการมีสุขภาพดี
และป้องกันโรคภัยไข้เจ็บ.....1 2 3 4 5
5. ฉันชอบที่จะกำหนดรายการอาหารวันต่อวัน มากกว่าที่จะ
กำหนดล่วงหน้าหลาย ๆ วัน.....1 2 3 4 5
6. การใช้เวลาในการวางแผนกำหนดรายการอาหาร
เป็นสิ่งที่คุ้มค่า.....1 2 3 4 5
7. การวางแผนกำหนดรายการอาหาร ล่วงหน้าหลาย ๆ วัน
เป็นสิ่งที่น่ารำคาญ และขาดความเป็นอิสระ.....1 2 3 4 5
8. การวางแผน รายการอาหารล่วงหน้าหลาย ๆ วัน
จะช่วยให้การจ่ายตลาดมีประสิทธิภาพมากขึ้น.....1 2 3 4 5
9. ถ้าฉันมีการวางแผนล่วงหน้าในการเตรียมอาหาร
แต่ละมื้อ ฉันก็สามารถประหยัดเวลาได้มากขึ้น.....1 2 3 4 5
10. ฉันชอบมากถ้าได้ทำอาหารตามตำรับของตัวเอง.....1 2 3 4 5
11. การทำอาหารเป็นศิลปะอย่างหนึ่ง.....1 2 3 4 5

12. การดัดแปลงส่วนผสมจากตำรับอาหารเดิมไปบ้าง
ทำให้ฉันรู้สึกว่าเป็นสูตรอาหารของตัวเอง.....1 2 3 4 5
13. ฉันมักจะเตรียมอาหารมื้อพิเศษในวันหยุด.....1 2 3 4 5
14. ฉันพยายามจะทำอาหารที่มีคุณค่าต่อร่างกายยิ่งขึ้น
ถ้าฉันรู้ว่าจะต้องเตรียมอาหารอะไรบ้าง.....1 2 3 4 5
15. ถึงแม้ว่าฉันจะไม่ชอบอาหารที่เตรียมโดยวิธีเดิม
แต่ฉันก็จะไม่พยายามที่จะลองเตรียมโดยวิธีอื่น.....1 2 3 4 5
16. ฉันชอบรับประทานอาหาร เฉพาะที่ฉันคุ้นเคยเท่านั้น....1 2 3 4 5
17. ฉันชอบลองรับประทานอาหารที่ไม่เคยเห็นมาก่อน.....1 2 3 4 5
18. ปกติฉันจะไม่ชิมอาหารที่มีลักษณะคล้ายบางสิ่งบางอย่าง
ที่ฉันไม่ชอบ.....1 2 3 4 5
19. ฉันพอใจที่จะให้คนในครอบครัวของฉันรับประทานอาหาร
อย่างที่เคยชอบรับประทานกันมาช้านานมากกว่าที่จะให้
รับประทานอาหารที่แปลกใหม่แตกต่างไปจากเดิม.....1 2 3 4 5
20. หากฉันพอใจอาหารที่ฉันรับประทานอยู่แล้ว ก็ไม่มีเหตุผล
อะไรที่ฉันต้องเปลี่ยนไปรับประทานอาหารชนิดอื่น ๆ.....1 2 3 4 5
21. ฉันเชื่อว่า คนที่มีความพอใจมากที่สุดกับรสชาติอาหารคือ
คนที่จำใจอยู่กับการกินอาหารที่ซ้ำซาก.....1 2 3 4 5
22. ฉันคิดว่าโภชนาการมีความสำคัญต่อสุขภาพ.....1 2 3 4 5
23. การกินอาหารที่ดีจะช่วยป้องกันโรคภัยไข้เจ็บ.....1 2 3 4 5
24. อาหารที่ฉันรับประทานอยู่จะช่วยทำให้ฉันมีสุขภาพดี.....1 2 3 4 5
25. ฉันเรียนรู้ที่จะกินผลไม้มากกว่าขนมหวาน.....1 2 3 4 5
26. ฉันไม่ค่อยสนใจเรื่องนิสัยการกินของฉันเท่าไรนัก.....1 2 3 4 5
27. ฉันจะหยุดรับประทานอาหารเฉพาะเมื่อฉันไม่สามารถ
รับประทานต่อไปได้อีก.....1 2 3 4 5
28. ฉันไม่ค่อยใส่ใจเกี่ยวกับอาหารที่ฉันรับประทาน.....1 2 3 4 5
29. ฉันรับประทานอะไรก็ได้ตามที่ฉันอยากจะรับประทาน
โดยไม่คำนึงถึงว่าดีต่อร่างกายหรือไม่.....1 2 3 4 5

30. ฉันไม่มีเวลาว่างพอที่จะคิดถึงเรื่องโภชนาการ.....1 2 3 4 5
31. การรู้ว่าอาหารชนิดไหนดีต่อสุขภาพมีอิทธิพลน้อยมากต่อการ
ตัดสินใจของฉันในการเลือกอาหารที่จะรับประทาน.....1 2 3 4 5

แบบสอบถามความรู้เกี่ยวกับอาหารและโภชนาการ

(สำหรับมารดาเป็นคำตอบ)

คำชี้แจง : จงพิจารณาประโยคในแต่ละข้อต่อไปนี้แล้วเลือกวงกลมเพียง 1 คำตอบที่ตรง

กับความคิดของท่าน

✓ = เป็นจริง

X = ไม่เป็นจริง

0 = ไม่ทราบหรือไม่แน่ใจคำตอบ

ข้อความ :

1. ความรู้เกี่ยวกับอาหารหลัก 5 หมู่สามารถนำมาใช้
สำหรับการวางแผนการกินอาหารให้ถูกต้องและเพียงพอ.....✓ X 0
2. "การกินอาหารที่ถูกต้องหลักโภชนาการ" หมายความว่ามีการกิน
อาหารครบทุกหมู่ในปริมาณที่แนะนำหรือกำหนด.....✓ X 0
3. วิตามินดีช่วยทำให้กระดูกเจริญเติบโตเป็นปกติและป้องกัน
โรคกระดูกอ่อน.....✓ X 0
4. ไขมันในพืชมีผลดีต่อร่างกายมากกว่าไขมันในสัตว์.....✓ X 0
5. วิตามินซีช่วยป้องกันโรคเลือดออกตามไรฟัน.....✓ X 0
6. ธาตุเหล็กที่มีอยู่ในตับ, เนื้อสัตว์ และผักใบเขียว
สามารถป้องกันโรคโลหิตจางได้.....✓ X 0
7. ฝรั่ง, ส้มเขียวหวาน, และใบคะน้า มีวิตามินซีมาก.....✓ X 0
8. อาหารที่มีโปรตีนมาก จะให้สารอาหารในปริมาณที่เพียงพอต่อการเจริญเติบโต.....✓ X 0
9. ผักใบเขียวหลายชนิดมีวิตามินเอตามที่ร่างกายต้องการ.....✓ X 0
10. ตับไก่และไข่มีธาตุเหล็ก.....✓ X 0
11. กัวเวิลีงและผลิตภัณฑ์จากกัวเวิลีงสามารถรับประทาน
แทนเนื้อสัตว์ได้.....✓ X 0
12. นมเป็นแหล่งที่มีธาตุแคลเซียมมาก.....✓ X 0
13. ถ้าต้องการลดน้ำหนัก เราต้องงดรับประทานข้าว.....✓ X 0

แบบสอบถามความชอบอาหาร

(สำหรับเด็กวัยรุ่นเป็นผู้ตอบ)

คำชี้แจง : รายชื่ออาหารในแบบสอบถามนี้เป็นอาหารที่คุ้นเคยตามร้านอาหารและท้องตลาด
ทั่วไปขอให้ท่านพิจารณาความชอบอาหารแต่ละชนิดแล้วเลือกวงกลมหมายเลขทาง
ด้านขวามือเพียง 1 คำตอบ

- | | |
|--------------------|-----------------|
| 1 = ไม่ชอบมาก | 5 = ชอบเล็กน้อย |
| 2 = ไม่ชอบปานกลาง | 6 = ชอบปานกลาง |
| 3 = ไม่ชอบเล็กน้อย | 7 = ชอบมาก |
| 4 = เฉย ๆ | |

สมมติว่าอาหารแต่ละชนิดในแบบสอบถามนี้เป็นอาหารที่เตรียมโดยวิธีการที่ง่าย ๆ
เช่น ต้ม หรือทอด เมื่อท่านจะเลือกคำตอบทางขวามือ, โปรดอย่าคำนึงถึงการปรุงอาหารชนิด
นั้น ๆ อย่างซับซ้อนหรือการปรุงอาหารชนิดนั้น ๆ ผสมกับอาหารชนิดอื่น ๆ

1. เนื้อสัตว์ต่าง ๆ และผลิตภัณฑ์จากสัตว์

1. กุนเชียงหมู.....	1	2	3	4	5	6	7
2. ไก่.....	1	2	3	4	5	6	7
3. เป็ด.....	1	2	3	4	5	6	7
4. เนื้อวัว.....	1	2	3	4	5	6	7
5. เนื้อหมู.....	1	2	3	4	5	6	7
6. กุ้งทะเล.....	1	2	3	4	5	6	7
7. ปลาช่อน.....	1	2	3	4	5	6	7
8. ปลากระป๋อง.....	1	2	3	4	5	6	7
9. ปลาเนื้ออ่อน.....	1	2	3	4	5	6	7
10. หอยแครง.....	1	2	3	4	5	6	7
11. หอยนางรม.....	1	2	3	4	5	6	7
12. หอยแมลงภู่.....	1	2	3	4	5	6	7
13. หอยลาย.....	1	2	3	4	5	6	7
14. ไข่ไก่.....	1	2	3	4	5	6	7
15. ไข่เป็ด.....	1	2	3	4	5	6	7
16. ไข่ปลา.....	1	2	3	4	5	6	7
17. นมถั่วเหลือง.....	1	2	3	4	5	6	7
18. กบ.....	1	2	3	4	5	6	7
19. ไส้กรอก (ฝรั่ง).....	1	2	3	4	5	6	7
20. ไส้กรอก (ไส้กรอกอีสาน).....	1	2	3	4	5	6	7

2. ผักพื้นบ้านและผลิตภัณฑ์

1. กว๊วยเตี้ยว.....	1	2	3	4	5	6	7
2. ข้าว.....	1	2	3	4	5	6	7
3. ข้าวโหนด.....	1	2	3	4	5	6	7
4. ข้าวเหนียวขาว.....	1	2	3	4	5	6	7
5. ข้าวเหนียวดำ.....	1	2	3	4	5	6	7
6. ขมเด็ก.....	1	2	3	4	5	6	7
7. ขมจีน.....	1	2	3	4	5	6	7
8. ขมปึงปอนด์.....	1	2	3	4	5	6	7
9. ขมโด้นท.....	1	2	3	4	5	6	7
10. ขมปึงกรอบ.....	1	2	3	4	5	6	7
11. ขมปึงเวเฟอร์.....	1	2	3	4	5	6	7
12. บะหมี่.....	1	2	3	4	5	6	7
13. เผือก.....	1	2	3	4	5	6	7
14. มันเทศ.....	1	2	3	4	5	6	7
15. มันฝรั่ง.....	1	2	3	4	5	6	7
16. มันแกว.....	1	2	3	4	5	6	7
17. มันสำปะหลัง.....	1	2	3	4	5	6	7
18. สาคุ.....	1	2	3	4	5	6	7

3. ผักและผลิตภัณฑ์จากผัก

1. กุ้ยฉ่าย(ดอกและต้น).....	1	2	3	4	5	6	7
2. กระชาย.....	1	2	3	4	5	6	7
3. กระเทียม (หัว).....	1	2	3	4	5	6	7
4. ช่า.....	1	2	3	4	5	6	7
5. ชิง.....	1	2	3	4	5	6	7
6. ช้เหล็ก (ดอกและใบ).....	1	2	3	4	5	6	7

7. ดอกแค.....	1	2	3	4	5	6	7
8. แดงร้าน.....	1	2	3	4	5	6	7
9. ใบตำลึง.....	1	2	3	4	5	6	7
10. ต้นหอม.....	1	2	3	4	5	6	7
11. แดงกวา.....	1	2	3	4	5	6	7
12. ถั่วฝักยาว.....	1	2	3	4	5	6	7
13. ถั่วพู(ฝักอ่อน).....	1	2	3	4	5	6	7
14. ถั่วลันเตา.....	1	2	3	4	5	6	7
15. บวบเหลี่ยม.....	1	2	3	4	5	6	7
16. ผักกระเจต.....	1	2	3	4	5	6	7
17. ผักกาดขาว.....	1	2	3	4	5	6	7
18. ผักกาดตอง.....	1	2	3	4	5	6	7
19. ผักคะน้า (ใบและต้น).....	1	2	3	4	5	6	7
20. ผักบุ้งจีน.....	1	2	3	4	5	6	7
21. พริกหยวก (เขียว).....	1	2	3	4	5	6	7
22. พริกไทยอ่อน.....	1	2	3	4	5	6	7
23. ฟักทอง.....	1	2	3	4	5	6	7
24. ฟักเขียว.....	1	2	3	4	5	6	7
25. มะเขือเปราะ.....	1	2	3	4	5	6	7
26. มะเขือเทศ.....	1	2	3	4	5	6	7
27. หน่อไม้.....	1	2	3	4	5	6	7
28. หอมหัวเล็ก (หอมแดง).....	1	2	3	4	5	6	7
29. หอมหัวใหญ่.....	1	2	3	4	5	6	7
30. ถั่วลิสง.....	1	2	3	4	5	6	7
31. ถั่วแดง.....	1	2	3	4	5	6	7
32. ถั่วดำ.....	1	2	3	4	5	6	7
33. ถั่วเหลือง.....	1	2	3	4	5	6	7

4. ผลไม้

1. กล้วยไข่.....	1	2	3	4	5	6	7
2. ชนุน.....	1	2	3	4	5	6	7
3. แคนตาลูป.....	1	2	3	4	5	6	7
4. เงาะ.....	1	2	3	4	5	6	7
5. ชมพู่.....	1	2	3	4	5	6	7
6. แตงโม.....	1	2	3	4	5	6	7
7. ทูเรียน.....	1	2	3	4	5	6	7
8. น้อยหน่า.....	1	2	3	4	5	6	7
9. ฝรั่ง.....	1	2	3	4	5	6	7
10. พุทรา.....	1	2	3	4	5	6	7
11. มะขามหวาน.....	1	2	3	4	5	6	7
12. ส้มเขียวหวาน.....	1	2	3	4	5	6	7
13. มะปราง.....	1	2	3	4	5	6	7
14. มะม่วง.....	1	2	3	4	5	6	7
15. มะละกอ (สุก).....	1	2	3	4	5	6	7
16. มังคุด.....	1	2	3	4	5	6	7
17. ละมุด.....	1	2	3	4	5	6	7
18. ลางสาด.....	1	2	3	4	5	6	7
19. ลำไย.....	1	2	3	4	5	6	7
20. ลิ้นจี่.....	1	2	3	4	5	6	7
21. ลูกตาล.....	1	2	3	4	5	6	7
22. กระท้อน.....	1	2	3	4	5	6	7
23. ลิ้นปี่.....	1	2	3	4	5	6	7
24. แอปเปิล.....	1	2	3	4	5	6	7
25. องุ่น.....	1	2	3	4	5	6	7
26. กล้วยน้ำว้า.....	1	2	3	4	5	6	7
27. กล้วยหอม.....	1	2	3	4	5	6	7

5. ไขมันและน้ำมัน

1. น้ำมันมะพร้าว.....	1	2	3	4	5	6	7
2. น้ำมันหมู.....	1	2	3	4	5	6	7
3. กะทิ.....	1	2	3	4	5	6	7
4. เนย.....	1	2	3	4	5	6	7

ข้อมูลเกี่ยวกับบิดาของท่าน

- (1) อายุบิดา (ระบุตัวเลขบอกอายุจริง)
- (2) ระดับการศึกษาของบิดา (เลือก 1 ข้อ)
 -ต่ำกว่ามัธยมศึกษาตอนปลาย
 -มัธยมศึกษาตอนปลาย
 -วิทยาลัยอาชีวศึกษา (ประกาศนียบัตร)
 -ปริญญาตรี
 -ปริญญาโทหรือปริญญาเอก
- (3) อาชีพของบิดา (โปรดระบุถึงตำแหน่งด้วยถ้าอาชีพนั้นมีตำแหน่ง เช่น ทหาร, ตำรวจ)

ข้อมูลเกี่ยวกับมารดาของท่าน

- (1) อายุมารดา (ระบุตัวเลขบอกอายุจริง)
- (2) ระดับการศึกษาของมารดา (เลือก 1 ข้อ)
 -ต่ำกว่ามัธยมศึกษาตอนปลาย
 -มัธยมศึกษาตอนปลาย
 -วิทยาลัยอาชีวศึกษา (ประกาศนียบัตร)
 -ปริญญาตรี
 -ปริญญาโทหรือปริญญาเอก
- (3) อาชีพของมารดา (โปรดระบุถึงตำแหน่งด้วยถ้าอาชีพนั้นมีตำแหน่ง เช่น ทหาร, ตำรวจ)

(4) สถานภาพทางการสมรส (เลือก 1 ข้อ)

.....แต่งงานและอยู่ร่วมกับบิดา

.....เป็นโสด

.....หย่าหรือแยกกันอยู่กับสามี

.....อื่นๆ โปรดระบุ

ข้อมูลเกี่ยวกับครอบครัวของท่าน

(1) โปรดประมาณรายได้ของครอบครัว

.....น้อยกว่า 5,000 บาท

.....5,000 - 9,999 บาท

.....10,000 - 14,999 บาท

.....15,000 - 20,000 บาท

.....มากกว่า 20,000 บาท

(2) ให้ใส่ข้อมูลเกี่ยวกับสมาชิกอื่น ๆ ที่อยู่ในครอบครัวเดียวกับท่าน
ลงในช่องว่างข้างล่างนี้โดยบอกอายุ และความสัมพันธ์กับท่าน

ตัวอย่าง	อายุ	ความสัมพันธ์กับท่าน
	18	พี่ชายคนโต
1.
2.
3.
4.
5.
6.

ขอขอบคุณในความกรุณาให้ความร่วมมือครั้งนี้ ถ้ามีข้อเสนอแนะหรือ
คำถามใด โปรดอธิบายลงในช่องว่างที่จัดไว้ให้ข้างล่างนี้

.....

.....

.....

ADOLESCENTS' 24-HOUR DIETARY RECALL

Item	Food Name	Serving	Portion	Amount
224	Bread	26	GRAMS	26.0 GMS
667	Jam pineapple	63	GRAMS	63.0 GMS
559	Cow milk	258	GRAMS	258.0 GMS
172	Hen egg whole cooked	44.46	GRAMS	44.5 GMS
570	Vegetable oil	20.84	GRAMS	20.8 GMS
209	Rice milled cooked	472.5	GRAMS	472.5 GMS
103	Shrimp-common fresh	188	GRAMS	188.0 GMS
219	Wheat flour	29.3	GRAMS	29.3 GMS
101	Shrimp-sea fresh	460	GRAMS	460.0 GMS
478	Sugar pea cooked	23.1	GRAMS	23.1 GMS
346	Corn young	50.4	GRAMS	50.4 GMS
442	Straw mushroom	12.99	GRAMS	13.0 GMS
596	Fish sauce good	34	GRAMS	34.0 GMS
581	Sugar white	4	GRAMS	4.0 GMS
637	Khanom khrok	52.5	GRAMS	52.5 GMS
533	Tangarine	77	GRAMS	77.0 GMS
284	Soybean Curd-White	120	GRAMS	120.0 GMS
72	Pork-meat lean	20	GRAMS	20.0 GMS
139	Squid fresh	44.95	GRAMS	45.0 GMS
348	Ginger young	6	GRAMS	6.0 GMS
103	Shrimp-common fresh	10.35	GRAMS	10.4 GMS
581	Sugar white	4	GRAMS	4.0 GMS
478	Sugar pea cooked	26.94	GRAMS	26.9 GMS
346	Corn young	66.15	GRAMS	66.1 GMS
442	Straw mushroom	12.99	GRAMS	13.0 GMS
581	Sugar white	4	GRAMS	4.0 GMS
148	Sea mussel fresh	70	GRAMS	70.0 GMS
106	Fish ball-cooked	20	GRAMS	20.0 GMS

NUTRIENT VALUES (%RDA)

KCALORIES	2556 Kc	(106%)	PROTEIN	179.4 Gm	(314%)
CARBOHYDRATE	325.1 Gm	(-%)	FAT	54.41 Gm	(-%)
IRON	45.98 Mg	(459%)	VITAMIN A	817.5 RE	(116%)
VITAMIN B12	0.000 Ug	(0%)	FOLACIN	0.000 Ug	(0%)
VITAMIN B6	0.000 Mg	(0%)	NIACIN	20.37 Mg	(113%)
RIBOFLAVIN	2.151 Mg	(126%)	THIAMIN	1.240 Mg	(88%)
VITAMIN C	91.47 Mg	(152%)	VIT. E/TOTAL	0.000 Mg	(0%)
VITAMIN D	0.000 IU	(0%)	CALCIUM	1434 Mg	(119%)
PHOSPHORUS	2974 Mg	(247%)	MONO FAT	0.000 Gm	(-%)
POLY FAT	0.000 Gm	(-%)	FIBER-DIET	0.000 Gm	(-%)
VITAMIN K	0.000 Ug	(-%)			

PROTEIN: 29% CARBOHYDRATE: 52% FAT: 20% ALCOHOL: 0%

Item	Food Name	Serving	Portion	Amount
207	Rice home pounded cooked	485	GRAMS	485.0 GMS
377	Chinese kale	88	GRAMS	88.0 GMS
282	Soybean paste black	10	GRAMS	10.0 GMS
285	Curd cake pressed plain	220	GRAMS	220.0 GMS
581	Sugar white	5	GRAMS	5.0 GMS
301	Soybean cooked	30	GRAMS	30.0 GMS
278	Sesame black	15	GRAMS	15.0 GMS
172	Hen egg whole cooked	58	GRAMS	58.0 GMS
456	Tomato	37	GRAMS	37.0 GMS
415	Onion	59.74	GRAMS	59.7 GMS
342	Gerlic-Bulb	4	GRAMS	4.0 GMS
596	Fish sauce good	4	GRAMS	4.0 GMS
559	Cow milk	636	GRAMS	636.0 GMS
549	Mee-krob	80	GRAMS	80.0 GMS
230	Wheat noodles soaked	75	GRAMS	75.0 GMS
285	Curd cake pressed plain	220	GRAMS	220.0 GMS
368	White cabbage	152	GRAMS	152.0 GMS
82	Pork-yor	80	GRAMS	80.0 GMS
523	Papaya ripe	240	GRAMS	240.0 GMS

NUTRIENT VALUES (%RDA)

KCALORIES	2796 Kc	(151%)	PROTEIN	131.2 Gm	(291%)
CARBOHYDRATE	345.1 Gm	(-%)	FAT	101.6 Gm	(-%)
IRON	26.34 Mg	(175%)	VITAMIN A	1726 RE	(287%)
VITAMIN B12	0.000 Ug	(0%)	FOLACIN	0.000 Ug	(0%)
VITAMIN B6	0.000 Mg	(0%)	NIACIN	11.10 Mg	(79%)
RIBOFLAVIN	2.114 Mg	(162%)	THIAMIN	1.315 Mg	(119%)
VITAMIN C	430.7 Mg	(717%)	VIT. E/TOTAL	0.000 Mg	(0%)
VITAMIN D	0.000 IU	(0%)	CALCIUM	1811 Mg	(150%)
PHOSPHORUS	1933 Mg	(161%)	MONO FAT	0.000 Gm	(-%)
POLY FAT	0.000 Gm	(-%)	FIBER-DIET	0.000 Gm	(-%)
VITAMIN K	0.000 Ug	(-%)			

PROTEIN: 19% CARBOHYDRATE: 49% FAT: 32% ALCOHOL: 0%

APPENDIX G

MEANS AND STANDARD DEVIATIONS OF VARIABLES

Variable	Mean	S.D.
<u>ATFN Questionnaire</u>		
Importance of nutrition and meals	53.27	4.33
Food preparation and caring about nutrition	32.03	3.23
Food habits	18.38	3.66
Total scale	104.16	7.59
<u>KAFN Questionnaire</u>		
General nutrition knowledge	6.06	2.78
Food composition	3.65	2.79
Vitamins	3.80	2.38
Knowledge about well-balanced diet and protein	4.41	2.21
Total scale	17.93	7.29
<u>FP Questionnaire</u>		
Meat, poultry, fish, eggs, and dairy products	100.33	13.83
Cereal and grain products	96.44	11.16
Vegetables and vegetable products	155.71	25.24
Fruit	156.31	18.97
Fats and oils	17.95	4.12
<u>Nutrient Intake</u>		
Calories	2365.04	1197.44
Protein	104.00	58.52
Carbohydrate	316.02	155.09
Total Fat	74.89	48.07
Iron	23.89	19.62

APPENDIX H

DIRECT AND INDIRECT EFFECTS ON ADOLESCENTS' FOOD PREFERENCES OF THE EXTENDED-MODEL II

Variables	Direct effect	Indirect effect	Total effect
K3 -Knowledge about well-balanced diet and protein	-	-	-
K2 -Food composition	.220	-	.220
K1 -General nutrition knowledge	-.407	.144	-.263
A2 -Food preparation and caring about nutrition	.479	-.055	.424
A1 -Importance of nutrition and meals	-.321	.144	-.177
X5 -Family income	.304	-.016	.288
X4 -Mothers' occupation	.135	-.266	-.131
X3 -Mothers' education	-	.281	.281
X2 -Fathers' occupation	.171	.041	.212
X1 -Fathers' education	-.369	-.252	-.621

APPENDIX I

DIRECT AND INDIRECT EFFECTS ON ADOLESCENTS' FOOD PREFERENCES OF THE MODIFIED-MODEL II

Variables	Direct effect	Indirect effect	Total effect
K3 -Knowledge about well-balanced diet and protein	-	-	-
K2 -Food composition	-	-	-
K1 -General nutrition knowledge	-.336	-	-.336
A2 -Food preparation and caring about nutrition	.327	-	.327
A1 -Importance of nutrition and meals	-	.121	.121
X5 -Family income	-	-	-
X4 -Mothers' occupation	-	-.098	-.098
X3 -Mothers' education	-	-	-
X2 -Fathers' occupation	-	-	-
X1 -Fathers' education	-	-	-

APPENDIX J

TESTING THE DIFFERENCE BETWEEN TWO MODELS

The difference between the extended-model II and the modified-model II was tested by calculating the R^2_m and M based on the following formulas;

$$R^2_m = 1 - \{(1-R^2_1)(1-R^2_2).....(1-R^2_i)\}$$

$$M = 1 - \{(1-R^2_1)(1-R^2_2).....(1-R^2_j)\}$$

R^2_m is calculated from R^2 of each step in the extended-model II.

M is calculated from R^2 of each step in the modified-model II.

These two equations were then compared by using the following formula

$$Q = \frac{1 - R^2_m}{1 - M}$$

W was then calculated by using the following formula

$$W = -(N - d)\log Q$$

where N = sample size
 d = the number of paths which were eliminated from the
 extended-model II
 \log = natural logarithm

W was then compared to chi-square with ($df = d$).

If this comparison was not significant, then the modified-model II can be used to explain the relationships among the variables as well as the extended-model II (Specht, 1975).

APPENDIX K

RECOMMENDED DIETARY ALLOWANCES FOR THAI BOYS (16-19 YEARS)

KCALORIES	2400	Kc	NIACIN	18.00	Mg	COPPER	-	Mg
PROTEIN	57.00	Gm	VITAMIN B6	2.000	Mg	MANGANESE	-	Mg
CARBOHYDRATE	-	Gm	FOLACIN	165.0	Ug	IODINE	150.0	Ug
FAT	-	Gm	VITAMIN B12	2.000	Ug	MONO FAT	-	Gm
FIBER-CRUDE	-	Gm	PANTO- ACID	-	Mg	POLY FAT	-	Gm
PROT-VEG	-	Gm	CALCIUM	1200	Mg	CAFFEINE	-	Mg
PROT-ANIMAL	-	Gm	PHOSPHORUS	1200	Mg	FLUORIDE	-	Ug
OLEIC FA	-	Gm	TRYPTOPHAN	-	Mg	MOLYBDENUM	-	Ug
LINOLEIC FA	-	Gm	THREONINE	-	Mg	VITAMIN K	-	Ug
SODIUM	-	Mg	ISOLEUCINE	-	Mg	SELENIUM	-	Mg
POTASSIUM	-	Mg	LEUCINE	-	Mg	BIOTIN	-	Ug
MAGNESIUM	400.0	Mg	LYSINE	-	Mg	CHLORIDE	-	Mg
IRON	10.00	Mg	METHIONINE	-	Mg	CHROMIUM	-	Mg
ZINC	15.00	Mg	CYSTINE	-	Mg	SUGAR	-	Gm
VITAMIN A	700.0	RE	PHENYL-ANINE	-	Mg	FIBER-DIET	-	Gm
VITAMIN D	10.00	IU	TYROSINE	-	Mg	VIT. E/AT	-	Mg
VIT. E/TOTAL	10.00	Mg	VALINE	-	Mg	HEM	-	Mg
VITAMIN C	60.00	Mg	HISTIDINE	-	Mg	NONHEM	-	Mg
THIAMIN	1.400	Mg	ALCOHOL	-	Gm			
RIBOFLAVIN	1.700	Mg	ASH	-	Gm			

APPENDIX L

RECOMMENDED DIETARY ALLOWANCES FOR THAI GIRLS (16-19 YEARS)

KCALORIES	1850	Kc	NIACIN	14.00	Mg	COPPER	-	Mg
PROTEIN	45.00	Gm	VITAMIN B6	2.000	Mg	MANGANESE	-	Mg
CARBOHYDRATE	-	Gm	FOLACIN	145.0	Ug	IODINE	150.0	Ug
FAT	-	Gm	VITAMIN B12	2.000	Ug	MONO FAT	-	Gm
FIBER-CRUDE	-	Gm	PANTO- ACID	-	Mg	POLY FAT	-	Gm
PROT-VEG	-	Gm	CALCIUM	1200	Mg	CAFFEINE	-	Mg
PROT-ANIMAL	-	Gm	PHOSPHORUS	1200	Mg	FLUORIDE	-	Ug
OLEIC FA	-	Gm	TRYPTOPHAN	-	Mg	MOLYBDENUM	-	Ug
LINOLEIC FA	-	Gm	THREONINE	-	Mg	VITAMIN K	-	Ug
SODIUM	-	Mg	ISOLEUCINE	-	Mg	SELENIUM	-	Mg
POTASSIUM	-	Mg	LEUCINE	-	Mg	BIOTIN	-	Ug
MAGNESIUM	400.0	Mg	LYSINE	-	Mg	CHLORIDE	-	Mg
IRON	15.00	Mg	METHIONINE	-	Mg	CHROMIUM	-	Mg
ZINC	15.00	Mg	CYSTINE	-	Mg	SUGAR	-	Gm
VITAMIN A	600.0	RE	PHENYL-ANINE	-	Mg	FIBER-DIET	-	Gm
VITAMIN D	10.00	IU	TYROSINE	-	Mg	VIT. E/AT	-	Mg
VIT. E/TOTAL	8.000	Mg	VALINE	-	Mg	HEM	-	Mg
VITAMIN C	60.00	Mg	HISTIDINE	-	Mg	NONHEM	-	Mg
THIAMIN	1.100	Mg	ALCOHOL	-	Gm			
RIBOFLAVIN	1.300	Mg	ASH	-	Gm			

APPENDIX M

LIST OF SIX THAI NUTRITIONISTS

รายชื่อผู้เชี่ยวชาญทางด้านอาหารและโภชนาการ

รศ. วลัย อินทรรั่มพรรย์

คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ ประสานมิตร

ดร. มลศิริ วิโรทัย

คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ ประสานมิตร

ผศ. ธรา วิริยะพานิช

สถาบันวิจัยโภชนาการ มหาวิทยาลัยมหิดล

ดร. อรุโพร จิตต์แจ้ง

สถาบันวิจัยโภชนาการ มหาวิทยาลัยมหิดล

ดร. พงศธร สัมพันธ์

สถาบันวิจัยโภชนาการ มหาวิทยาลัยมหิดล

ดร. พัชรณี วินิจจะกุล

สถาบันวิจัยโภชนาการ มหาวิทยาลัยมหิดล