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Korean female adolescents' food attitudes and food intake relative to the Korean Food Tower

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**Korean female adolescents' food attitudes and food intake
relative to the Korean Food Tower**

by

Kyeung-Eun Kim Park

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
DOCTOR OF PHILOSOPHY

Major: Family and Consumer Sciences Education

Major Professor: Rosalie J. Amos

Iowa State University

Ames, Iowa

1999

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TABLE OF CONTENTS

LIST OF TABLES	vi
ABSTRACT	x
CHAPTER I. INTRODUCTION	1
Objectives	3
Research Questions	3
Assumptions	3
Limitations	4
Organization	4
Definitions	4
CHAPTER II. REVIEW OF LITERATURE	5
Factors Influencing Food Intake	5
Adolescent Nutrition	6
Adolescent growth and development	7
Factors influencing growth and maturation	8
Nutrient needs during adolescence	8
Recommended Dietary Allowances for Korean Adolescents	11
Cultural Background Related to the Nutritional Problems of Korean Secondary School Students	12
Studies Related to Korean Adolescent Food Behaviors and Nutritional Status	13
The Korean Food Tower	16
Standard serving size of foods	17
Recommended serving frequencies for Korean Adolescents	18
Food Frequency Methodology	18
Rationale and conceptual basis	18
Strengths	20
Weaknesses	20
Validity	22
CHAPTER III. METHODS	24
Preliminary Study	24
Preliminary checklist	24
Preliminary testing	25
Sample	25
Data analysis	26
Instrument Development	26
Food frequency	26
Food attitude scale	27

Demographic information	27
Pilot Testing	28
Expert judges	28
Instrument revision	28
Use of Human Subjects	29
Testing	29
Data collection	29
Data analysis	30
CHAPTER IV. RESULTS AND DISCUSSION	32
Description of Sample	32
Description of Food Frequency	35
Grain products	40
Vegetables and fruits	42
Seasonal vegetables and fruits	46
Meat, eggs, fish, shellfish, beans, and nuts	51
Milk and milk products	55
Fats and sweets	57
Summary of food serving frequency and serving size	60
Discussion on the total standardized serving frequency	62
Description of Food Attitudes	64
Analysis of instrument	64
Factor 1. Conscious choice of food	68
Factor 2. Health concerns	70
Factor 3. Economics and time influence	72
Factor 4. Interest in foods	73
Factor 5. Foods that energize	74
Summary and discussion	74
Relationships among Food Intake, Attitudes, and Demographic Data	76
Relationship between food intake and food attitudes	76
Demographic influence on food intake and food attitudes	77
Effect of grade level on food intake and food attitudes	78
Effect of other demographic data on food intake and food attitudes	79
Summary	92
CHAPTER V. SUMMARY AND CONCLUSIONS	94
APPENDIX A. KOREAN FOOD TOWER	99
APPENDIX B. PRELIMINARY CHECKLIST	101
APPENDIX C. INSTRUMENT	123
APPENDIX D. HUMAN SUBJECTS APPROVAL	144

APPENDIX E. LETTERS	146
APPENDIX F. ADDITIONAL TABLES	151
REFERENCES	154
ACKNOWLEDGMENTS	158

LIST OF TABLES

Table 2.1.	Recommended dietary allowances for Korean adolescents by gender and age	12
Table 2.2	Examples of medium-sized servings for the five food groups	17
Table 2.3.	Recommended serving frequencies per day for Korean adolescents	18
Table 3.1.	Code for serving frequency and serving size	30
Table 4.1.	Distribution of adolescents' ages	32
Table 4.2.	Education level of parents	33
Table 4.3.	Parents' monthly income	33
Table 4.4.	Family size	34
Table 4.5.	Health and dental status	34
Table 4.6.	Mean body weight, height, and BMI by age	35
Table 4.7.	Distribution of serving frequency and serving size (in percentage) of grain products	36
Table 4.8.	Means for daily serving frequency, serving size, and standardized serving frequency of grain products	38
Table 4.9.	Weighting factors for serving frequency and serving size	39
Table 4.10.	Distribution of the total standardized serving frequency of intake for grain products	40
Table 4.11.	Distribution of serving frequency and serving size (in percentage) for vegetables and fruits	43
Table 4.12.	Means for daily serving frequency, serving size, and standardized serving frequency of vegetables and fruits	44
Table 4.13.	Distribution of the total standardized serving frequency of intake for vegetables and fruits	46

Table 4.14.	Distribution for serving frequency and serving size (in percentage) of seasonal vegetables and fruits	47
Table 4.15.	Means for daily serving frequency, serving size, and standardized serving frequency of seasonal vegetables and fruits	48
Table 4.16.	Months of the year seasonal vegetables and fruits are available and the year equivalent for the available period	49
Table 4.17.	Distribution of the total standardized serving frequency of intake for seasonal vegetables and fruits through the year	50
Table 4.18.	Distribution of the total standardized serving frequency for intake of vegetables and fruits with the seasonal ones	51
Table 4.19.	Distribution of serving frequency and serving size (in percentage) for the meat group	52
Table 4.20.	Means for daily serving frequency, serving size, and standardized serving frequency of the meat group	53
Table 4.21.	Distribution of the total standardized serving frequency of intake for the meat group	54
Table 4.22.	Distribution for serving frequency and serving size (in percentage) of milk products	56
Table 4.23.	Means for daily serving frequency, serving size, and standardized serving frequency of the milk group	57
Table 4.24.	Distribution of the total standardized serving frequency for the intake of the milk group	57
Table 4.25.	Distribution for serving frequency and serving size (in percentage) of fats and sweets	58
Table 4.26.	Means for daily serving frequency, serving size, and standardized serving frequency of fats and sweets	59
Table 4.27.	Distribution of the total standardized serving frequency of the intake for fats and sweets	60
Table 4.28.	Estimated mean total standardized serving frequency, the serving frequency recommended by The Korean Nutrition Society, and the percentage of the sample consuming less than the recommendation	63

Table 4.29.	Percentage of the respondents who meet the recommended serving frequency in the number of food groups	64
Table 4.30.	Reliability coefficients of the 22-item attitude scale for the five food groups	65
Table 4.31.	Profile of the sample distribution among the 5 scales with respect to the 22 attitude items on the instrument, in percentage	66
Table 4.32	Reliability of all the items in each factor with respect to the total food groups	68
Table 4.33.	Food attitude scores by the five factors and the five food groups	69
Table 4.34.	Mean scores of the seven items on factor 1 indicating “conscious choice of food” for the five food groups	70
Table 4.35.	Mean scores of the six items in factor 2 indicating “health concerns” for the five food groups	71
Table 4.36.	Mean scores of the four items in factor 3 indicating “economics and time influence” for the five food groups	72
Table 4.37.	Mean scores of the three items in factor 4 indicating “interest in foods” for the five food groups	73
Table 4.38.	Mean scores of the two items in factor 5 indicating “foods that energize” for the five food groups	74
Table 4-39.	Intercorrelation matrix between total standardized serving frequency of five food groups and five factors of food attitudes	77
Table 4.40.	Means of total standardized serving frequency of five food groups by grade	79
Table 4.41.	Parameter estimates of the food intake for the five food groups	80
Table 4.42.	Means of attitude scores for the five food groups by grade	82
Table 4.43.	Parameter estimates of the five food attitudes for grain products	83
Table 4.44.	Parameter estimates of the five food attitudes for vegetables and fruits	85
Table 4.45.	Parameter estimates of the five food attitudes for the meat group	87

Table 4.46.	Parameter estimates of the five food attitudes for the milk group	89
Table 4.47.	Parameter estimates of the five food attitudes for fats and sweets	91
Appendix F.1.	The 22 attitude items and their item-total correlation coefficients	152
Appendix F.2.	Factor loading of factor 1	153
Appendix F.3.	Factor loading of factor 2	153
Appendix F.4.	Factor loading of factor 3	153
Appendix F.5.	Factor loading of factor 4	153
Appendix F.6.	Factor loading of factor 5	153

ABSTRACT

A survey was conducted to examine food intake and food attitudes of 285 Korean female students attending a high school in Seoul. Food intake was assessed using a food frequency based on the Korean Food Tower consisting of five food groups, i.e., grain products, vegetables and fruits, meat, milk, and fats and sweets. The food attitude scale consisted of 22 items that were categorized into five factors with items about conscious choice of food, health concerns, economics and time influence, interest in foods, and foods that energize in regard to each of the five food groups.

An analysis of the food frequency indicated that the participants ate rice, cabbage kimchi, radish, and soybean or red pepper paste most frequently along with milk, ice cream, tea, and seasonal fruits such as citrus fruit, apple, watermelon, and grapes. The mean serving frequency for each food group was 10 to 77% above what is recommended by the Korean Nutrition Society, except in the case of fats and sweets where it was 12.5% below.

Attitudes about the foods indicated that most of the participants did not consider economics, time, or other external influences as a limiting factor in their food consumption. Their food attitudes may be characterized by a favorable evaluation for vegetables and fruits on all of the five factors considered in this study, and an unfavorable evaluation of the meat, and fats and sweets groups in health concerns.

In examining the relationships between food intake and food attitudes, some of them were positively correlated with each other ($p < .01$). In addition, the effect of income on the intake of the meat and fats and sweets groups was found to be most noticeable ($p < .01$).

Other factors that had a significant influence included grade, age, father's education, mother's education, health status, and dental status ($p < .05$ or $p < .01$).

CHAPTER I. INTRODUCTION

There is no school lunch program for secondary school students in Korea. Most of the students carry home-prepared box lunches. At times, they carry two box lunches: one for lunch, the other for dinner. Some of the students have lunch in the snack bar operated by the school or eat lunch or dinner in fast food restaurants near the school (Ko, Kim, & Mo, 1991). They seem to eat nutritionally unbalanced lunches in most cases. In addition, some students skip breakfast to get to school on time and also have irregular lunch or dinner times (Kim & Lee, 1993). Sometimes they eat too much at one time because they skip breakfast or lunch. Therefore, the students have various types of diet-related problems such as malnutrition, obesity, stomach upset, and constipation (Mo, 1990). They are under a great burden of school work and preparation for entrance examinations, and, therefore, do not have enough time to spend on anything other than studying.

During the period of adolescence, youth need adequate intake of energy and nutrients to achieve optimal growth, development, and health. The adolescent years are highly formative for the development of health-promoting as well as health-damaging behaviors. The food habits acquired in this period have a great impact on future health. It is important for adolescents to practice food behaviors that meet their current nutrient needs and to adopt dietary and exercise behaviors that will delay the onset of chronic disease in later life (Terry, 1993, pp. 103-112). Three research studies of American adolescents suggested a need to use adolescence as a teachable moment for nutrition because of the adolescents' interest in body image (Pearce, 1985; Pearce, Amos, & Terry, 1987; Searles, Terry, & Amos, 1986). Parents,

schools, and the government need to attempt to help these young individuals make a successful and healthy transition to adulthood by promoting healthy food behaviors.

Food choices are influenced by many factors: food supply and food availability; income and food prices; demographic factors; environmental factors; biological factors; sociocultural factors; food preferences, cognition, and attitudes; and food beliefs (Boyle & Morris, 1994, pp. 240-246). Demographic, environmental, and other factors shape many of our personal attributes such as food preferences, cognition, and attitudes. These attributes in turn affect our food choices. Research correlating attitudes and behavior is one of the most complex areas of consumer behavior. Early attitude research, conducted at the turn of the century, suggested that an individual's behavior was determined to a great extent by his or her attitudes toward that behavior. Beginning in the 1930s, however, some researchers began to suspect that there was no predictable relationship between attitude and any given behavior. By the 1970s, some investigators concluded that attitudes could not be used to predict behavior. Today attitudes are believed to influence behavior indirectly (Ajzen & Fishbein, 1980, pp. 13-27).

In the literature search, comprehensive studies were not found about food attitudes and food intake of Korean secondary school students relative to the Korean Food Tower. The purposes of this study were to examine Korean adolescents' food attitudes and food intake relative to the Korean Food Tower, and to determine the relationships between the participants' food intake and attitudes. This study will provide baseline data to develop future nutrition education programs and improve the home economics curriculum for secondary school students in Korea.

Objectives

The objectives of the study were as follows:

1. Examine the food intake of Korean secondary school female students based on five basic food groups of the Korean Food Tower (Appendix A).
2. Assess the food attitudes of Korean secondary school female students.
3. Examine the relationships among the participants' food intake, food attitudes, and demographic factors.

Research Questions

More specifically, the study was designed to answer the following research questions:

1. Are there any relationships between food intake and food attitudes?
2. Are there any differences in food intake and food attitudes among 9th, 10th, and 11th grade female students?
3. Are there any differences in food intake and food attitudes related to demographic characteristics?

Assumptions

The study was based on the following assumptions:

1. The participants responded to the survey accurately and honestly.
2. The food frequency questionnaire provided meaningful data about the food intake of the Korean female secondary school students.
3. The food attitude questionnaire provided meaningful data about the food attitudes of the Korean female secondary school students.

Limitations

The study was confined by the following limitations:

1. Only one school was used to gather data. This may restrict the generalizability of the results for the entire population group.
2. The use of questionnaires as the data collection method may not reveal all of the respondents' food intake or food attitudes.
3. The food frequency method used to estimate food consumption relies on the respondents' memory, therefore, it may be inaccurate or incomplete.

Organization

The study is organized into five chapters. They are: Introduction, Review of Literature, Methods, Results and Discussion, and Summary and Conclusions.

Definitions

For the purposes of this study, the following definitions were used:

Food attitudes: Food attitudes are how people feel about the foods, i.e., measurements of opinions about food such as agreement or disagreement (Terry, 1993, p. 24).

Food intake: Food intake refers to the foods eaten, how often and how much (Terry, 1993, p. 24). Food frequency instruments are used to determine how often and how much the respondents consume of each food item.

CHAPTER II. REVIEW OF LITERATURE

Increased understanding of the relationship between the diet and health has increased public interest in the nutrition and has spurred research related to the role of the diet, food consumption, factors influencing food intake, nutritional problems, and nutritional goals of specific population groups. Such information is useful for developing nutrition intervention programs and designing nutrition education materials. This study examined the food attitudes and food intake of Korean secondary students relative to the Korean Food Tower to improve the Korean home economics curriculum and to develop a nutrition education program. This literature review is divided into seven subsections: (a) Factors Influencing Food Intake, (b) Adolescent Nutrition, (c) Recommended Dietary Allowances for Korean Adolescents, (d) Cultural Background Related to the Nutritional Problems of Korean Secondary Students, (e) Studies Related to Korean Adolescent Food Behaviors and Nutritional Status, (f) The Korean Food Tower, and (g) Food Frequency Methodology.

Factors Influencing Food Intake

Food choices are influenced by several factors: (a) food supply and food availability; (b) income and food prices; (c) demographic factors; (d) environmental factors; (e) biological factors; (f) sociocultural factors; (g) food preferences, cognition, and attitudes; and (h) food beliefs (Boyle & Morris, 1994, pp. 240-246). Demographic, environmental, and other factors shape many of our personal attributes such as food preferences, cognition, and attitudes. These attributes in turn affect our food choices. Because food choices are affected largely by perception, it seems logical that consumers who have learned about food composition and

healthful eating practices would have the knowledge base needed to select foods for good health. However, consumers do not always practice what they have learned (Parraga, 1990). Research on the correlation between attitudes and behavior is one of the most complex areas of consumer behavior. Early attitude research conducted at the turn of the century suggested that an individual's behavior is determined to great extent by his or her attitudes toward that behavior. However, in the 1930s some researchers began to suspect that there was no predictable relationship between attitude and any given behavior. By the 1970s, some investigators concluded that attitudes could not be used to predict behavior. Today attitudes are believed to influence behavior indirectly (Ajzen & Fishbein, 1980, pp. 13-27).

The influences of peers and conformity to peer pressure often are considered as important factors affecting adolescent behavior. With a greater emphasis on group norms during adolescence, the influence of peers is directed more strongly toward attitudes than toward specific behaviors. One may assume that peer influence plays a significant role in shaping adolescent eating behavior, although data substantiating this assumption are lacking (Crockett & Sims, 1995).

Adolescent Nutrition

Adolescence is a period of transition from childhood to adulthood with a broad spectrum of biological changes, alterations in body composition, and sexual maturation. It is important to understand these basic changes and nutritional needs in order to plan effective nutrition education strategies for this age group.

Adolescent growth and development

Adolescence is the only time following birth when the rate of growth accelerates (Gong & Heald, 1988, pp. 969-981). Teenagers attain approximately 15% of their final adult height and about 45% of their maximal skeletal mass (Spear, 1995, pp. 3-24).

Chronologically, this height spurt may occur between 10 and 13 years of age for girls, and 12 and 15 years of age for boys (Gong & Spear, 1988). The rate of weight gain during adolescence parallels that of the height spurt. Weight gain during this period accounts for approximately 40 to 50% of the ideal adult weight (Boyle & Morris, 1994, pp. 429-433).

Menarche, one of the major developmental milestones for female adolescents, occurs approximately one year following peak height velocity. Therefore, an adolescent who has reached menarche is in the deceleration phase of growth. Any height increases after menarche are limited, since approximately 98% of the final adult height has been attained (Gong & Spear, 1988).

Elevated androgen levels have a growth-promoting effect for both males and females. However, females tend to deposit more fat than muscle mass due to the impact of the female sex hormones, estrogen and progesterone (Spear, 1995, pp. 3-24). In contrast to girls, boys gain proportionately more muscle mass than fat under the influence of testosterone and the anabolic adrenal androgens. Therefore, males have more lean body mass per unit height than females (Forbes, 1988, pp. 533-569). These changes in body composition accompanying this growth have a great influence on the nutritional needs of teenagers, particularly in regard to energy, iron, and protein needs for tissue synthesis (Spear, 1995, pp. 3-24).

Factors influencing growth and maturation

Genetic and environmental factors are known to play roles in adolescent growth and maturation. There is a strongly positive genetic component in the determination of height, weight, body shape, and breast size, as well as the rate of growth. When environmental factors are controlled for, then, genetic factors are found to exert a major influence on puberty and growth of adolescents (Spear, 1995, pp. 3-24).

Environmental factors include nutritional status, socioeconomic status, disease, and illness. Adolescents living in developed countries generally are taller and attain puberty at younger ages than those living in developing countries. These trends are probably due to a better nutritional status related to a high socioeconomic status (Spear, 1995, pp. 3-24).

Nutrient needs during adolescence

Few specific experimental data exist on which to base the nutrient needs of adolescents. Most recommendations are based on estimates of intake under good and normal health conditions, extrapolations from animal research, or interpolation from the studies of children and adults (Spear, 1995, pp. 3-24). Because of the wide ranges of growth rate, physical activity, metabolic rate, physiological status, and adaptability of adolescents, it is difficult to estimate specific nutrient requirements for the adolescents. For practical reasons, the Recommended Dietary Allowances (RDA) for adolescents are categorized by chronological age rather than the maturational development. Thus, practitioners should use the RDA with caution (Gong & Heald, 1988).

The caloric requirements for growing adolescents have not been studied enough to give an accurate amount of the energy needs of individuals. Few studies have investigated

the relationship between growth and caloric intake. It has been reported that the highest caloric intake occurs during the growth spurt (peak height velocity). Due to significant variation in timing and intensity of growth observed in adolescents, large variations in caloric intake among this group should be considered and emphasized (Spear, 1995, pp. 3-24).

Physical activity also contributes significantly to individual total energy requirement.

Protein metabolism is particularly sensitive to caloric restriction in adolescents during their growth spurt (Gong & Heald, 1988). During adolescence, protein needs, like those for energy, correlate more closely with the physical growth pattern than with chronological age. Using the RDA for protein in relation to height is probably the most useful guideline for estimating protein needs. Adolescents who restrict food intake and those in low-income groups have a high risk for inadequate protein intake. In addition, adolescent females who practice dieting patterns resulting in restricted calorie intake are likely to have potential health problems when protein sources are used to meet energy needs.

Mineral needs increase during adolescence. Dietary surveys have consistently shown that calcium and iron intakes are marginal in an adolescent's diet (Gong & Spear, 1988), which often is due to the strong tendency to make popular rather than nutritional food choices (Story, 1984, pp. 77-103), especially sugar-containing snacks (Guenther, 1986).

Calcium needs are greater during adolescence than in childhood or adulthood due to accelerated muscular, skeletal, and endocrine development during this period. Skeletal growth during adolescence accounts for approximately 45% of the adult skeletal mass (Spear, 1995, pp. 3-24). At the peak of the growth spurt, the daily deposition of calcium can be twice that of the average increment during the adolescent period (Gong & Heald, 1988). The National Academy of Science issued a new RDA for calcium, recommending 1300 mg

per day for adolescents to meet the needs of the growth spurt during adolescence (Yates, Schlicker, & Sutor, 1998).

During adolescence there is an increased need for iron to aid the expansion of red blood cells and muscle mass. Teenagers also require additional amounts of iron to synthesize the substantial amounts of new myoglobin and hemoglobin. The dietary intake of iron must be sufficient to account for losses through the feces, urine, skin, and menstruation, as well as to provide for the expansion of red blood cell volume and tissue growth. During menarche adolescent girls have additional iron loss from menstruation. The National Research Council (NRC) recommends 18 mg iron intake daily for both adolescent boys and girls (Food and Nutrition Board, 1989). In spite of the significant increase in the need for iron, iron intake has been below the recommended level for adolescents. Iron deficiency has been observed in both genders and in lower socioeconomic groups of all races. Adolescent females who typically have a lower caloric intake than males may have more difficulty in obtaining adequate levels of iron from their diets (Gong & Spear, 1988).

Zinc is essential for healthy growth and sexual maturation in adolescents and it has been shown to have a role in protein synthesis. Zinc deficiency is associated with growth retardation and hypo-gonadism in adolescents (Gong & Heald, 1988, pp. 969-981). There are two major factors responsible for the development of zinc deficiency, resulting in growth retardation and delayed sexual maturation: zinc intake from poor dietary zinc sources and inhibition of zinc absorption by phytates generally found in high cereal diets. Adolescents who are in a stage of rapid growth are likely to be at high risk for zinc deficiency. Pregnant teenagers may be particularly susceptible to zinc deficiency. Zinc intake should be sufficient for the fetus and for the adolescents, themselves, since there is a rapid cell division and

growth of the fetus, as well as the continued growth of the biologically immature teenager (Gong & Heald, 1988, pp. 969-981).

The recommended vitamin allowances for teenagers are extrapolated from other age group estimates (Gong & Heald, 1988). Due to growth and increased energy demands of adolescents there also is an increase in the need for thiamin, riboflavin, and niacin. There also is an increase in the demand for vitamin B6, folic acid, and vitamin B12, which are required for normal DNA and RNA synthesis, and protein metabolism (Spear, 1995, pp. 3-24).

There are few reports of low serum vitamin C levels in adolescents. On the other hand, a low vitamin C intake may be exhibited in adolescents who habitually avoid fruits and vegetables, are dieting, or who are from low socioeconomic levels (Gong & Spear, 1988).

Inadequate folate status is relatively common among American adolescents (Bailey, 1992). Inadequate consumption of fruits and vegetables may contribute to a poor folate status. Adolescents from low-income groups as well as pregnant teenagers may have particularly high risk of folic acid deficiency. A recent report on Dietary Reference Intakes from the Institute of Medicine recommends an intake of 400 ug folate per day to reduce the risk of having a child with neural tube defects (Yates et al., 1998).

Recommended Dietary Allowances for Korean Adolescents

The recommended dietary allowances (RDA) of nutrients for Korean adolescents are presented in Table 2.1. As shown in this table, the RDA for some nutrients are different depending on gender and age; however, the fat-soluble vitamins (A, D, and E) and iron RDA are the same regardless of gender and age. Because there is little supervision of the dietary

Table 2.1. Recommended dietary allowances for Korean adolescents^a by gender and age

Factors	Male		Female	
	13-15	16-19	13-15	16-19
Weight (kg)	50	63	48	54
Height (cm)	159	172	155	160
Nutrients				
Energy (kcal)	2400	2600	2000	2100
Protein (g)	70	80	65	65
Vitamin A ($\mu\text{g RE}$)	700	700	700	700
Vitamin D (μg)	10	10	10	10
Vitamin E (mga-TE)	10	10	10	10
Calcium (mg)	900	900	800	800
P (mg)	900	900	800	800
Iron (mg) ^b	18	18	18	18
Zinc (mg)	15	15	12	12
Vitamin C (mg)	50	55	50	55
Vitamin B1 (mg)	1.2	1.4	1.0	1.1
Vitamin B2 (mg)	1.4	1.6	1.2	1.3
Niacin (mg NE)	16	18	13	13
Vitamin B6 (mg)	1.4	1.6	1.4	1.5
Folate (μg)	200	250	200	250

^a Korean Nutrition Society. (1995). *Recommended dietary allowances for Koreans* (6th rev.), p. 14.

^b Iron supplements can be consumed when the iron intake from food is not enough.

intake of adolescents through school-based measures such as dietary meal plans, there is no guarantee that Korean adolescents are meeting these allowances.

Cultural Background Related to the Nutritional Problems of Korean Secondary School Students

There is no school lunch program for secondary school students in Korea. Most students carry home-prepared, box lunches. At times, they carry two box lunches: one for

lunch, the other for dinner. Some students have lunch in the snack bar operated by the school, or they eat lunch or dinner in fast food restaurants near the school (Ko et al., 1991). In addition, some students skip breakfast to get to school on time and they also have irregular lunch or dinner times (Cho, Kim, & Song, 1994; Kim & Lee, 1993). Sometimes they eat too much at one time because they skip breakfast or lunch (Moon, Yoon, & Lee, 1989). As a result, these students may have various types of diet-related problems such as malnutrition, obesity, stomach upset, or constipation (Cho et al., 1994; Mo, 1990). This problem is exacerbated because from an early age Korean students are under great pressures due to the burden of school work and additional cram courses to prepare for entrance examinations because of the limited number of openings at the best schools. Thus, they do not have enough time to spend on concerns (e.g., diet, exercise, and sleep) other than studying.

Studies Related to Korean Adolescent Food Behaviors and Nutritional Status

Several studies were found relative to obesity and its related factors, eating behaviors, food preferences, food intake, the relationship between food intake and demographic factors, and nutritional status of Korean secondary school students living in urban or rural areas. In a study by Lee and Lee (1986) of middle school girls in the Seoul area, parental obesity was closely related to children's obesity. Food habits of individuals, such as frequency of snacking and bedtime snacking, were related significantly to fatness. A relationship was found between obesity and eating patterns for high school girls in urban areas (Kim & Lee, 1993). Prevalence of obesity was 16.7% and 3.6% using the criteria of triceps skinfold thickness and body mass index (BMI), respectively. In this study, most of the subjects had three meals and snacks twice per day. About 24% of the subjects also took nutrient

supplements, mostly in the form of vitamins. Food habits such as frequency of snacking and bedtime meals were positively related to fatness. Prevalence of obesity was more likely in girls having bad food habits and high calorie intakes. The researchers suggested that good food habits and adequate nutrient intake were essential to prevent obesity in high school girls.

The relationship between dietary intake and obesity of middle school students in Seoul area also was studied (Cho et al., 1994). When compared to the standard height/weight ratio, 16.4% of male students and 16.1% of female students were either overweight or obese. Female subjects showed higher ratios than male subjects with more skipping of meals, frequency of snacks per day, and concerns about dieting. Compared to the Korean RDA, the calcium intake of male and female subjects was deficient. Calorie, protein, and fat intakes of the overweight/obese group were higher than those of the non-overweight/non-obese group. Correlation analysis showed that obesity was closely associated with parental body weight, family income, frequency of meals per day, frequency of snacking per day, eating speed, and overeating.

In another study (Kim, Han, & Lee, 1988), the food habits of middle school students living in the Taegu area were ascertained using the questionnaire method. Food intake was positively related to parents' income and education level. About 24% of the students did not pay attention to their nutritional condition or meals. Cookies, fruits, fruit juices, and ice cream were the favorite snacks among those participants. Fish and crab were the least liked foods.

Moon et al. (1989) found a correlation between eating behavior and nutritional and physical growth status in urban Korean adolescents. They reported that subjects who do not

have breakfast usually overeat at other meals, and that personality and sociological factors were correlated with eating behaviors. Self-estimated food intake questionnaires were used in this study.

In another study, differences were found in the eating behaviors of male and female students at the middle school level (Ko et al., 1991). The boys had a better morning appetite and lower rate of skipping breakfast than the girls; whereas, the girls carried more home-prepared box lunches and ate their foods at lunch time better than the boys did.

In a study by Lee, Choi, and Back (1994), the total daily energy and nutrient intake of the middle school students in a rural area was 48–103% of RDA. They indicated that calcium (48.3% of RDA) and iron (55.1% of RDA) intakes were especially low among the rural students. Carbohydrate, protein, and fat intakes were 71%, 12%, and 17%, respectively, of the total calories. The researchers suggested the need to conduct a nutrition education program for the parents and to initiate a school lunch program for the secondary school students.

A study by Kim and Kim (1989) examined the beverage consumption of middle and high school students in the Taejeon area. The students usually consumed an average of 606.6 ml liquid per day: 292.8 ml water, 131.8 ml soft drink, 109.2 ml milk, 26.1 ml fruit juice, 9.6 ml vegetable juice, 21.7 ml coffee and tea, and 15.4 ml Korean tea.

In the literature search, comprehensive studies were not found about food attitudes and food intake of Korean secondary school students relative to the Korean Food Tower. Studies should be conducted to examine food attitudes and food intake based on the five food groups of the Korean Food Tower to provide baseline data for intervention programs focusing on food attitudes and behavior change to promote better health.

The Korean Food Tower

The Korean Food Tower (Appendix A) is comprised of five food groups: (a) grain products; (b) vegetables and fruits; (c) meat, eggs, fish, shellfish, beans, and nuts; (d) milk and milk products; and (e) fats and sweets.

1. Grain products group includes rice, bread, noodles, cereals, and other grain products.
2. Vegetables and fruits group includes potatoes and seaweeds as well as all the vegetables and fruits.
3. Meat, eggs, fish, shellfish, beans, and nuts group includes meat, poultry, fish, shellfish, eggs, nuts, seeds, beans, and bean products.
4. Milk and milk products group includes milk, cheese, yogurt, and ice cream.
5. Fats and sweets group includes butter, margarine, oils, mayonnaise, salad dressings, candies, carbonated beverages, and teas.

The size and the position of each food group in the Korean Food Tower represents the relative importance of the group in terms of the consumption amount among Koreans and nutrition considerations. Grain products are the main dish of the Korean; therefore, they are positioned at the bottom of the tower. Vegetables and fruits are positioned in the second layer from the bottom because the consumption from this group is relatively high. The Meat, fish, eggs, and bean group is positioned as the third layer from the bottom of the tower. Milk and milk products group is positioned as the fourth layer from the bottom of the tower. The Fats and sweets group is positioned as the fifth layer from the bottom of the tower because their consumption should be relatively low (The Korean Nutrition Society, 1995, p. 209).

Standard serving size of foods

Examples of a medium-sized serving of representative foods in each food group are shown in Table 2.2. These standard serving sizes are based on the average food serving size per meal for adults.

Table 2.2. Examples of medium-sized servings for the five food groups^a

Food Group	Medium-sized serving	
Grain products	1 bowl of cooked rice	210 g
	cereal	30g
	1 bowl of cooked noodles	300g (dried, 90g)
	3 slices of bread	100g
	2-3 slices of rice cake	100g
Vegetables & fruits	1 dish of spinach	70g (raw)
	1 dish of bean sprouts	70g (raw)
	1 dish of cabbage kimchi	60g
	1 dish of mushrooms	70g (raw)
	1 dish of fresh sea mustard	70g
	1 small potato	100g
	1 medium citrus fruits	100g
	1 medium tomato	200g
	½ medium apple	100g
	strawberry, watermelon	200g
½ cup of fruit juice	100g	
Meat, eggs, fish, shellfish, beans, and nuts	1 dish of meat	60g (raw)
	1 piece of chicken	60g (raw)
	ham	40g
	sausage	40g
	1 piece of fish	70g (raw)
	anchovies	15g
	1 medium egg	50g
	tofu	80g
	soybean paste	15g
	Milk & milk products	1 cup of milk
1.5 - 2 slices of cheese		30g
1 cup of yogurt		180g
1 cup of ice cream		100g
Fats and sweets	1 teaspoon of oil	5g
	1 teaspoon of butter, mayonnaise	6g
	½ cup of carbonated beverages	100g

^aKorean Nutrition Society. (1995). *Recommended dietary allowances for Koreans (6th rev.)*, p. 213.

Recommended serving frequencies for Korean adolescents

The recommended serving frequencies per day to meet the nutrient needs based on the RDA for Korean adolescents is presented in Table 2.3. It was designed to maintain a balanced diet implying neither nutrient deficiency nor nutrient surplus.

Table 2.3. Recommended serving frequencies per day for Korean adolescents

Food group	Male (2600 kcal)	Female (2100 kcal)
Grain products	4½	3½
Vegetables & fruits	8	6
Meat	6	5
Milk	2½	1½
Fats and sweets	5	4

Korean Nutrition Society. (1995). *Recommended dietary allowances for Koreans* (6th rev.), p. 209.

Food Frequency Methodology

Rationale and conceptual basis

Because short-term recall and diet record methods generally are unrepresentative of usual intake and inappropriate for assessment of past diet, data from single 24-hour recalls should not be used to estimate the proportion of the population that has adequate or inadequate diets (Dwyer, 1988, pp. 887-905). Therefore, investigators have sought alternative methods for measuring long-term dietary intake. The underlying principle of the food-frequency approach is that average long-term diet, for example, intake over weeks, months, or years, is conceptually an important representation of intake rather than intake on a few specific days.

Using the food frequency method respondents are expected to report their usual frequency of consumption for each food from a list of foods for a specific period. Sometimes the amount consumed (serving size) also is reported. Details on the other characteristics of the foods (i.e., the cooking methods, the combinations of foods in meals) usually are not considered (Thompson & Byers, 1994).

The first questionnaire design issue is whether the primary objective is to measure the intake of a few specific foods or nutrients, or whether a comprehensive assessment of dietary intake is desired. A comprehensive assessment generally is desirable whenever possible. A second questionnaire design issue is whether an objective is to rank individuals (i.e., to discriminate among subjects according to dietary intake) or to provide a measure of absolute intake.

For a food item to be informative it must have three general characteristics. First, the food must be used reasonably often by an appreciable number of individuals. Second, the food must have a substantial content of the nutrients of interest. Third, to be discriminating, the use of the food must vary from person to person.

It is important to select carefully the most informative items for the food list to avoid fatigue and boredom that can impair concentration and accuracy. Several approaches can be used to compile a food list. The simplest way is to examine published food composition tables and identify the foods that contain substantial amounts of the nutrients of interest. Although rapid and simple, this strategy would lead to the inclusion of foods that are not eaten with sufficient frequency to be important.

Another approach is to start with a long list of foods that are potentially important nutrient sources derived from food composition tables, and systematically reduce this list by

pilot testing the questionnaire. The easiest method is simply to delete items that are not frequently used. This process, however, ignores the fact that foods with high between-person variation in their use are more informative than those that are of similar average use, but used uniformly by all persons (Willett, 1998, pp. 74-94). There are many food frequency instruments, and many continue to be developed for different populations and different purposes (Krebs-Smith & Clark, 1989; United States Department of Agriculture, 1995).

Strengths

The food frequency method is developed to estimate a respondent's usual intake of food. It also can be used to circumvent recent changes in diet by obtaining information about individual's diets as recalled about a prior time period (Dwyer, 1988, pp. 887-905). Food frequency methods most commonly are used to rank or group study subjects for the purpose of assessing the association between dietary intake and disease risk, such as in case-control or cohort studies (Kushi, 1994).

Some food frequency instruments have been devised to be self-administered and to require a short time to complete. The food frequency method has become a common way to estimate usual dietary intake because the costs for the data collection and processing are lower and also the respondents' burdens are typically much lower in this method compared to the other methods (Zulkifli & Yu, 1992).

Weaknesses

The major limitation of the food frequency method is that many details of dietary intake such as preparation method and food combinations are not measured, and the quantification of intake is not as accurate as with recalls or records. Inaccuracies in the data

may result from an incomplete listing of all possible foods (Zulkifli & Yu, 1992), from errors in frequency estimation, and from errors in estimation of usual serving sizes (Briefel et al., 1992). As a result, it could yield inaccurate estimates of the average intake for the group. In general, longer food frequency lists overestimate intake; whereas, shorter lists underestimate intake (Krebs-Smith et al., 1994). In the absence of knowledge about the true usual intake of the population, it is unknown how closely the distribution of intake estimates from food frequency questionnaires reflects the distribution of true intake in that population.

There has been controversy over whether it is proper to use the food frequency method to estimate quantitative parameters of a population's dietary intake (Block & Subar, 1992). The levels of nutrient intake estimated by food frequency questionnaires should best be regarded as only approximations because different food frequency questionnaires often will perform in unpredictable ways in different populations (Briefel et al., 1992), although some food frequency questionnaires seem to produce estimates of population average intake that are reasonable (Block & Subar, 1992). Food frequency questionnaires are much better suited for judging the subjects in terms of food or nutrient intake than for estimating the levels of nutrient intake.

Evaluating the serving size of foods consumed is difficult for respondents and, thus, is problematic for dietary history instruments. However, the inaccuracies involved in respondents' attempting to determine usual serving size in food frequency questionnaires may increase error. The importance of this error has been debated widely. Because frequency is believed to be a greater contributor than typical serving size to the variance in most food intake, some prefer to use food frequency questionnaires without the additional respondent burden of reporting serving sizes (Willett, 1998, pp. 74-94). Others cite small

improvements in the performance of food frequency questionnaires that ask the respondents to report a usual serving size for each food (Cummings et al., 1987).

Development of the food lists is crucial to the success of the food frequency method (Block et al., 1986). The full variability of an individual's diet, which includes many different foods, brands, and preparation practices, cannot be captured fully with a finite food list. Obtaining accurate reports for foods eaten both alone and in mixtures is particularly problematic. Food frequency questionnaires can ask the respondents to report either a combined frequency for a particular food eaten both alone and in mixtures, or separate frequencies can be asked. The first approach is cognitively complex, but the second approach may lead to double counting. Often food frequency questionnaires will include similar foods in a single question (e.g., hamburger, steak, roast beef). However, such groupings can create a cognitively complex question (e.g., for someone who often eats hamburger but never eats steak). In addition, when one question is used to represent a group of foods, assumptions about the relative frequencies of the intake of the foods contributing to the group must be made when calculating nutrient estimates. These assumptions often are not based on the information from the study population; true eating patterns may differ considerably across population subgroups and over time.

Validity

The definitive validity study for food frequency-based estimates of the usual diet would require non-intrusive observation of the respondent's total diet over a long time. No such studies have been done. The most practical approach to examining the concordance of food frequency responses and usual diet is to use multiple food recalls or records over a

period as an indicator of the usual diet (Feskanich et al., 1993; Willett et al., 1987). This approach has been used in many studies examining various food frequency methods.

CHAPTER III. METHODS

The purposes of the study were to examine food attitudes and food intake of Korean female secondary school students based on the five basic food groups of the Korean Food Tower, and to assess the relationships among the participants' food intakes, food attitudes, and demographic factors. The specific research questions were as follow:

1. Are there any relationships between food intake and food attitudes?
2. Are there any differences in food intake and food attitudes among 9th, 10th, and 11th grade female students?
3. Are there any differences in food intake and food attitudes related to demographic characteristics?

The description of methods used in the study includes sections on the preliminary study, instrument development, pilot testing, and testing.

Preliminary Study

Preliminary checklist

Validity is the primary characteristic to be considered in instrument development. A preliminary study was done to obtain construct- and content-related evidence of validity for the instrument. A preliminary checklist (Appendix B) to be used eventually in designing a food frequency was developed by categorizing foods into 10 food groups. The 10 food groups were created by combining the detailed 18 food groups documented in the Korean Food Composition table (The Korean Nutrition Society, 1995, pp. 215-339): (a) Grains, grain products, and potatoes; (b) Sweets; (c) Beans, bean products, nuts, and seeds; (d) Vegetables;

(e) Fruits; (f) Meat, eggs, and sea foods; (g) Milk and dairy products; (h) Fats and oils; (i) Beverages; and (j) Miscellaneous. Food items were combined in some instances and different food preparation methods were not considered in order to collapse from the 18 Korean food groups to 10 for the research. Most of the food items were composed of a single food, but some of the food items were composed of mixed foods, for example, pizza and sandwiches. There were 351 food items in the 10 groups: (a) Grains, grain products, and potatoes, 74; (b) Sweets, 14; (c) Beans, bean products, nuts, and seeds, 26; (d) Vegetables, 56; (e) Fruits, 37; (f) Meat, eggs, and sea foods, 97; (g) Milk and dairy products, 9; (h) Fats and oils, 16; (i) Beverages, 6; and (j) Miscellaneous, 16. For response to the food frequency checklist there were 9 points on the scale: Never or less than once per month, 1 time per month, 2 to 3 times per month, 1 time per week, 2 times per week, 3 to 4 times per week, 5 to 6 times per week, 1 time per day, and 2 times per day or more. There were three possible responses for the amount consumed each time: small, medium, or large serving. A medium-sized serving indicated one Korean standard serving size, small-sized serving indicated half or less than half of a medium-sized serving, and large-sized serving indicated one and a half or more of a medium-sized serving. Prior to preliminary testing the English draft of the preliminary checklist was translated into the Korean language.

Preliminary testing

Sample

Students from one secondary girl's school in Seoul, Korea, were selected by convenience sampling. The preliminary test sample was composed of 42 female students from the third year of the middle school (9th grade in American school system), 47 from the

first year of the high school (10th grade in American school system), and 56 from the second year of the high school (11th grade in American school system). The Korean version of the preliminary test instrument was administered to them during their home economics class hours.

Data analysis

The 351 food items were coded according to the nine points of the food frequency and three categories for serving size. The mean for each food item was obtained by using descriptive statistics in the SPSS sub-program for Windows version 8.0.

Instrument Development

Food frequency

The 10 food groups in the preliminary study were reorganized into 5 food groups based on the Korean Food Tower (The Korean Nutrition Society, 1995) by combining vegetables and fruits together; meat, eggs, sea foods, beans, bean products, nuts, and seeds together; fats, oils, beverages, and sweets together. Potatoes were classified into vegetables and fruits group. Using descriptive statistics, a total of 74 food items were selected as representative food items for the food frequency questionnaire: Grain products, 15; Vegetables and fruits, 31; Meat, eggs, fish, shellfish, beans, and nuts, 16; Milk and milk products, 4; and Fats and sweets, 8. Some of the food items had a single food name (for example, rice, barley, beef, and strawberries) and some of the food items combined foods together that have similar nutritional characteristics (for example: green leafy vegetables; pizza and spaghetti; chicken and turkey; tuna, hair tail, yellow croaker, and Alaska pollack;

and mayonnaise and salad dressing). A criterion of selection was whether the food item was consumed more than 2 to 3 times per month on average. However, organ meat in the meat group as a rich source of iron was an exception to this criterion in consideration of low iron consumption among adolescents (Lee et al., 1994). Food preparation methods such as boiled, fried, or grilled were not considered.

A nine-point scale for frequency of consumption as on the preliminary checklist was used. There were three categories for the serving amounts as on the preliminary checklist: small, medium, and large with the same interpretations. Examples of medium-sized servings, as documented in the literature, were given on the food frequency for some of the foods. Grams were used as the standard unit of measure (Appendix C).

Food attitude scale

Twenty-two items modified from the "Eating Behaviors of Young Adults" instrument (Amos, 1999) were used to examine attitudes about foods (Appendix C). A five-point Likert-type scale was used to indicate: strongly disagree, disagree, neutral, agree, and strongly agree.

Demographic information

Ten items were used to obtain demographic information about the respondents (Appendix C): age, father's education level, mother's education level, mother's employment situation, parents' income level, number of family members living together, health status, dental condition, body weight, and height. Age, body weight, and height were measured as continuous variables, and parents' education level, mother's employment situation, parents'

income level, number of family members living together, health status, and dental condition were measured as ordinal variables.

Pilot Testing

A pilot test was conducted with 20 Korean secondary school students to check the adequacy and reliability of the instrument, data collection techniques, data processing procedures, and data analysis methods. All of the participants fulfilled the necessary sample selection criteria: 14 to 18 year old secondary school students and Korean. The Korean version of the instrument was administered to them and the collected data were analyzed by using the SPSS sub-programs for Windows version 8.0.

Expert judges

The instrument was reviewed by four expert judges: one from Food Science and Human Nutrition; two from Family and Consumer Sciences Education and Studies; one from Hotel, Restaurant, and Institution Management. The person from Hotel, Restaurant, and Institution Management was chosen because she is a Korean and has a strong food science and human nutrition background. Their comments about the instrument were incorporated into the final revision of the instrument.

Instrument revision

Five revisions were made on the instrument based on the pilot testing. In pilot testing, “ham, sausage, bacon” was checked as one food item, but, in the actual test instrument, they were separated into two items, “ham” and “sausage, bacon.” Ham is considered to be leaner than sausage and bacon, which have a high fat content. Duck was

omitted from the “chicken, turkey, duck” item because duck has a higher fat content than chicken and turkey. “Tea, cocoa” was separated into two items, “tea” and “cocoa.”

Depending on the preparation method, cocoa can be a good source of calcium. A medium-sized serving of carbonated beverages, tea, and cocoa was changed from 1/2 cup to 1 cup.

The final version of the food frequency includes 76 food items (Appendix C). There were no changes in the food attitude and demographic information sections of the instrument.

Use of Human Subjects

The final form of the questionnaire was submitted for approval to the Human Subjects Review Committee at Iowa State University to ensure that the rights and welfare of the human subjects were adequately protected, risks were outweighed by the potential benefits and expected value of the knowledge sought, confidentiality of data was assured, and that informed consent was obtained by appropriate procedures. The signed approval form appears in Appendix D.

Testing

Data collection

One secondary girl’s school in Seoul, Korea, was selected by convenience sampling. The sample (N=285 students) was composed of 81 female students from the third year of the middle school (9th grade in American school system), 96 from the first year of the high school (10th grade in American school system), and 108 from the second year of the high school (11th grade in American school system)). The Korean version of the instrument was administered to them during their home economics class hours.

Data analysis

The 76 food items were coded according to the nine points on the food frequency and three categories of serving size. Table 3.1 presents the codes of the food frequency and serving size scales.

Table 3.1. Code for serving frequency and serving size

	Code
Serving frequency	
Never or less than once per month	0.00
1 time per month	0.033
2-3 times per month	0.083
1 time per week	0.14
2 times per week	0.29
3-4 times per week	0.50
5-6 times per week	0.79
1 time per day	1.00
2 times per day or more	2.00
Serving size	
Small	0.50
Medium	1.00
Large	1.50

Descriptive statistics were obtained using a SPSS sub-program for Windows version 8.0 in order to describe food intake and food attitudes. Reliability for the food attitude scale was checked by calculating Cronbach's coefficient alpha using a SPSS sub-program. The 22 attitude items on the instrument were categorized into five factors through factor analysis using the SPSS FACTOR sub-program to obtain a description of the participants' food attitudes. To answer research question one, "Are there any relationships between food intake and food attitudes?" Pearson product-moment correlation coefficients were obtained using a

SPSS sub-program. To answer research questions two and three, “Are there any differences in food attitudes and food intake among 9th, 10th, and 11th grade female students?” and “Are there any differences in food attitudes and food intake related to demographic characteristics?” General Linear Model (GLM) statistics were obtained using a SPSS sub-program.

CHAPTER IV. RESULTS AND DISCUSSION

The results are reported and discussed in four sections: Description of Sample; Description of Food Frequency; Description of Food Attitudes; and Relationships among Food Intake, Food Attitudes, and Demographic Data.

Description of Sample

Secondary school female students who participated in this study were between 14 and 17 years of age. The participants consisted of 81 middle school 3rd graders (9th grade in American school system), 96 high school 1st graders (10th grade in American school system), and 108 high school 2nd graders (11th grade in American school system). The distribution of students' age is shown in Table 4.1.

Table 4.1. Distribution of female adolescents' ages (N=285)

Age (years)	Number of respondents	Percent of respondents
14	21	7.4
15	77	27.0
16	93	32.6
17	92	32.3
No response	2	0.7

The distribution of parents' education level is presented in Table 4.2, revealing that fathers have, on average, a better education than mothers. About 52% of the respondents' fathers have a bachelor's (B.S.) degree or higher, whereas only 30% of the mothers have a B.S. or higher degree. Approximately half (48%) of the mothers have a job outside the home.

Table 4.2. Education level of parents (N=285)

Education level	Father		Mother	
	Number of respondents	Percent of respondents	Number of respondents	Percent of respondents
Elementary	3	1.1	4	1.4
Middle school	10	3.5	22	7.7
High school	100	35.1	150	52.6
College graduate	19	6.7	19	6.7
Bachelor's degree	113	39.6	79	27.7
Master's degree	30	10.5	5	1.8
Ph.D. degree	4	1.4	0	0.0
No response	6	2.1	6	2.1

Parents' monthly income level was categorized into six groups, as shown in Table 4.3. Approximately 51% of the respondents' families have an income over \$1,500 per month, and 17% are below \$1,000. Table 4.4 gives information about the family size, showing that the majority (81%) of the respondents have four or five family members including the respondent.

Table 4.3. Parents' monthly income (N=285)

Income per month (\$) U.S. ^a	Number of respondents	Percent of respondents
≤ 500	5	1.8
501-1,000	44	15.4
1,001-1,500	79	27.7
1,501-2,000	51	17.9
2,001-2,500	52	18.2
≥ 2,501	42	14.7
No response	12	4.2

^a Exchange rate, \$1 U.S. = 1,400 won at the beginning of December, 1998 (data collection period). Income was estimated by students' perception; therefore, it may not be accurate. Average monthly income per family in Korea = \$1,280; criterion of poverty level = \$550 (<http://www.nso.go.kr/report/data>).

Table 4.4. Family size (N=285)

Size ^a	Number of respondents	Percent of respondents
2-3	28	9.8
4-5	232	81.4
6-7	21	7.4
≥ 8	2	0.7
No response	2	0.7

^a Number of family members living together including the respondent.

Both health and dental status of the respondents are summarized in Table 4.5, indicating that the majority of the students think their health condition is average (52%) or better than average (44%). The dental status, however, reveals a different trend; i.e., 26% of the respondents consider themselves in poor dental condition and 26% good or excellent condition.

Table 4.5. Health and dental status (N=285)

Status	Health		Dental	
	Number of respondents	Percent of respondents	Number of respondents	Percent of respondents
Poor	11	3.9	74	26.0
Average	147	51.6	134	47.0
Good	96	33.7	61	21.4
Excellent	28	9.8	13	4.6
No response	3	1.1	3	1.1

Table 4.6 summarizes the respondents' mean body weight, height, and Body Mass Index (BMI) according to age. There were no differences in body weight, height, and BMI among four age groups at a significance level of $p < .05$. BMI indicates that the respondents are pretty lean.

Table 4.6. Mean body weight, height, and BMI by age (N=278)

Age (years)	Number of respondents	Weight (kg)	Height (cm)	BMI (kg/m ²)
14	20	50.9 (1.5) ^a	159.8 (1.1)	20.0 (0.5)
15	75	52.7 (0.8)	161.7 (0.5)	20.1 (0.3)
16	93	53.6 (0.8)	161.6 (0.5)	20.5 (0.3)
17	90	53.2 (0.7)	162.1 (0.6)	20.2 (0.2)

^aNumbers in () are standard error of mean.

Description of Food Frequency

The survey results will be presented in the same order as on the questionnaire, which consists of six tables for the food serving frequency and serving size by food items. Each of the five food groups constructing the Korean Food Tower, which includes, from the bottom, (a) grain products, (b) vegetables and fruits, (c) meat group, (d) milk group, and (e) fats and sweets, was assigned one section on the questionnaire with one extra section for seasonal vegetables and fruits so they could be evaluated separately. Three tables are used to achieve the three goals of this section, i.e., (a) summarization of all the data collected from the respondents, which displays the distribution of serving frequency and serving size for the items in each food group, (b) description of the mean values for serving frequency, serving size, and standardized serving frequency, and (c) estimation of the distribution of the daily total standardized serving frequency for each group.

Table 4.7 summarizes the distribution of the serving frequency and serving size of grain products. It is in the same format as the corresponding items on the questionnaire with a little modification so that the food items are arranged in descending order according to their serving frequency. The order is based on the median and mode of the data. The items in the upper rows have higher serving frequency than those in the lower rows. Each cell in the

Table 4.7. Distribution of serving frequency and serving size (in percentage) of grain products

Grain products	Serving frequency									Serving size		
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Small	Medium	Large
	Rice	0.0 ^a (0.0) ^b	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.4 (0.4)	0.4 (0.8)	0.4 (1.2)	4.9 (6.1)	97.0 (100.0)	8.4	73.0
Biscuits, crackers, cookies	3.2 (3.2)	1.4 (4.6)	3.5 (8.1)	11.2 (19.3)	16.1 (35.4)	27.7 (50.0)	18.9 (75.7)	18.9 (94.6)	5.3 (100.0)	19.7	46.2	34.1
Ra Myon	4.9 (4.9)	1.4 (6.3)	9.5 (15.8)	21.1 (36.9)	26.7 (63.0)	23.2 (88.2)	7.7 (95.9)	4.2 (100.0)	0.0 (100.0)	9.1	74.5	16.4
Barley	28.8 (28.8)	6.3 (35.1)	9.8 (44.9)	6.3 (51.2)	5.6 (56.8)	7.7 (64.5)	5.6 (70.1)	6.7 (76.8)	23.2 (100.0)	88.1	11.2	0.7
Ddokbokgi, ddokguk	4.2 (4.2)	6.7 (10.9)	20.4 (31.3)	20.0 (51.3)	20.7 (72.0)	18.2 (90.2)	7.7 (97.9)	1.8 (99.7)	0.4 (100.0)	10.8	58.1	31.2
Dock marked bread, cake, cream-jam bread, doughnuts	9.1 (9.1)	8.1 (17.2)	17.2 (34.4)	23.3 (57.9)	16.1 (74.0)	17.2 (91.2)	4.9 (96.1)	3.5 (99.6)	0.4 (100.0)	21.5	60.2	18.3
Loaf bread (toast, sandwich, etc.)	8.4 (8.4)	6.3 (14.7)	21.4 (36.1)	22.5 (58.6)	15.1 (73.7)	12.6 (86.3)	4.2 (90.5)	8.4 (98.9)	1.1 (100.0)	23.3	55.9	20.8
Hamburger bun or hot dog bun	15.4 (15.4)	12.3 (27.7)	26.7 (54.4)	22.5 (76.9)	11.9 (88.8)	7.4 (96.2)	2.8 (99.0)	1.1 (100.0)	0.0 (100.0)	22.7	61.2	16.1
Noodle (cholmyun, chajangmyun, chambbong, udong kalguksoo, etc.)	11.6 (11.6)	13.7 (25.3)	35.1 (60.4)	23.2 (83.6)	10.5 (94.1)	4.2 (98.3)	1.4 (99.7)	0.4 (100.0)	0.0 (100.0)	11.2	69.7	19.1
Starch vermicelli (japchae, sundae filling, etc.)	22.1 (22.1)	18.2 (40.3)	32.0 (72.9)	14.0 (86.9)	6.0 (92.9)	5.3 (98.2)	1.1 (99.3)	0.4 (99.7)	0.4 (100.0)	32.7	51.3	16.0
Other rice products: shiruduck, injulmi, songpyon, yacksik, popped rice	23.5 (23.5)	22.1 (45.6)	29.3 (75.1)	12.3 (87.4)	4.9 (92.3)	4.2 (96.5)	2.1 (98.6)	1.4 (100.0)	0.0 (100.0)	37.9	44.1	18.0
Pizza, spaghetti	23.5 (23.5)	24.6 (48.1)	36.8 (84.9)	7.4 (92.3)	5.3 (97.6)	0.7 (98.3)	1.8 (100.0)	0.0 (100.0)	0.0 (100.0)	9.2	57.2	33.6
Glutinous rice	38.6 (38.6)	12.3 (50.9)	17.2 (68.1)	6.3 (74.4)	6.3 (80.7)	4.9 (85.6)	0.7 (86.3)	3.5 (89.8)	10.2 (100.0)	71.8	25.5	2.7
Cereals	43.6 (43.6)	8.1 (52.7)	17.9 (70.6)	7.7 (78.3)	5.6 (83.9)	7.4 (91.3)	3.2 (94.5)	4.6 (99.1)	1.1 (100.0)	34.7	46.3	18.9
Other grains: job's tears, oatmeal, millet, sorghum	53.7 (53.7)	6.3 (60.0)	10.9 (70.9)	7.0 (77.9)	2.8 (80.7)	3.5 (84.2)	1.4 (85.6)	4.2 (89.8)	10.2 (100.0)	92.8	6.8	0.4

^a Percentage of respondents.

^b Cumulative percentage.

frequency part of the table has two numbers, one with and the other without parentheses. The cells in the serving size part have only one number with no parentheses. The one without parentheses is the percentage of respondents with respect to the total sample size who checked that cell in the questionnaire. The number in parentheses denotes the cumulative percentage of the frequency. In an attempt to visualize the result, a thick vertical line is drawn in each row where the cumulative percentage of the food item crosses 50% (median), and the cell with the highest frequency (mode) of each row is shaded with its numbers italicized and in a bold font. It is important to understand that the rows, i.e., the food items, with both the 50% median line and the shaded mode cell located near the right edge are, in general, consumed more frequently and chosen by more respondents.

Table 4.8 takes into account the weighting factor of each frequency level to obtain average values of the serving frequency per day, serving size, and standardized serving frequency of each item. The weighting factors used in the calculation of the mean serving frequency per day and serving size are shown in Table 4.9. For a given food item, the values without parentheses in a row of Table 4.7, i.e., the proportion of the number of the respondents belonging to the frequency level relative to the total, are multiplied by the corresponding weighting factors. The sum of all the resulting values in the serving frequency part of the row, then, gives an average serving frequency per day, and the value in the serving size part gives an average serving size. The items, then are arranged in descending order of mean serving frequency per day. Care must be taken to understand how the mean standardized serving frequency is obtained. The individual standardized serving frequency of a food item has to be calculated by multiplying the two weighting factors, one for each of the serving frequency and the other for each of the serving size that are selected. This is

done individually for all the respondents before the mean values are placed in Table 4.8.

Thus obtained, the mean standardized serving frequency may be at variance with the value resulting from the direct multiplication of the mean serving frequency per day and the mean serving size, as observed in Table 4.8.

Table 4.8. Means for daily serving frequency, serving size, and standardized serving frequency of grain products

Food items	Serving frequency ^a	Serving size ^b	Standardized serving frequency ^c
Rice	1.94 (0.02) ^d	1.05 (0.02)	2.00 (0.03)
Barley	0.65 (0.05)	0.56 (0.01)	0.36 (0.03)
Biscuits, crackers, cookies	0.62 (0.03)	1.07 (0.02)	0.71 (0.04)
Ra Myon	0.34 (0.01)	1.04 (0.02)	0.36 (0.02)
Glutinous rice	0.31 (0.04)	0.65 (0.02)	0.19 (0.02)
Loaf bread (toast, sandwich, etc.)	0.30 (0.02)	0.99 (0.02)	0.29 (0.02)
Other grains: job's tears, oatmeal, millet, sorghum	0.30 (0.04)	0.54 (0.01)	0.16 (0.02)
Ddokbokgi, ddokguk	0.28 (0.02)	1.10 (0.02)	0.32 (0.02)
Dock marked bread, cake, cream-jam bread, doughnuts	0.26 (0.02)	0.98 (0.02)	0.26 (0.02)
Cereals	0.17 (0.02)	0.92 (0.02)	0.19 (0.02)
Hamburger bun or hot dog bun	0.16 (0.01)	0.97 (0.02)	0.16 (0.01)
Noodle (cholmyun, chajangmyun, chambbong, udong kalguksoo, etc.)	0.13 (0.01)	1.04 (0.02)	0.14 (0.01)
Starch vermicelli (japchae, sundae filling, etc.)	0.12 (0.01)	0.92 (0.02)	0.12 (0.01)
Other rice products: shiruduck, injulmi, songpyon, yacksik, popped rice	0.12 (0.01)	0.90 (0.02)	0.11 (0.01)
Pizza, spaghetti	0.08 (0.01)	1.12 (0.02)	0.10 (0.01)

^aTotal sample number for serving frequency is 285.

^bTotal sample number for serving size varies from 251 to 285 due to missing values.

^cTotal sample number for standardized serving frequency varies from 281 to 285 due to missing values.

^dNumbers in () are standard error of mean.

Table 4.9. Weighting factors for serving frequency and serving size

	Weighting factor	Transformation formula
Serving frequency		
Never or less than once per month	0.00	0/30
1 time per month	0.033	1/30
2-3 times per month	0.083	2.5/30
1 time per week	0.14	1/7
2 times per week	0.29	2/7
3-4 times per week	0.50	3.5/7
5-6 times per week	0.79	5.5/7
1 time per day	1.00	1/1
2 times per day or more	2.00	2/1
Serving size		
Small	0.50	
Medium	1.00	
Large	1.50	

Tables 4.7 and 4.8 characterize the general trends in the respondents' food intake by presenting the medians, modes, and means of the serving frequency and serving size for the food items. The next step is to examine how much the respondents, as individuals, consume the items in a specific food group on a daily basis. The total standardized serving frequency of an individual for a specific food group then is obtained by adding the respondent's standardized serving frequency values of all the items in the group. The distribution of the total standardized serving frequency is presented in Table 4.10. It must be noted that the total standardized serving frequency per day is based on a medium-sized serving.

With the aid of these tables, the results are presented starting from the group located at the bottom of the Korean Food Tower (i.e., grain products) followed in sequence by vegetables and fruits, seasonal vegetables and fruits, meat, milk, and fats and sweets.

Table 4.10. Distribution of the total standardized serving frequency of intake for grain products (mean=5.5 times/day, s.d.= ± 2.5 , N=269)

Total standardized serving frequency/day	Percentage
< 3.5	16.0
3.5 – 5.9	52.0
6.0 – 10.9	30.1
≥ 11	1.9

Grain products

The profile of the sample distribution for the food items in the grain products group, with regard to the serving frequency and serving size, is summarized in Table 4.7. The most prominent aspect in the serving frequency and serving size of grain products is shown in the first row of Table 4.7, which reveals that most of the respondents (94%) eat rice twice or more every day, and mostly (73%) in a medium-sized serving. This also is evident as shown in Table 4.8, where rice is placed on the top row with mean serving frequency/day=1.94, mean serving size=1.05, and mean standardized daily serving frequency=2.0. For the other items in the group, a careful comparison of Tables 4.7 and 4.8 shows that the same item may have a different position in the sequencing arrangement depending on the criterion applied. Table 4.7 highlights the number of observations in each interval by treating all the frequency levels equally, with the arrangement based on the position of the 50% median line. By using this table one may examine the sample distribution profile over the entire frequency interval and gain information about which food items draw more attention from the majority of the respondents and which items are more neglected. In contrast, the difference in weighting factor was taken into account in Table 4.8 and one can estimate accurately which item is, on average, consumed more frequently on a daily basis. If the items in Table 4.8 were to be

arranged according to the mean standardized serving frequency, considering the effect of serving size, some items would appear on different rows. The discussion that follows is based on the arrangement in Table 4.8, with comments on items showing a significant variation in positions in the tables.

The items “Barley” in the 2nd row and “Biscuits, crackers, cookies” in the 3rd row, together with “rice” in the 1st row, are the only items with a mean serving frequency of more than four times a week. As shown in Table 4.7, the majority (51%) eat “Barley” once a week or less, including a significant portion (28.8%) who eat it never or less than once a month. However, it has a high mean serving frequency because a substantial portion (23.2%) eat “Barley” twice per day or more. The item “Biscuits, crackers, cookies” is chosen by the majority (65%) at least 3 to 4 times a week and its mean frequency is 4.34 times a week (=0.62 time/day). The remaining food items in “grain products” are consumed less frequently than the ones in the top three rows of Table 4.8. One can see easily that the less frequently chosen items may be categorized, roughly, in three groups. The items in rows 4 to 9, “Ra Myon,” “Glutinous rice,” “Loaf bread (toast, sandwich, etc.),” “Other grains: job’s tears, oatmeal, millet, sorghum,” “Ddokbokgi, ddokguk,” and “Dock marked bread, cake, cream-jam bread, doughnuts,” are consumed, roughly, twice a week (=0.286 time/day). Rows 10 to 14 show the items “Cereals,” “Hamburger bun or hot dog bun,” “Noodle (cholmyun, chajangmyun, chambbong, udong, kalguksoo, etc.),” “Starch vermicelli (japchae, sundae filling, etc.),” and “Other rice products: shiruduch, injulmi, songpyon, yacksik, popped rice,” which are consumed approximately once a week (=0.143 time/day). The item in the last row, “Pizza, spaghetti,” is eaten only 2.4 times a month (=0.08 time/day). Among the less frequently served ones, two items, “Glutinous rice,” and “Other grains: job’s tears,

oatmeal, millet, sorghum,” need further comment. High proportions (10.2% for both) of the respondents who eat them twice per day or more cause the mean frequency for each item to be a little over twice a week even though the majority eat them never or at the most once a month, as is apparent in Table 4.7.

Most items in the grain products group are consumed mainly in a medium size (i.e., serving size=1), but the exceptions include “Barley,” “Glutinous rice,” and “Other grains: job’s tears, oatmeal, millet, sorghum,” which are, on an average, consumed in a small size. This may be understood by the fact that the items are cooked in most Korean families in a small amount as an addition to rice. The values in the last column of Table 4.8 indicate that the serving size effect would make those three items come later were they arranged according to the mean standardized serving frequency.

Table 4.10 summarizes the distribution of the total standardized serving frequency of the grain products’ intake in four intervals. According to the Korean Food Tower three and one-half servings a day is recommended as a serving frequency of the grain products for the Korean female adolescents. It is shown in Table 4.10 that the majority (84%) of the respondents meet the recommended serving frequency for the grain products, and the mean, which is estimated to be 5.5, is above the recommendation.

Vegetables and fruits

The results of the sample distribution for the food items in vegetables and fruits group, with respect to the serving frequency and serving size, are summarized in Table 4.11. Table 4.12 presents the average values for the serving frequency, serving size, and standardized serving frequency on a daily basis. It is noticed, by comparing Table 4.11 and

Table 4.11. Distribution of serving frequency and serving size (in percentage) for vegetables and fruits

Vegetables & fruits	Serving frequency									Serving size		
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Small	Medium	Large
	Cabbage kimchi	5.3 ^a (5.3) ^b	0.7 (6.0)	0.7 (6.7)	1.4 (8.1)	1.1 (9.2)	4.6 (13.8)	8.4 (22.2)	20.7 (42.9)	57.2 (100.0)	32.0	51.4
Radish	3.5 (3.5)	2.1 (5.6)	2.8 (8.4)	3.9 (12.3)	7.0 (19.3)	9.8 (29.1)	13.3 (42.4)	28.1 (70.5)	29.8 (100.0)	39.9	49.5	10.7
Green onion, leek, garlic, onion	11.6 (11.6)	4.9 (16.5)	3.5 (20.0)	4.6 (24.6)	4.6 (29.2)	14.7 (43.9)	11.9 (55.8)	21.4 (77.2)	22.8 (100.0)	71.6	25.0	3.4
Vegetables in mixed foods (soup, stew, fried rice, japchae, bibimbab, etc.)	1.4 (1.4)	2.5 (3.9)	8.8 (12.7)	10.5 (23.2)	13.3 (36.5)	16.8 (53.3)	13.0 (66.3)	18.2 (89.5)	15.4 (100.0)	7.8	62.4	29.8
Laver	1.4 (1.4)	2.5 (3.9)	5.6 (9.5)	10.5 (20.0)	17.5 (37.5)	23.9 (61.9)	12.6 (74.0)	17.2 (91.2)	8.8 (100.0)	25.2	50.4	24.5
Banana	8.8 (8.8)	10.2 (19.0)	17.9 (36.9)	12.6 (49.5)	16.5 (66.0)	16.1 (82.1)	6.0 (88.1)	7.7 (95.8)	4.2 (100.0)	25.6	43.4	31.0
Green leafy vegetables (spinach, lettuce, radish leaves, perilla leaf, etc.)	7.4 (7.4)	6.7 (14.1)	17.9 (32.0)	19.3 (51.3)	15.1 (66.4)	14.4 (80.8)	10.5 (91.3)	5.6 (96.9)	3.2 (100.0)	48.0	43.7	8.2
100% fruit or vegetable juices	10.5 (10.5)	7.7 (18.2)	14.9 (33.1)	14.7 (51.8)	13.7 (65.5)	12.6 (78.1)	5.6 (83.7)	11.9 (95.6)	4.2 (100.0)	18.6	45.7	35.7
Potatoes	6.0 (6.0)	10.5 (16.5)	22.7 (39.2)	16.1 (54.7)	20.4 (75.1)	14.4 (89.5)	8.4 (97.9)	1.8 (99.7)	0.4 (100.0)	19.4	54.1	26.5
Sweet potatoes	12.3 (12.3)	14.7 (27.0)	20.0 (47.0)	18.2 (65.2)	13.7 (78.9)	9.8 (88.7)	7.4 (96.1)	3.2 (99.3)	0.7 (100.0)	21.1	51.9	27.0
Bean sprouts	6.0 (6.0)	9.5 (15.5)	33.3 (48.8)	20.4 (69.2)	14.4 (83.6)	12.6 (96.2)	1.8 (98.0)	1.4 (99.4)	0.7 (100.0)	54.6	39.6	5.7
Peppers-green, red	22.5 (22.5)	11.2 (33.7)	14.0 (47.7)	16.8 (64.5)	11.9 (76.4)	14.4 (90.8)	4.2 (95.0)	2.1 (97.1)	2.8 (100.0)	80.1	18.0	1.8
Sea-mustard, tangle	15.1 (15.1)	13.3 (28.4)	26.0 (54.4)	15.4 (69.8)	13.0 (82.8)	10.2 (93.0)	3.9 (96.9)	2.5 (99.4)	0.7 (100.0)	50.5	39.3	10.2
Mushrooms	22.8 (22.8)	12.3 (35.1)	17.9 (53.0)	13.7 (66.7)	13.7 (80.4)	10.9 (91.3)	4.6 (95.9)	2.1 (98.0)	2.1 (100.0)	56.7	34.1	9.3
Squash, zucchini	27.0 (27.0)	8.4 (35.4)	18.6 (54.0)	17.2 (71.2)	14.0 (85.2)	9.8 (95.0)	2.5 (97.5)	1.4 (98.9)	1.1 (100.0)	72.2	25.3	2.6
Carrot	30.5 (30.5)	7.4 (37.9)	17.9 (55.8)	13.7 (69.5)	11.2 (80.7)	10.5 (91.2)	5.3 (96.5)	2.5 (99.0)	1.1 (100.0)	82.8	14.9	2.3
Lotus root, braken, burdock, bellflower root	27.7 (27.7)	13.0 (40.7)	24.6 (65.3)	13.7 (79.0)	10.2 (89.2)	6.3 (95.5)	2.8 (98.3)	1.4 (99.7)	0.4 (100.0)	71.2	25.5	3.3
Canned fruits (peach, pineapple, citrus fruits, etc.)	33.2 (33.2)	17.9 (61.1)	16.1 (77.2)	4.6 (81.8)	5.6 (87.4)	4.9 (92.3)	1.4 (93.7)	3.5 (97.2)	2.8 (100.0)	36.2	42.3	21.5

^a Percentage of respondents.

^b Cumulative percentage.

Table 4.12. Means for daily serving frequency, serving size, and standardized serving frequency of vegetables and fruits

Food items	Serving frequency ^a	Serving size ^b	Standardized serving frequency ^c
Cabbage kimchi	1.45 (0.04) ^d	0.92 (0.02)	1.41 (0.05)
Radish	1.05 (0.04)	0.85 (0.02)	0.97 (0.05)
Green onion, leek, garlic, onion	0.86 (0.04)	0.66 (0.02)	0.58 (0.03)
Vegetables in mixed foods (soup, stew, fried rice, japchae, bibimbab, etc.)	0.74 (0.04)	1.11 (0.02)	0.83 (0.04)
Laver	0.64 (0.03)	1.00 (0.02)	0.67 (0.04)
100% fruit or vegetable juices	0.39 (0.03)	1.09 (0.02)	0.46 (0.04)
Banana	0.37 (0.03)	1.03 (0.02)	0.43 (0.04)
Green leafy vegetables (spinach, lettuce, radish leaves, perilla leaf, etc.)	0.36 (0.02)	0.80 (0.02)	0.31 (0.02)
Potatoes	0.27 (0.02)	1.04 (0.02)	0.29 (0.02)
Peppers-green, red	0.26 (0.02)	0.61 (0.01)	0.17 (0.02)
Sweet potatoes	0.24 (0.02)	1.03 (0.02)	0.27 (0.02)
Mushrooms	0.23 (0.02)	0.76 (0.02)	0.21 (0.02)
Bean sprouts	0.21 (0.01)	0.76 (0.02)	0.16 (0.01)
Sea-mustard, tangle	0.21 (0.02)	0.80 (0.02)	0.17 (0.01)
Carrot	0.21 (0.02)	0.60 (0.01)	0.15 (0.02)
Squash, zucchini	0.19 (0.02)	0.65 (0.02)	0.13 (0.01)
Canned fruits (peach, pineapple, citrus fruits, etc.)	0.17 (0.02)	0.93 (0.02)	0.21 (0.03)
Lotus root, braken, burdock, bellflower root	0.15 (0.01)	0.66 (0.02)	0.10 (0.01)

^aTotal sample number for serving frequency is 285.

^bTotal sample number for serving size varies from 262 to 282 due to missing values.

^cTotal sample number for standardized serving frequency varies from 282 to 285 due to missing values.

^dNumbers in () are standard error of mean.

4.12, that there is not much difference in the relative positions of the items, which means that the arrangement based on the location of the 50% respondent line is almost the same as that based on means. The item in the first row of both tables, "Cabbage kimchi," is definitely seen to be consumed most frequently with the mean serving frequency=1.45 times/day, approximately 57% of the respondents eating it twice a day or more, and mostly in a medium-sized serving. The items chosen by the majority with a relatively high serving frequency include "Radish" (at least once a day by 58% with the mean value=1.05 times/day), "Green onion, leek, garlic, onion" (5 to 6 times per week or more by 56% with the mean=0.86 time/day), "Vegetables in mixed foods (soup, stew, fried rice, japchae, bibimbab, etc.)" (3 to 4 times per week or more by 64% with the mean=0.74 time/day), and "Laver" (at least 3 to 4 times by 63% with the mean=0.64 time/day). The remaining items in this vegetables and fruits group are found to be among those served with smaller serving frequency. However, the items in rows 6 to 8 of Table 4.12, i.e., "100 % fruit or vegetable juices," "Banana," and "Green leafy vegetables (spinach, lettuce, radish leaves, perilla leaf, etc.)," are consumed by the majority (63 to 68%) at least once a week, with the mean approximately 2.5 times/week (=0.36 time/day). The items in rows 9 to 18 of Table 4.12, i.e., "Potatoes," "Peppers-green, red," "Sweet potatoes," "Mushrooms," "Bean sprouts," and "Sea-mustard, tangle," "Carrot," "Squash, zucchini," "Canned fruits (peach, pineapple, citrus fruits, etc.)," and "Lotus root, braken, burdock, bellflower root," are chosen on the average 1 to 2 times a week. Forty-three percent of the respondents indicated they never eat canned fruits or eat them less than once a month.

It is interesting to note in Table 4.11 that the items with higher frequency are, in general, consumed in a medium size while those with smaller frequency in a small size. The

only evident exception to this is the item in the 3rd row, “Green onion, leek, garlic, onion,” which shows “small” as the major serving size. This may be explained by the fact that these items are mainly used as seasoning elements added in small amounts. The effect of the item’s small-sized serving results in the reduced standardized serving frequency, causing it to rank at the 5th place. No items in this food group have a major serving size that is large.

Table 4.13 summarizes the distribution of the total standardized serving frequency of vegetables and fruits in four intervals. The Korean Nutrition Society suggests 6.0 servings/day as a recommended serving frequency of the total vegetables and fruits’ group intake for the Korean female adolescents. Slightly more than one-half of the respondents meet the recommended serving frequency even without including the seasonal group.

Table 4.13. Distribution of the total standardized serving frequency of intake for vegetables and fruits (mean=7.1 times/day, s.d.= ± 4.1, N=272)

Total standardized serving frequency/day	Percentage
< 3	12.5
3 – 5.9	32.0
6 – 9.9	37.1
≥ 10	18.4

Seasonal vegetables and fruits

The results of the sample distribution for the food items in the seasonal vegetables and fruits group, with respect to the serving frequency and serving size, are summarized in Table 4.14. Table 4.15 presents the mean values for the serving frequency, serving size, and standardized serving frequency on a daily basis. Because of a restriction in availability throughout the year, Table 4.15 has an additional column for the standardized serving

Table 4.14. Distribution for serving frequency and serving size (in percentage) of seasonal vegetables and fruits

Seasonal vegetables & fruits	Serving frequency									Serving Size		
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Small	Medium	Large
	Citrus fruit	0.4 ^a (0.4) ^b	0.4 (0.8)	1.1 (1.9)	2.1 (4.0)	2.1 (6.1)	15.8 (21.9)	14.4 (36.3)	24.2 (60.5)	39.6 (100.0)	3.5	21.5
Watermelon	6.7 (6.7)	2.1 (8.8)	2.8 (11.6)	4.9 (16.5)	10.9 (27.4)	17.9 (45.3)	20.0 (65.3)	18.9 (84.2)	15.8 (100.0)	9.4	29.3	61.2
Apple	3.5 (3.5)	0.7 (4.2)	3.2 (7.4)	6.7 (14.1)	11.6 (25.7)	23.2 (48.9)	16.8 (65.7)	18.6 (84.3)	15.8 (100.0)	14.2	34.5	51.2
Grapes	5.3 (5.3)	2.1 (7.4)	3.9 (11.3)	6.3 (17.6)	9.8 (27.4)	23.0 (51.3)	17.5 (68.8)	15.1 (83.9)	16.1 (100.0)	13.2	30.4	56.4
Persimmon	5.3 (5.3)	2.8 (8.1)	7.7 (15.8)	9.8 (25.6)	15.4 (41.0)	22.1 (63.1)	17.2 (80.3)	10.2 (90.5)	9.5 (100.0)	23.1	43.3	33.6
Melons	7.0 (7.0)	2.8 (9.8)	7.4 (17.2)	11.2 (28.4)	13.3 (41.7)	22.1 (63.8)	13.3 (77.8)	14.7 (92.5)	7.4 (100.0)	19.0	38.0	43.0
Strawberry	9.5 (9.5)	2.8 (12.3)	7.0 (19.3)	10.9 (30.2)	20.7 (50.9)	21.1 (72.0)	9.8 (82.5)	10.5 (93.0)	7.0 (100.0)	17.9	38.6	43.6
Peach	11.2 (11.2)	4.2 (15.4)	11.2 (26.6)	11.6 (38.2)	17.5 (55.7)	18.6 (74.3)	7.7 (82.0)	9.5 (91.5)	8.4 (100.0)	21.4	41.3	37.3
Pear	4.2 (4.2)	8.8 (13.0)	12.3 (25.3)	14.0 (39.3)	18.6 (57.9)	15.8 (73.7)	9.1 (82.8)	11.2 (94.0)	6.0 (100.0)	20.2	45.1	34.7
Tomatoes	10.2 (10.2)	4.9 (15.1)	11.2 (26.3)	11.2 (37.5)	21.1 (58.6)	17.2 (75.8)	9.8 (85.6)	9.8 (95.4)	4.6 (100.0)	25.5	42.4	32.0
Plum	10.2 (10.2)	5.6 (15.8)	11.2 (27.0)	14.0 (41.0)	18.9 (59.9)	13.7 (73.6)	9.1 (82.7)	10.5 (93.2)	6.7 (100.0)	30.1	41.2	28.7
Cucumber	6.0 (6.0)	7.0 (13.0)	16.8 (29.8)	18.6 (48.4)	16.1 (64.5)	20.7 (85.2)	7.7 (92.9)	4.9 (97.8)	2.1 (100.0)	35.7	45.1	19.1
Corn	13.0 (13.0)	10.9 (23.9)	21.8 (45.7)	16.1 (61.8)	16.8 (78.6)	11.6 (90.2)	4.9 (95.1)	4.2 (99.3)	0.7 (100.0)	21.9	52.5	25.5

^a Percentage of respondents.

^b Cumulative percentage.

Table 4.15. Means for daily serving frequency, serving size, and standardized serving frequency of seasonal vegetables and fruits

Food items	Serving frequency ^a	Serving size ^b	Standardized serving frequency	
			in season ^c	through the year ^c
Citrus fruit	1.24 (0.04) ^d	1.36 (0.02)	1.72 (0.06)	0.57 (0.02)
Apple	0.80 (0.04)	1.19 (0.02)	1.02 (0.05)	0.50 (0.03)
Watermelon	0.79 (0.04)	1.26 (0.02)	1.08 (0.05)	0.36 (0.02)
Grapes	0.77 (0.04)	1.22 (0.02)	1.01 (0.05)	0.25 (0.01)
Persimmon	0.60 (0.03)	1.01 (0.02)	0.71 (0.04)	0.18 (0.01)
Melons	0.57 (0.03)	1.12 (0.02)	0.70 (0.04)	0.23 (0.01)
Strawberry	0.51 (0.03)	1.13 (0.02)	0.65 (0.04)	0.16 (0.01)
Peach	0.49 (0.03)	1.08 (0.02)	0.59 (0.04)	0.15 (0.01)
Pear	0.47 (0.03)	1.08 (0.02)	0.54 (0.04)	0.22 (0.02)
Plum	0.46 (0.03)	0.99 (0.02)	0.52 (0.04)	0.09 (0.01)
Tomatoes	0.44 (0.03)	1.03 (0.02)	0.51 (0.04)	0.17 (0.01)
Cucumber	0.34 (0.02)	0.92 (0.02)	0.35 (0.03)	0.15 (0.01)
Corn	0.25 (0.02)	1.01 (0.02)	0.27 (0.02)	0.09 (0.01)

^aTotal sample number for serving frequency is 285.

^bTotal sample number for serving size varies from 276 to 284 due to missing values.

^cTotal sample number for standardized serving frequency varies from 282 to 285 due to missing values.

^dNumbers in () are standard error of mean.

frequency through the year which takes into account the year-equivalent factors based on the number of months seasonal items are available, which is given in Table 4.16. Note that, as in the previous vegetables and fruits, there is not much difference in the relative positions of the items in both Table 4.14 and 4.15. The data reveal that the seasonal items are consumed with a significantly higher frequency in season in comparison to the other vegetables and fruits. “Citrus fruit,” “Apple,” “Watermelon,” and “Grapes,” placed in the top four rows of Table 4.15, are the most favorite among the young female respondents, with approximately 64% eating “Citrus fruit” 1 time per day or more, and approximately half of them eating “Apple,”

Table 4.16. Months of the year seasonal vegetables and fruits are available and the year equivalent for the available period^a

Seasonal vegetables & fruits	Month												Year Equivalent
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	
Citrus fruit	■	■									■	■	0.33
Apple	■							■	■	■	■	■	0.50
Watermelon					■	■	■	■	■				0.33
Grapes									■	■	■		0.25
Persimmon									■	■	■		0.25
Melones				■	■	■	■						0.33
Strawberry		■	■	■	■								0.25
Peach							■	■	■				0.25
Pear	■								■	■	■	■	0.42
Plum								■					0.17
Tomatoes				■	■	■	■	■					0.33
Cucumber				■	■	■	■	■					0.42
Corn				■	■	■	■	■	■				0.33

^aThe information in this table is available in the web site at (<http://www.garak.co.kr>). Garak is the name of the wholesale market located in Seoul where the respondents of this study are living. Garak is the biggest distribution center for fruits and vegetables which most local retailers are mainly using. Retrieved on January 3, 1998.

“Watermelon,” and “Grapes,” at least 5 to 6 times a week mostly in a large-sized serving (51 to 75%), with mean frequencies of 1.24, 0.80, 0.79, and 0.77 time/day, respectively. The items “Persimmon” and “Melons” also are included in the high serving frequency items which the majority (60%) eat at least 3 to 4 times a week, with means of 0.60 and 0.57 time/day. The items in rows 7 to 11 of Table 4.15, i.e., “Strawberry,” “Peach,” “Pear,” “Plum,” and “Tomatoes,” are chosen by 60 to 70% of the students twice a week or more, with the mean ranging from 0.44 to 0.51 time/day (3 to 4 times/week). “Cucumber” and “corn” are the last two items in the table, with means of 0.34 and 0.25 time/day (1.8 to 2.4 times/week), and a majority (54 to 70%) of the respondents eat them at least once a week.

Similar to the other vegetables and fruits, the seasonal items with higher frequencies, in general, are consumed in a large-sized serving while the less frequent ones generally are consumed in a medium-sized serving. Consequently, the serving size has a negligible effect and the items with high serving frequencies also have a high standardized serving frequency. No items in this group have a major serving size that is small.

Table 4.17 summarizes the distribution of the total standardized serving frequency of the seasonal vegetables and fruits throughout the year, by intervals of five. The values in

Table 4.17. Distribution of the total standardized serving frequency of intake for seasonal vegetables and fruits through the year (mean=3.5 times/day, s.d.= ± 2.4, N=272)

Total standardized serving frequency/day	Percentage
< 1	6.7
1 – 1.9	21.5
2 – 2.9	27.1
3 – 5.9	29.9
≥ 6	14.8

Table 4.17 are added to the values in Table 4.13 to estimate the total intake frequency for vegetables and fruits (Table 4.18). Table 4.18 indicates that the 81.9% of the respondents meet the recommended serving frequency, and the mean, which is estimated at 10.6, is above the recommendation of 6.0.

Table 4.18. Distribution of the total standardized serving frequency for intake of vegetables and fruits with the seasonal ones (mean=10.6 times/day, s.d.= ± 5.5, N=271)

Total standardized serving frequency/day	Percentage
< 3	2.6
3 – 5.9	15.5
6 – 9.9	34.3
≥ 10	47.6

Meat, eggs, fish, shellfish, beans, and nuts

The results of the sample distribution for the food items in the meat group, with respect to the serving frequency and serving size, are summarized in Table 4.19. Table 4.20 presents the average values for the serving frequency, serving size, and standardized serving frequency on a daily basis. It can be noted that there is not much difference in the relative positions of the items in Table 4.19 and 4.20, with the exception of the item “Beans, nuts,” which is placed in the 15th row in Table 4.19 but in 6th row in Table 4.20. Although 61% of the respondents eat “Beans, nuts” once per week or less, approximately 28% eat them 3 to 4 times per week or more, which results in the high mean serving frequency as shown in Table 4.20. No item in this group is served with such a high frequency as rice and cabbage kimchi which are consumed twice or more every day by the majority. The items in the top four rows of Table 4.19 and 4.20, “Soybean paste, red pepper paste,” “Egg, quail’s egg,”

Table 4.19. Distribution of serving frequency and serving size (in percentage) for the meat group

Meat, eggs, fish, shellfish, beans, & nuts	Serving frequency									Serving size		
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Small	Medium	Large
	Soybean paste, red pepper paste	4.2 ^a (4.2) ^b	2.1 (6.3)	6.0 (12.3)	11.2 (23.5)	11.2 (34.7)	24.2 (51.2)	18.2 (77.1)	14.0 (91.1)	8.8 (100.0)	39.3	44.0
Egg, quail's egg	2.8 (2.8)	2.1 (4.9)	5.6 (10.5)	11.9 (22.4)	18.2 (40.6)	23.9 (64.3)	17.2 (81.7)	14.0 (95.7)	4.2 (100.0)	19.0	58.4	22.6
Beef, pork, chicken in mixed foods (stew, fried rice, etc.)	4.6 (4.6)	2.1 (6.7)	11.6 (18.3)	11.6 (29.9)	12.6 (42.5)	27.1 (69.9)	12.6 (82.5)	13.0 (95.5)	4.6 (100.0)	13.7	56.8	29.5
Seeds-perilla, sesame	13.3 (13.3)	6.3 (19.6)	13.7 (33.3)	10.2 (43.5)	11.6 (55.1)	13.3 (68.4)	13.7 (82.1)	13.3 (95.4)	4.6 (100.0)	72.5	22.8	4.7
Ham	10.9 (10.9)	5.6 (16.5)	14.0 (30.5)	15.1 (45.6)	15.8 (61.4)	23.9 (85.3)	10.9 (96.2)	2.5 (98.7)	1.4 (100.0)	35.3	45.5	19.3
Anchovies, icetfishes	7.0 (7.0)	7.7 (14.7)	12.3 (32.2)	16.1 (48.3)	16.5 (64.8)	15.8 (80.6)	7.4 (88.0)	7.4 (95.4)	4.6 (100.0)	48.2	39.6	12.1
Tofu	4.6 (4.6)	4.9 (9.5)	15.8 (25.3)	19.3 (44.6)	21.8 (66.4)	16.8 (83.2)	10.9 (94.1)	5.6 (99.7)	0.4 (100.0)	26.6	53.6	19.8
Tuna, hair tail, yellow croaker, Alaska pollack	5.6 (5.6)	6.7 (12.3)	18.2 (30.5)	21.8 (52.3)	17.5 (69.8)	17.5 (87.3)	4.9 (92.2)	7.4 (99.6)	0.4 (100.0)	26.4	53.6	20.0
Pork	4.2 (4.2)	4.6 (8.8)	19.3 (28.1)	27.1 (65.2)	19.6 (72.3)	16.8 (89.1)	8.1 (97.2)	2.5 (99.7)	0.4 (100.0)	20.1	49.5	30.4
Beef	5.6 (5.6)	10.5 (16.1)	20.7 (36.8)	17.2 (54.0)	18.6 (72.6)	15.1 (87.7)	8.4 (96.1)	3.5 (99.6)	0.4 (100.0)	22.1	53.6	24.3
Sausage, bacon	12.6 (12.6)	9.8 (29.4)	14.0 (43.4)	15.1 (58.5)	16.1 (74.6)	15.8 (90.4)	6.7 (97.1)	1.4 (98.5)	1.4 (100.0)	40.4	43.7	15.9
Fish paste, fish sausage	8.4 (8.4)	10.5 (18.9)	20.7 (39.6)	19.6 (59.2)	23.2 (82.4)	9.5 (91.9)	6.0 (97.9)	2.1 (100.0)	0.0 (100.0)	41.8	43.6	14.6
Mackerel, Pacific saury	10.9 (10.9)	9.8 (20.7)	23.9 (44.6)	17.2 (61.8)	12.3 (75.1)	16.8 (91.9)	6.0 (97.9)	2.1 (100.0)	0.0 (100.0)	37.0	43.8	19.2
Squid, shrimp, clam, solen	8.1 (8.1)	10.5 (18.6)	20.8 (47.4)	19.6 (67.0)	17.5 (84.5)	9.5 (94.0)	3.5 (97.5)	2.1 (99.6)	0.4 (100.0)	30.6	50.0	19.4
Beans, nuts	16.8 (16.8)	13.3 (30.1)	21.7 (51.8)	10.2 (61.4)	10.9 (72.3)	7.0 (79.3)	6.0 (85.3)	6.3 (91.6)	8.4 (100.0)	60.1	31.5	8.3
Chicken, turkey	9.5 (9.5)	13.7 (23.2)	23.8 (57.0)	21.1 (80.1)	10.5 (90.6)	6.0 (96.6)	2.5 (99.1)	0.7 (99.8)	0.4 (100.0)	18.6	37.1	44.3
Organ meats (liver, kidney, etc.)	6.7 (6.7)	10.2 (70.6)	14.7 (85.3)	8.8 (94.1)	3.5 (97.6)	1.4 (99.0)	0.4 (99.4)	0.4 (99.8)	0.4 (100.0)	80.1	17.5	2.4

^a Percentage of respondents.

^b Cumulative percentage.

Table 4.20. Means for daily serving frequency, serving size, and standardized serving frequency of the meat group

Food items	Serving frequency^a	Serving size^b	Standardized serving frequency^c
Soybean paste, red pepper paste	0.63 (0.03) ^d	0.88 (0.02)	0.60 (0.03)
Egg, quail's egg	0.55 (0.03)	1.02 (0.02)	0.59 (0.03)
Beef, pork, chicken in mixed foods (stew, fried rice, etc.)	0.52 (0.03)	1.08 (0.02)	0.57 (0.03)
Seeds-perilla, sesame	0.46 (0.03)	0.66 (0.02)	0.32 (0.03)
Anchovies, icefishes	0.39 (0.03)	0.82 (0.02)	0.36 (0.03)
Beans, nuts	0.38 (0.03)	0.74 (0.02)	0.32 (0.03)
Ham	0.34 (0.02)	0.92 (0.02)	0.34 (0.02)
Tofu	0.34 (0.02)	0.97 (0.02)	0.35 (0.02)
Tuna, hair tail, yellow croaker, Alaska pollack	0.31 (0.02)	0.97 (0.02)	0.33 (0.02)
Pork	0.29 (0.02)	1.05 (0.02)	0.32 (0.02)
Beef	0.28 (0.02)	1.01 (0.02)	0.30 (0.02)
Sausage, bacon	0.26 (0.02)	0.88 (0.02)	0.26 (0.03)
Mackerel, Pacific saury	0.24 (0.01)	0.91 (0.02)	0.24 (0.02)
Fish paste, fish sausage	0.23 (0.01)	0.86 (0.02)	0.22 (0.02)
Squid, shrimp, clam, solen	0.21 (0.01)	0.94 (0.02)	0.21 (0.02)
Chicken, turkey	0.16 (0.01)	1.13 (0.02)	0.19 (0.02)
Organ meats (liver, kidney, etc.)	0.06 (0.01)	0.61 (0.01)	0.04 (0.01)

^a Total sample number for serving frequency is 285.

^b Total sample number for serving size varies from 251 to 280 due to missing values.

^c Total sample number for standardized serving frequency varies from 281 to 285 due to missing values.

^d Numbers in () are standard error of mean.

“Beef, pork, chicken in mixed foods (stew, fried rice, etc.),” and “Seeds-perilla, sesame,” are consumed by 45 to 65% participants at least 3 times a week, with means of 0.63, 0.55, 0.52, and 0.46 time/day, respectively. The items in rows 5 to 16 of Table 4.20, “Anchovies, icefishes,” “Beans, nuts,” “Ham,” “Tofu,” “Tuna, hair tail, yellow croaker, Alaska pollack,”

“Pork,” “Beef,” “Sausage, bacon,” “Mackerel, Pacific saury,” “Fish paste, fish sausage,” “Squid, shrimp, clam, solen,” and “Chicken, turkey,” are served 0.16 to 0.39 time/day (1 to 3 times/week), on average. Nearly 60% of the respondents consume “Organ meats (liver, kidney, etc.)” never or less than once a month, with a mean serving frequency of 0.06 time/day (less than twice/month). With consideration of low iron intake among Korean female adolescents, more frequent consumption of red meat such as beef, organ meat and pork is recommended (Lee et al., 1994)

The items in this meat group are mostly consumed in a medium-sized serving except “Seeds-perilla, sesame,” “Anchovies, icefish,” “Beans, nuts,” and “organ meats,” which are consumed mostly in a small-sized serving. The serving size has a negligible effect on the relative magnitude of standardized serving frequency.

Table 4.21 summarizes the distribution of the total standardized serving frequency of the meat group. The Korean Nutrition Society (KNS) suggests 5.0 servings/day as a recommended serving frequency for the total intake of the meat group for Korean female adolescents. As shown in Table 4.21, approximately 44% of the respondents meet the recommended serving frequency, and the mean, which is estimated at 5.5, is above the recommendation.

Table 4.21. Distribution of the total standardized serving frequency of intake for the meat group (mean=5.5, s.d.= \pm 3.7 times/day, N=271)

Total standardized serving frequency/day	Percentage
< 2	24.3
2 – 4.9	31.4
5 – 7.9	22.2
\geq 8	22.1

Milk and milk products

The results of the sample distribution for the food items in milk products, with regard to the serving frequency and serving size, are summarized in Table 4.22. Table 4.23 presents the average values for the serving frequency, serving size, and standardized serving frequency on a daily basis. There is no difference in the relative positions of the items in both Tables 4.22 and 4.23. Milk is consumed by slightly more than one-half of the respondents at least 5 to 6 times a week in a medium-sized serving, with mean serving frequency of 0.76 time/day. Ice cream and yogurt also have a significant serving frequency, nearly 50% eating ice cream at least 3 to 4 times a week and yogurt twice a week or more, with means of 0.47 and 0.45 time/day. Cheese is seen to be the least frequently consumed item in this group, about 60% of the respondents eating cheese less than once a week and largely in a small-sized serving, with mean frequency of 0.21 time/day. All milk products except cheese are consumed mostly in a medium-sized serving, and the serving size has a negligible effect on the determination of the relative magnitude of standardized serving frequency.

Table 4.24 summarizes the distribution of the total standardized serving frequency of intake from the milk group. The Korean Nutrition Society suggests 1.5 servings per day as the recommended serving frequency from the milk group for Korean female adolescents. Table 4.24 reveals that 61.3% of the samples meet the recommended serving frequency, and the mean, which is estimated at 2.1, is above the recommendation.

Table 4.22. Distribution for serving frequency and serving size (in percentage) of milk products

Milk & milk products	Serving frequency									Serving size		
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Small	Medium	Large
	Milk	4.6 ^a (4.6) ^b	2.1 (6.7)	6.3 (13.0)	8.4 (21.4)	8.4 (29.8)	17.5 (47.3)	11.9 (59.2)	27.7 (86.9)	13.0 (100.0)	14.8	58.3
Ice cream	2.5 (2.5)	1.4 (3.9)	10.5 (14.4)	15.1 (29.5)	20.4 (49.9)	22.8 (72.7)	15.4 (88.1)	9.1 (97.2)	2.8 (100.0)	9.9	51.4	38.7
Yogurt	7.4 (7.4)	6.0 (13.4)	16.1 (29.5)	15.1 (44.6)	15.1 (59.7)	12.3 (72.0)	10.2 (82.2)	12.6 (94.8)	5.3 (100.0)	27.9	53.2	18.9
Cheese	27.0 (27.0)	13.3 (40.3)	21.4 (61.7)	11.6 (73.3)	8.8 (82.1)	7.7 (89.8)	4.2 (94.0)	4.6 (98.6)	1.4 (100.0)	59.1	31.4	9.5

^a Percentage of respondents.

^b Cumulative percentage.

Table 4.23. Means for daily serving frequency, serving size, and standardized serving frequency of the milk group

Food items	Serving frequency ^a	Serving size ^b	Standardized serving frequency ^c
Milk	0.76 (0.03) ^d	1.06 (0.02)	0.87 (0.05)
Ice cream	0.47 (0.02)	1.14 (0.02)	0.57 (0.03)
Yogurt	0.45 (0.03)	0.96 (0.02)	0.47 (0.04)
Cheese	0.21 (0.02)	0.75 (0.02)	0.18 (0.02)

^a Total sample number for serving frequency is 285.

^b Total sample number for serving size varies from 274 to 283 due to missing values.

^c Total sample number for standardized serving frequency varies from 284 to 285 due to missing values.

^d Numbers in () are standard error of mean.

Table 4.24. Distribution of the total standardized serving frequency for the intake of the milk group (mean=2.1 times/day, s.d.= ± 1.4, N=284)

Total standardized serving frequency/day	Percentage
< 1.5	38.7
1.5 – 2.9	39.5
≥ 3	21.8

Fats and sweets

The results of the sample distribution for the food items in fats and sweets, with respect to the serving frequency and serving size, are summarized in Table 4.25. The mean values for serving frequency, serving size, and standardized serving frequency on a daily basis are presented in Table 4.26. It also is noted that there is not much difference in the relative positions of the items in both Table 4.25 and 4.26. The items in rows 1 to 5 of Table 4.26, including “Corn oil, soybean oil,” “Perilla oil, sesame oil,” “Tea,” “Candies, chocolate,” and “Carbonated beverages,” are chosen by 45 to 63% of the respondents at least 3 to 4 times a week, with a major serving size “small” for the first two items and “medium”

Table 4.25. Distribution for serving frequency and serving size (in percentage) of fats and sweets

Fats & sweets	Serving frequency									Serving size		
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Small	Medium	Large
	Perilla oil, sesame oil	4.2 ^a (4.2) ^b	2.1 (6.3)	9.1 (15.4)	9.1 (24.5)	13.0 (37.5)	19.3 (56.8)	20.0 (76.8)	16.1 (92.9)	7.0 (100.0)	57.3	39.5
Corn oil, soybean oil	6.7 (6.7)	2.8 (9.5)	6.7 (16.2)	10.2 (26.4)	13.7 (40.1)	17.5 (57.6)	15.4 (73.0)	17.9 (90.9)	9.1 (100.0)	56.5	37.7	5.8
Tea	10.2 (10.2)	4.2 (14.4)	12.3 (26.7)	9.5 (36.2)	10.5 (46.7)	16.8 (63.5)	9.1 (72.6)	17.2 (89.8)	10.2 (100.0)	21.8	62.9	15.4
Candies, chocolate	3.2 (3.2)	2.1 (5.3)	9.5 (14.8)	16.5 (31.3)	15.8 (47.1)	22.8 (69.9)	16.5 (86.4)	10.2 (96.6)	3.5 (100.0)	23.9	48.9	27.1
Carbonated beverages	6.7 (6.7)	1.8 (8.5)	13.0 (21.5)	17.9 (39.4)	15.8 (55.2)	19.6 (74.8)	12.3 (87.1)	8.8 (95.9)	4.2 (100.0)	15.5	57.0	27.4
Mayonnaise, salad dressing	17.2 (17.2)	9.1 (26.3)	14.0 (40.3)	20.0 (60.3)	16.1 (76.4)	13.3 (89.7)	6.7 (96.4)	3.2 (99.6)	0.4 (100.0)	47.4	37.2	15.4
Jam	20.7 (20.7)	11.2 (31.9)	20.7 (52.6)	13.7 (66.3)	12.6 (78.9)	11.2 (90.1)	3.9 (94.0)	5.3 (99.3)	0.7 (100.0)	48.3	40.8	10.9
Margarine, butter	20.7 (20.7)	11.9 (32.6)	20.4 (53.0)	10.2 (63.2)	15.1 (78.3)	10.9 (89.2)	4.9 (94.1)	5.3 (99.4)	0.7 (100.0)	63.2	32.9	4.0
Cocoa	35.7 (35.7)	11.9 (45.6)	15.8 (61.4)	10.2 (71.6)	8.4 (80.0)	9.1 (89.1)	4.2 (93.3)	5.6 (98.9)	1.1 (100.0)	34.8	58.1	7.0

^a Percentage of respondents.

^b Cumulative percentage.

Table 4.26. Means for daily serving frequency, serving size, and standardized serving frequency of fats and sweets

Food items	Serving frequency ^a	Serving size ^b	Standardized serving frequency ^c
Corn oil, soybean oil	0.63 (0.03) ^d	0.75 (0.02)	0.50 (0.03)
Perilla oil, sesame oil	0.61 (0.03)	0.73 (0.02)	0.45 (0.03)
Tea	0.59 (0.03)	0.97 (0.02)	0.64 (0.04)
Candies, chocolate	0.49 (0.02)	1.02 (0.02)	0.54 (0.03)
Carbonated beverages	0.45 (0.03)	1.06 (0.02)	0.53 (0.04)
Mayonnaise, salad dressing	0.25 (0.02)	0.84 (0.02)	0.23 (0.02)
Margarine, butter	0.24 (0.02)	0.70 (0.02)	0.18 (0.01)
Jam	0.23 (0.02)	0.81 (0.02)	0.21 (0.02)
Cocoa	0.21 (0.02)	0.86 (0.02)	0.21 (0.02)

^aTotal sample number for serving frequency is 285.

^bTotal sample number for serving size varies from 265 to 281 due to missing values.

^cTotal sample number for standardized serving frequency varies from 283 to 285 due to missing values.

^dNumbers in () are standard error of mean.

for the last three items, with mean serving frequencies ranging from 0.45 to 0.63 time/day.

The items in the bottom four rows of Table 4.26 include “Mayonnaise, salad dressing,” “Margarine, butter,” “Jam,” and “Cocoa,” which a significant proportion (17 to 34%) of the respondents eats never or less than once a month, but the items are consumed by 30 to 40% at least twice a week, with the mean ranging from 0.21 to 0.25 time/day, and mostly in a small- or medium-sized serving.

The distribution of the total standardized serving frequency of the fats and sweets are summarized in Table 4.27. The Korean Nutrition Society suggests four servings per day as the recommended serving frequency of the fats and sweets for Korean female adolescents. It

Table 4.27. Distribution of the total standardized serving frequency of the intake for fats and sweets (mean=3.5 times/day, s.d.= ± 2.5, N=282)

Total standardized serving frequency/day	Percentage
< 2	28.4
2 – 3.9	37.6
≥ 4	34.0

is indicated in Table 4.27 that only 34% of the respondents meet the recommended serving frequency, and the mean, which is estimated at 3.5, is below the recommendation.

Summary of serving frequency and serving size

The description in this section is based on the mean standardized serving frequency, which combines the effect of mean serving frequency and that of mean serving size. As mentioned previously, the mean standardized serving frequency shows nearly the same trend as the mean serving frequency. It is important to remember that a unit standardized serving frequency (1 time/day) amounts to one medium-sized serving per day. The facts that emerged from examining the results of the survey on serving frequency and serving size of the food groups may be summarized as follows:

1. As indicated in Tables 4.7 and 4.8, 99% of the participants eat rice every day, with a mean standardized serving frequency (MSSF) of 2.0 times/day, implying that rice is eaten, on the average, twice a day in a medium-sized serving. Next on the list are the items “Biscuits, crackers, cookies” (MSSF=0.71), “Barley” (MSSF=0.36), “Ra Myon” (MSSF=0.36), “Ddokbokgi, ddokguk” (MSSF=0.32), “Loaf bread” (MSSF=0.29), “Dock marked bread, cake, cream-jam bread, doughnuts” (MSSF=0.26), and some other minor items with an MSSF of less than 0.2. Among the major items in grain products, rice and

barley are included in the main dishes served at home; whereas the others, in general, are consumed as a snack either at home or in a snack bar operated by the school or in fast food restaurants near the school.

2. As shown in Table 4.12, the two most important items in vegetables and fruits are “Cabbage kimchi” (MSSF=1.41) and “Radish” (MSSF=0.97). The other major items include “vegetables in mixed foods” (MSSF= 0.83), “Laver” (MSSF= 0.67), “Green onion, leek, garlic, onion” (MSSF=0.58), “100 % fruit or vegetable juices” (MSSF=0.46), and “Banana” (MSSF=0.43).

3. As indicated in Table 4.15, all the fruit items in seasonal vegetables and fruits are consumed at least once every other day, on the average, when they are in season (MSSF > 0.5). When the seasonal effect is taken into consideration, the most favored are “Citrus fruit” (year-equivalent MSSF=0.57), “Apple” (year-equivalent MSSF=0.50), and “Watermelon” (year-equivalent MSSF=0.36).

4. The major items in the meat group shown in Table 4.20 are “Soybean paste, red pepper paste” (MSSF=0.60), “Egg, quail’s egg” (MSSF=0.59), and “Beef, pork, chicken in mixed foods (stew, fried rice, etc.)” (MSSF=0.57).

5. As shown in Table 4.23, the major items in the milk group include “Milk” (MSSF=0.87), “Ice cream” (MSSF=0.57), and “Yogurt” (MSSF=0.47).

6. The major items in fats and sweets, shown in Table 4.26, include “Tea” (MSSF=0.64), “Candies, chocolate” (MSSF=0.54), “Carbonated beverages” (MSSF=0.53), “Corn oil, soybean oil” (MSSF=0.50), and “Perilla oil, sesame oil” (MSSF=0.45).

Discussion on the total standardized serving frequency

One of the objectives of this study was to examine the food intake of Korean female adolescents relative to the Korean Food Tower. The Korean Food Tower is suggested by the Korean Nutrition Society (KNS) to better illustrate the recommended dietary guideline for the five food groups (The Korean Nutrition Society, 1995, pp. 201-214). The recommended serving frequency for a specific food group is estimated by considering the proportion of both the nutrients and the amount of energy that are supplied from that food group. The KNS especially emphasizes eating sufficient protein-containing foods, drinking milk every day, and consuming an adequate amount of fat-containing foods to supply approximately 20% of the total daily energy need. The emphasis on fat-related foods arises from the fact that the fat consumption percentage reported to be 9% of the total daily energy intake in rural areas and 15% in urban areas is significantly lower than the recommendation (The Korean Nutrition Society, 1995, pp. 399-403).

Of the total of 285 questionnaires collected, 247 completed the food frequency for all five food groups so that they can be used to evaluate the dietary behavior of the participants. The data in the following discussion are, therefore, based on the 247 completed questionnaires, and may be somewhat at variance with those that have been used previously in the discussion of an individual food group. Table 4.28 shows a comparison of the mean total standardized serving frequency from this study with the serving frequencies recommended by KNS for Korean female adolescents (The Korean Nutrition Society, 1995, p. 209). The mean values are seen to be above the recommendation by 10 to 77% except for fats and sweets, which is 12.5% below. The average values for the participants, however, do not provide sufficient information regarding the dietary behavior of each individual to judge

whether she is on a balanced diet or if she has any problem areas that need to be considered in the development of future nutrition education programs. The last row of Table 4.28 indicates the percentage of respondents who do not meet the recommended serving frequency in a specific food group. It is seen that even in the groups “grain products” and “vegetables and fruits,” where the mean total standardized serving frequency is 57% and 77% above the recommendation, respectively, 16.6% and 17.4% of the respondents eat them less than the

Table 4.28. Estimated mean total standardized serving frequency, the serving frequency recommended by The Korean Nutrition Society, and the percentage of the respondents consuming less than the recommendation (N=247)

Food group ⇒	Grain products	Vegetables & fruits	Meat	Milk	Fats & sweets
Mean total standardized serving frequency (times/day)	5.5	10.6	5.5	2.1	3.5
Recommended serving frequency (times/day)	3.5	6	5	1.5	4
Percentage of respondents below the recommendation	16.6	17.4	54.7	39.7	65.7

recommendation. The situation deteriorates further in the other food groups. The percentage of respondents who need to consume more of the “meat” is 54.7%, of the “milk” 39.7%, and of “fats and sweets” 65.7%. This result is in support of the KNS, which recommends sufficient consumption of those three food groups (The Korean Nutrition Society, 1995, pp. 339-403).

Table 4.29 presents the percentage of the respondents who meet the recommended serving frequency by group numbers. Only 19.9% are on a balanced diet that satisfies the recommendation in all the five food groups and 4.1% are short on all of the five food groups. The data indicate conclusively that one of the most serious problems may be related to an

apparent imbalance in food consumption. The first statement included in the Korean dietary guideline by KNS (The Korean Nutrition Society, 1995, p. 339), which puts an emphasis on the balanced diet from the five food groups, implies that an unbalanced diet is not a specific problem among the present age groups. The results of the food attitudes discussed in the next section show that the vast majority of the respondents do not have external restrictions, such as economics and time that may limit their food choice. The imbalance in the dietary behavior, therefore, may be an indication of the need for future nutrition education programs for the students as well as for their parents.

Table 4.29. Percentage of the respondents who meet the recommended serving frequency in the number of food groups (N=247)

Number of food groups ⇒	0	1	2	3	4	5
Percentage	4.1	11.7	17.8	27.1	19.4	19.9
Cumulative percentage	4.1	15.8	33.6	60.7	80.1	100.0

Description of Food Attitudes

Analysis of instrument

This section describes the participants' food attitudes toward the five food groups by analyzing the results obtained from the instrument which was designed specifically for the purpose and whose validity has been proven in a previous study by Amos (1999). A five-point Likert-type scale was chosen for the response format, with the 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree. The instrument has 22 items to measure food attitudes for the five food groups. Six of the total 22 items (4, 6, 8, 10, 13, and 19) are negatively worded. Scoring of the six items, therefore, was reversed in the analysis.

The reliability of the attitude scale for the present study was calculated using Cronbach's coefficient alpha for each food group, and is summarized in Table 4.30. The reliabilities for the "vegetables and fruits" and "milk" group scales are 0.74 and 0.72, respectively, and that of the "grain products," "meat," and "fats and sweets" group scales are 0.58, 0.57, and 0.52, respectively. The attitude items and their item-total correlation coefficients are shown in Appendix F.1 for each of the five food groups.

Table 4.30. Reliability coefficients of the 22-item attitude scale for the five food groups (N=285)

Food group	Alpha (α)
Vegetables & fruits	0.74
Milk	0.72
Grain products	0.58
Meat	0.57
Fats & sweets	0.52

The sample distribution (N=285) among the five scales with respect to the 22 items, each applied to the five food groups, is shown in Table 4.31. The values are given by the percentage of respondents choosing the rating. It is extremely difficult to draw meaningful conclusions by reviewing the data as they appear in Table 4.31. In order to describe the participants' food attitudes, the 22 items on the instrument were categorized into five factors through factor analysis using the SPSS FACTOR sub-program. The factor analysis utilizes an extraction method (principal components analysis) and a rotation method (Varimax with Kaiser normalization), which produces, as a result, a rotated orthogonal component matrix for each of the five food groups. The rotated component matrix provides the information necessary to isolate the items pertaining to a specific factor. The data used on the factor loading are given in Appendixes F.2 through F.6 for factors 1 through 5, respectively. The

Table 4.31. Profile of the sample distribution among the 5 scales with respect to the 22 attitude items on the instrument, in percentage (N=285)

Item	Food group	Scales ⇒				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	Grain products	1.4	15.4	44.6	31.6	7.0
	Vegetables & fruits	0.4	1.8	6.3	40.7	50.9
	Meat	3.2	37.2	44.6	14.4	0.7
	Milk	1.8	3.2	15.8	41.8	37.5
	Fats & sweets	24.2	51.9	20.7	3.2	0.0
2	Grain products	6.7	26.7	21.1	31.2	14.4
	Vegetables & fruits	5.3	12.3	20.4	39.6	22.5
	Meat	3.9	8.4	15.1	45.6	27.0
	Milk	18.2	39.6	29.5	7.4	5.3
	Fats & sweets	18.2	26.7	22.5	21.4	11.2
3	Grain products	4.6	10.5	18.2	34.0	32.6
	Vegetables & fruits	3.2	10.9	14.4	38.2	33.3
	Meat	7.0	17.5	28.4	27.0	20.0
	Milk	10.5	17.9	24.6	27.0	20.0
	Fats & sweets	17.2	32.6	28.1	14.7	7.4
4	Grain products	8.4	20.7	33.3	29.1	8.4
	Vegetables & fruits	16.1	27.0	31.9	21.1	3.9
	Meat	13.0	25.6	35.1	20.0	6.3
	Milk	13.0	26.0	30.5	23.5	7.0
	Fats & sweets	13.7	22.5	33.0	20.7	10.2
5	Grain products	15.4	28.1	30.9	17.2	8.4
	Vegetables & fruits	4.2	8.4	19.6	37.5	30.2
	Meat	7.0	24.2	36.1	21.8	10.9
	Milk	3.5	12.6	29.8	33.0	21.1
	Fats & sweets	11.9	17.9	18.2	24.9	27.0
6	Grain products	17.5	38.2	28.4	11.9	3.9
	Vegetables & fruits	19.3	33.3	30.2	13.0	4.2
	Meat	10.5	28.8	30.5	22.8	7.4
	Milk	17.9	37.5	28.1	13.3	3.2
	Fats & sweets	13.7	33.0	26.7	18.9	7.7
7	Grain products	26.3	40.7	21.4	8.4	3.2
	Vegetables & fruits	35.1	33.3	17.2	10.2	4.2
	Meat	22.8	35.1	21.8	14.4	6.0
	Milk	29.5	35.8	20.0	9.5	5.3
	Fats & sweets	21.1	33.3	19.3	13.7	12.6
8	Grain products	63.5	29.5	5.3	0.7	1.1
	Vegetables & fruits	53.7	31.2	9.8	3.5	1.8
	Meat	46.3	30.2	13.0	7.0	3.5
	Milk	56.8	34.4	5.3	2.8	0.7
	Fats & sweets	57.2	33.3	6.0	2.8	0.7
9	Grain products	7.4	19.3	41.8	26.0	5.6
	Vegetables & fruits	28.4	39.6	17.5	8.1	6.3
	Meat	14.0	41.4	33.3	8.8	2.5
	Milk	7.0	20.7	41.4	21.8	9.1
	Fats & sweets	31.9	35.4	23.9	3.9	4.9
10	Grain products	23.9	38.9	22.5	11.6	3.2
	Vegetables & fruits	32.6	44.2	17.5	3.5	2.1
	Meat	18.2	30.2	23.9	18.6	9.1
	Milk	43.2	42.8	11.6	1.4	1.1
	Fats & sweets	34.0	46.0	14.4	4.2	1.4
11	Grain products	7.4	20.7	29.1	30.5	12.3
	Vegetables & fruits	3.5	8.1	12.3	41.8	34.4
	Meat	8.4	30.5	31.9	20.7	8.4
	Milk	4.9	9.5	23.9	37.9	23.9
	Fats & sweets	17.9	29.1	29.1	16.1	7.7

Table 4.31. (continued)

Item	Food group	Scales ⇒				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
12	Grain products	5.6	14.4	34.7	34.0	11.2
	Vegetables & fruits	1.4	3.2	7.0	40.7	47.7
	Meat	6.3	30.5	32.6	23.5	7.0
	Milk	0.7	8.8	20.7	42.8	27.0
	Fats & sweets	21.8	41.8	27.4	6.7	2.5
13	Grain products	9.8	28.4	38.6	15.4	7.7
	Vegetables & fruits	27.7	39.3	24.2	7.0	1.8
	Meat	7.7	33.3	37.2	16.1	5.6
	Milk	22.1	37.5	25.3	8.8	6.3
	Fats & sweets	9.5	24.9	31.6	18.6	15.4
14	Grain products	7.0	11.6	32.3	37.9	11.2
	Vegetables & fruits	3.5	3.9	13.7	40.0	38.9
	Meat	6.0	12.6	23.9	35.4	22.1
	Milk	7.4	10.9	17.9	36.8	27.0
	Fats & sweets	11.9	16.5	32.3	27.0	12.3
15	Grain products	1.1	5.6	22.5	44.6	26.3
	Vegetables & fruits	1.4	7.0	23.5	41.8	26.3
	Meat	3.9	9.1	31.9	40.0	15.1
	Milk	5.6	19.3	24.2	32.3	18.6
	Fats & sweets	3.5	14.7	44.9	28.4	8.4
16	Grain products	2.8	10.9	32.3	38.2	15.8
	Vegetables & fruits	0.7	3.5	12.3	42.8	40.7
	Meat	2.8	17.5	43.9	29.1	6.7
	Milk	1.4	4.6	24.6	41.1	28.4
	Fats & sweets	15.8	36.8	40.7	5.6	1.1
17	Grain products	2.8	6.3	21.8	40.7	28.4
	Vegetables & fruits	1.8	4.6	13.7	41.1	38.9
	Meat	4.2	18.6	36.5	28.8	11.9
	Milk	2.8	3.9	19.3	36.5	37.5
	Fats & sweets	6.0	15.8	29.5	33.3	15.4
18	Grain products	2.8	14.7	38.6	28.8	15.1
	Vegetables & fruits	3.5	12.3	33.7	32.6	17.9
	Meat	4.2	15.1	30.5	34.4	15.8
	Milk	3.2	12.3	31.9	37.5	15.1
	Fats & sweets	10.5	26.7	42.1	16.5	4.2
19	Grain products	35.8	34.7	21.4	5.6	2.5
	Vegetables & fruits	19.6	28.1	19.3	22.8	10.2
	Meat	18.9	33.3	22.5	18.6	6.7
	Milk	25.6	39.3	21.1	9.5	4.6
	Fats & sweets	23.9	34.0	22.8	13.3	6.0
20	Grain products	15.8	29.8	32.6	16.1	5.6
	Vegetables & fruits	1.8	3.5	2.1	27.0	65.6
	Meat	31.2	41.4	17.9	4.9	4.6
	Milk	8.4	21.4	30.2	22.5	17.5
	Fats & sweets	51.9	30.5	10.2	3.2	4.2
21	Grain products	4.6	6.3	21.1	38.9	29.1
	Vegetables & fruits	4.2	5.3	30.9	35.4	24.2
	Meat	1.4	2.8	11.2	32.3	52.3
	Milk	3.2	6.7	22.1	35.8	32.3
	Fats & sweets	10.5	14.7	37.9	22.8	14.0
22	Grain products	17.2	28.4	26.0	21.4	7.0
	Vegetables & fruits	6.3	10.2	15.1	38.2	30.2
	Meat	18.9	36.5	31.9	9.5	3.2
	Milk	23.5	41.1	28.4	4.2	2.8
	Fats & sweets	27.0	42.1	25.3	3.9	1.8

five factors, thus determined, were named, based on the content of the items: (a) conscious choice of food, (b) health concerns, (c) economics and time influence, (d) interest in foods, and (e) foods that energize. The reliability for all the items pertaining to each factor was calculated with respect to the total food groups; these results are presented in Table 4.32. The reliabilities of factors 1, 2, 3, 4, and 5 are 0.69, 0.74, 0.84, 0.62, and 0.74, respectively. The overall trend in attitudes is summarized in Table 4.33, where the mean, standard deviation, mode, and median for each food group are evaluated for each factor. The items belonging to each factor are given in Tables 4.34 through 4.38, along with their mean scores. The statistics for food attitudes as they relate to each factor for the five food groups are displayed in Table 4.33, and Tables 4.34 through 4.38.

Table 4.32. Reliability of all the items in each factor with respect to the total food groups^a

Factor	Reliability for the total five food groups
1. Conscious choice of food	0.69
2. Health concerns	0.74
3. Economics & time influence	0.84
4. Interest in foods	0.62
5. Foods that energize	0.74

^aReliability for the total 5 food groups is based on 7 items in factor 1, 6 items in factor 2, 4 items in factor 3, 3 items in factor 4, and 2 items in factor 5. Sample size, N=285.

Factor 1. Conscious choice of food

Table 4.33 displays median values ranging from 3.00 to 3.57, and mean scores from 3.01 to 3.55, with standard deviations near 0.5, “fats and sweets” and “vegetables and fruits” being the lower and upper limit of both median and mean, respectively. The scores higher

Table 4.33. Food attitude scores by the five factors and the five food groups (N=285)

Factor ↓	Food group ⇒	Grain	Vegetables	Meat	Milk	Fats
		products	& fruits			& Sweets
1. Conscious choice of food	Mean	3.2486	3.5539	3.2722	3.1549	3.0065
	S.D.	0.4736	0.5007	0.5048	0.5445	0.5376
	Mode	3.43	3.71	3.43	3.29	2.71
	Median	3.2857	3.5714	3.2857	3.1429	3.0000
2. Health concerns	Mean	3.0889	4.1538	2.6363	3.3895	2.1187
	S.D.	0.5699	0.5730	0.5109	0.5665	0.5491
	Mode	3.00	4.00	2.67	3.50	2.17
	Median	3.0000	4.1667	2.6667	3.3333	2.1667
3. Economics & time influence	Mean	4.0096	3.9211	3.5088	4.1088	3.8588
	S.D.	0.5654	0.6634	0.7514	0.5934	0.5749
	Mode	4.00	4.00	4.00	4.25	4.00
	Median	4.0000	4.0000	3.5000	4.2500	4.0000
4. Interest in foods	Mean	3.0947	3.7006	3.1018	3.4702	2.8994
	S.D.	0.6578	0.7176	0.6738	0.7734	0.6960
	Mode	3.00	3.67	3.00	3.33	3.00
	Median	3.0000	3.6667	3.0000	3.6667	3.0000
5. Foods that energize	Mean	3.6018	3.5965	3.8684	3.6825	2.9614
	S.D.	0.8641	0.8192	0.7630	0.7939	0.8330
	Mode	3.50	3.50	4.00	3.50	3.00
	Median	3.5000	3.5000	4.0000	3.5000	3.0000

than 3.0 indicated a more favorable attitude toward the food group as it relates to conscious choice of food. The data, therefore, clearly indicated that the majority of the participants, in general, choose foods consciously, especially “vegetables and fruits.”

Individual mean scores for the 7 items in factor 1 are shown in Table 4.34. The data in Table 4.34 reveal at least two facts that are hidden in Table 4.33. First, the response to item 7 is “disagree” (mean=2.15 to 2.63) in all food groups, reflecting that the majority, in general, do not make a conscious effort to eat the recommended number of servings of foods. The removal of item 7 would move the general attitude to be closer to “agree” side. Another fact is that three (2, 3, and 7) of the seven items have mean scores for “fats and sweets” on the “disagree” side, and the other four (5, 6, 14, and 15) on the slightly “agree” side. It is also indicated in Table 4.34 that the respondents eat better at home (item 3), except for “fats

Table 4.34. Mean scores of the seven items on factor 1 indicating “conscious choice of food” for the five food groups (N=285)

Questionnaire item ↓	Food group ⇒				
	Grain products	Vegetables & fruits	Meat	Milk	Fats & sweets
2. I eat better when I eat with others.	3.202	3.62	3.834	2.42	2.807
3. I eat better when I eat at home.	3.792	3.875	3.352	3.281	2.625
5. Teenage girls are concerned about eating more	2.751	3.808	3.054	3.556	3.369
6. I do not know what to do when it comes to new choices for ^a	3.538	3.505	3.122	3.536	3.261
7. I need to make a conscious effort to consume the recommended servings of	2.215	2.151	2.460	2.256	2.634
14. I can learn to like these foods.	3.347	4.069	3.550	3.651	3.113
15. I think I eat enough of these foods.	3.897	3.846	3.533	3.390	3.232

^a Scoring is reversed to account for the negative valence.

and sweets,” and with others (item 2) except for “milk” and “fats and sweets.” They do not seem to have much difficulty in learning to like a variety of foods whether familiar (item 14) or new (item 6), and eat enough (item 15) regardless of the food group. The response to item 5 indicates that teenage girls have a slightly unfavorable (mean=2.75) preference for “grain products.”

Factor 2. Health concerns

The five food groups are divided into three sub-groups depending upon the participants’ judgment about health concerns: health-promoting, neutral, or affecting negatively (Table 4.33). Judging from the median, 4.17 for “vegetables and fruits,” with mean=4.15 (S.D.=0.57), and 3.33 for “milk,” with mean=3.39 (S.D.=0.57), the majority of the participants consider the two food groups to be health-promoting, especially “vegetables and fruits.” “Grain products” generally are considered neutral in health concerns, with

median=3.00 and mean=3.09 (S.D.=0.57). The remaining two groups, “meat,” with median=2.67 and mean=2.64 (S.D.=0.51), and “fats and sweets,” with median=2.17 and mean=2.12 (S.D.=0.55), are considered to have a negative effect on health, especially “fats and sweets.”

The responses to the six items for factor 2 are shown in Table 4.35. The “vegetables and fruits” and “milk” are evaluated highly for healthy feeling (item 1), health consciousness (item 12), and being healthier (item 16), with mean scores of 4.19 to 4.40 for the former group and 3.87 to 4.10 for the latter. The majority consider “vegetables and fruits” best for female weight watchers (item 20) as is evident in the highest mean, 4.51, but “fats and sweets” and “meat” are lowest, with mean scores of 1.77 and 2.10, respectively. However, “vegetables and fruits” obtained a substantially low score, 2.24, in item 9, asking if its consumption will decrease the risk of heart disease, and the highest score in concern about pesticide residues (mean=3.758 in item 22). “Fats and sweets” received scores below 2.4 for all of the items in

Table 4.35. Mean scores of the six items in factor 2 indicating “health concerns” for the five food groups (N=285)

Questionnaire item ↓	Food group ⇒				
	Grain products	Vegetables & fruits	Meat	Milk	Fats & sweets
1. would feel healthier if I would eat more	3.274	4.402	2.725	4.103	2.209
9. Consuming a variety of these foods will decrease my risk of heart disease.	3.034	2.240	2.444	3.053	2.145
12. Individuals who eat these foods are health conscious.	3.305	4.301	2.941	3.866	2.269
16. Individuals who consume these foods are healthier.	3.533	4.193	3.194	3.908	2.394
20. Individuals who consume these foods are female weight watchers.	2.656	4.511	2.103	3.193	1.773
22. When I eat these foods, I am afraid of the residues of pesticides.	2.726	3.758	2.416	2.217	2.117

factor 2; whereas, the “meat” is rated almost neutral in health consciousness (item 12, mean=2.94) and being healthier (item 16, mean=3.19).

Factor 3. Economics and time influence

Table 4.33 indicates the median and mode to be 4.00 or above for all of the food groups, except the median 3.50 of “meat.” The average score is 3.51 for the “meat,” and above 3.8 for the other four groups, with standard deviations of 0.57 to 0.75. The data indicate that economics and time have little influence on food choice for the majority. The relatively low score for the “meat” group may reflect the price of meat-related foods which is, in general, higher than the others in Korea.

The data in Table 4.36, showing the means of individual items for each food group, are in accord with the general information contained in Table 4.33. No single item has a mean score on the “disagree” side. The means for item 8, about budget, are all above 4.00, suggesting that economics offer almost no limitations in the respondents’ food consumption. “Meat” scores are the least in items 8, 10, and 17, asking, respectively, about the influence of

Table 4.36. Mean scores of the four items in factor 3 indicating “economics and time influence” for the five food groups (N=285)

Questionnaire item ↓	Food group ⇒				
	Grain products	Vegetables & fruits	Meat	Milk	Fats & sweets
8. My parents have a limited budget to purchase these foods. ^a	4.533	4.315	4.088	4.438	4.435
10. I do not have enough time to eat these foods. ^a	3.684	4.020	3.298	4.253	4.070
17. Nothing keeps me from eating these foods.	3.856	4.110	3.256	4.020	3.363
19. I eat these foods only if they are available. ^a	3.957	3.241	3.391	3.715	3.565

^a Scoring is reversed to account for the negative valence.

budget, time, and other possible limitations, although the means are all on the “agree” side. In item 19, concerning the influence of availability, however, the “vegetables and fruits” (mean=3.24) is last, following “meat” (mean=3.39), which may reflect that some of vegetables and fruits are available only in season.

Factor 4. Interest in foods

It is indicated in Table 4.33 that the “grain products,” “meat,” and “fats and sweets” groups all have medians and modes of 3.00, with mostly neutral means, and with standard deviations of 0.66 to 0.70. For the “vegetables and fruits” and “milk” groups, the median, 3.67 for both suggests that the majority of the respondents have a positive interest in the groups, especially for “vegetables and fruits,” whose mode and mean are 3.67 and 3.70, respectively (S.D.=0.72).

The data in Table 4.37 suggest that the participants are, in general, not concerned about how much they eat of the foods (item 11) in the groups “vegetables and fruits” (mean=3.96), and “milk” (mean=3.67), and they show a slight concern for “fats and sweets” (mean=2.66). It also is noted that the majority care if they eat the foods (item 13) in the “vegetables and fruits” (mean=3.84) and “milk” groups (mean=3.60). They reported a

Table 4.37. Mean scores of the three items in factor 4 indicating “interest in foods” for the five food groups (N=285)

Questionnaire item ↓	Food group ⇒				
	Grain products	Vegetables & fruits	Meat	Milk	Fats & sweets
4. I have no interest in learning more about eating ^a	2.919	3.303	3.190	3.145	3.085
11. I am not concerned about how much I consume of these foods.	3.196	3.958	2.899	3.667	2.663
13. I do not care if I eat these foods ^a	3.175	3.841	3.217	3.603	2.945

^a Scoring is reversed to account for the negative valence.

slightly favorable attitude in learning more about eating (item 4) “vegetables and fruits” (mean=3.30).

Factor 5. Foods that energize

It is indicated in Table 4.33 that the response to the items in factor 5 measuring the respondents’ evaluation of the “foods that energize,” is generally on the “agree” side (all medians, modes, and means of 3.5 or above), except for the foods in “fats and sweets,” evaluated neutral (median and mode=3.00, mean=2.96, S.D.=0.83). It is noted that the “meat” received the most favorable evaluation (mode and median=4.00, mean=3.87) in the “foods that energize.”

It is revealed in Table 4.38 that the “meat” group is considered most necessary (mean=4.31) for athletes (item 21); whereas, it is rated a little lower (mean=3.43) in being a

Table 4.38. Mean scores of the two items in factor 5 indicating “foods that energize” for the five food groups (N=285)

Questionnaire item ↓	Food group ⇒				
	Grain products	Vegetables & fruits	Meat	Milk	Fats & sweets
18. Individuals who consume these foods are more energetic.	3.387	3.491	3.425	3.490	2.772
21. Individuals who consume these foods are athletes.	3.816	3.701	4.313	3.876	3.148

food that energizes (item 18). It is interesting to note that all of the food groups except “fats and sweets” are, in general, considered necessary to be energetic and athletic.

Summary and discussion

The 22 items were classified into five factors to evaluate the participants’ attitudes regarding the (a) conscious choice of food, (b) health concerns, (c) economics and time

influence, (d) interest in foods, and (e) foods that energize. The preceding section described the respondents' attitudes toward the five food groups relative to the five factors. Several facts are apparent in examining their food attitudes. The most evident is related to the response to the items asking about the influence of economics and time on food choices. Table 4.33 indicates that median and mode values are 4.0 or above, with means near 4.0 (S.D.=0.57 to 0.75) for all food groups except the meat group, with a mean of 3.51 and S.D.=0.75. This indicates that, for the majority, there are no serious external restrictions such as economics, time, and other noticeable obstacles that may limit their food consumption in general. The second fact includes the exceptionally favorable attitude toward "vegetables and fruits," which is highly rated on all five factors, with means ranging from 3.55 to 4.15 (S.D.=0.50 to 0.82). The third fact is the unfavorable attitude toward "fats and sweets" (median, mode, and mean all near 2.15) relative to health concerns. The "fats and sweets" are rated near neutral on the other factors except on "economics and time influence." The "meat" group also is considered unfavorably in "health concerns" (mean, median, and mode all near 2.65). The group is rated favorably in "foods that energize" (mean=3.87, median and mode=4.00) and "conscious choice of food" (mean=3.27, median=3.29, and mode=3.43), and near neutral in "interest in foods" (mean=3.10, median and mode=3.00). The mean scores for the "milk" group are all on the favorable side, ranging from 3.15 to 4.11. "Grain products" were rated near neutral in "health concerns" (mean=3.09, S.D.=0.57) and "interest in foods" (mean=3.09, S.D.=0.66), and is considered favorably in "foods that energize" (mean=3.60, S.D.=0.86) and "conscious choice of food" (mean=3.25, S.D.=0.47).

An unbalanced diet was pointed out previously in the discussion of food frequency as one of the serious concerns for adolescents. It is indicated in Table 4.28 that all five food

groups have a significant percentage of the respondents who do not meet the recommendation for serving frequency. It is shown that 65.7% and 54.7% of the respondents need more of the “fats and sweets” and the “meat” group, respectively. It is not clear if the low food consumption observed in these two groups is interrelated with individual’s attitudes. It is interesting to note that these two groups are the most unfavorably rated for “health concerns.” Another fact that is apparent in reviewing the data in Tables 4.28 and 4.33 is that a substantial proportion eat less than the recommended frequency of the three food groups (grain products, vegetables and fruits, and milk), even without any single score of their mean, median, or mode on the “disagree” side in attitudes.

The food attitudes of the respondents, who generally have enough money and time required in food choice, may be characterized by (a) the favorable attitudes for “vegetables and fruits” in all the five factors considered in this study and (b) the unfavorable evaluation of “meat” and “fats and sweets” with regard to health concerns. The respondents also gave favorable evaluations for the “foods that energize” for all the food groups except “fats and sweets.”

Relationships among Food Intake, Food Attitudes, and Demographic Data

Relationship between food intake and food attitudes

This section reports the relationships between food intake and food attitudes in order to answer the first research question, “Are there any relationships between food intake and food attitudes?” The food intake for each individual was represented in the previous section by the total standardized serving frequency. Pearson product-moment correlation coefficients were calculated using a SPSS sub-program and summarized in Table 4.39 for the

five food groups as they relate to the five attitude factors. The relationships that are estimated to be significant are marked with two asterisks, indicating a significance level of $p < .01$. A negative relationship is marked by a minus (-) sign. Four of the total 25 relationships are estimated to be significant at $p < .01$. Correlation is not found in the intake of “grain products,” “meat,” and “fats and sweets” related to any of the five food attitudes. The consumption of “vegetables and fruits” is shown to be related to two of the attitudes: interest in foods ($r = .164, p < .01$) and foods that energize ($r = .188, p < .01$). The milk

Table 4-39. Intercorrelation matrix between total standardized serving frequency of five food groups and five factors of food attitudes

5 factors in food attitudes ⇒		Conscious choice of food	Health concerns	Economics & time influence	Interest in foods	Foods that energize
Food group ↓						
Grain products (N=269) ^c	r ^a	-.068	.078	-.015	.033	.086
	p ^d	.268	.204	.804	.590	.159
Vegetables & fruits (N=271)	r	.080	.125	.117	.164**	.188**
	p	.190	.040	.054	.007	.002
Meat (N=271)	r	.155	.142	.142	.124	.009
	p	.010	.019	.019	.041	.881
Milk (N=284)	r	.245**	.094	.226**	.132	.069
	p	.000	.113	.000	.026	.249
Fats & sweets (N=282)	r	.119	.106	.096	.014	.132
	p	.046	.076	.106	.814	.027

^a Pearson product-moment correlation coefficients

^b Significance level (2-tailed); ** at the $p < .01$ level

^c N=sample size

group intake correlates with “conscious choice of food” ($r = .245, p < .01$) and “economics and time influence” ($r = .226, p < .01$).

Demographic influence on food intake and food attitudes

The General Linear Model (GLM) sub-program of SPSS was utilized to answer research questions 2 and 3: “Are there any differences in food intake and food attitudes

among 9th, 10th, and 11th grade students?” and “Are there any differences in food intake and food attitudes related to demographic characteristics?” In this analysis, food intake and food attitudes were treated as dependent variables, and the demographic data were used as independent variables. Grade (9th, 10th, and 11th) and mother’s job situation (yes or no) were used as fixed factors while the other demographic data (age, father’s and mother’s education level, income, number of family members, health and dental status, weight, height, and body mass index) were used as covariates. In preparation for the GLM analysis, the dependent variables, food intake and food attitudes, were first checked for normal distribution. Because some of them were skewed, all of the variables in the food intake and food attitudes were transformed by taking their natural logarithm (LN) to try to make them normally distributed before they were used in the GLM analysis. Data transformation was done by using SPSS sub-program. The results are summarized in Tables 4.40 through 4.47.

Effect of grade level on food intake and food attitudes

The mean values of the total standardized serving frequency of the five food groups by grade level are summarized, with standard deviations (S.D.) and sample size (N) in Table 4.40, before the data were transformed to natural logarithm (LN). The result of the GLM analysis, using the data in Table 4.40 after the data transformation, is summarized in Table 4.41, which indicates that the grade level effect on food intake is not found in any of the food group intake at the significance level of $p < .01$.

The average scores for the five attitude factors by grade are summarized in Table 4.42 for the 5 food groups before the data were transformed to natural logarithm (LN). The results of the GLM analysis using the data in Table 4.42 after the data transformation are

Table 4.40. Means of total standardized serving frequency of five food groups by grade

Food group ⇒		Total standardized serving frequency (times/day)				
		Grain products	Vegetables & fruits	Meat	Milk	Fats & sweets
Grade ↓						
9 th	Mean	5.071	10.331	5.925	2.186	3.129
	S.D. ^a	1.853	5.123	3.656	1.367	1.996
	N ^b	79	80	79	81	81
10 th	Mean	6.007	11.031	5.631	1.989	3.657
	S.D.	2.982	6.567	4.329	1.406	2.950
	N	93	91	92	95	95
11 th	Mean	5.379	10.422	5.156	2.093	3.651
	S.D.	2.300	4.701	3.129	1.521	2.275
	N	97	100	100	108	106
Total	Mean	5.506	10.600	5.541	2.085	3.503
	S.D.	2.469	5.500	3.724	1.437	2.457
	N	269	271	271	284	282

^a S.D.=standard deviation

^b N=sample size

summarized in the upper rows of Table 4.43 through Table 4.47, which show that the grade effect on food attitudes is found only in 1 of the 50 comparisons at a significance level of $p < .01$. It is found that the 10th graders are more conscious in choosing vegetables and fruits than the 11th graders, at $p < .01$. No grade level effect is found in any of the five food attitude factors with respect to the other four food groups at a significance level of $p < .01$.

Effect of other demographic data on food intake and food attitudes

This section discusses the third research question: “Are there any differences in food intake and food attitudes related to demographic characteristics?” The effect of the demographic variables, other than grade level on food intake and food attitudes was sought to determine if any of the demographic variables may be selected as a predictor for food intake and food attitudes.

Relationships between the demographic data and food intake are presented in Table 4.41. GLM analysis was done after the food intake data were transformed to natural logarithm (LN) to make them normally distributed. Those estimated to be significant from the GLM analysis are marked with two asterisks indicating the significance level of $p < .01$.

Table 4.41. Parameter estimates of the food intake for the five food groups

Food group ⇒ Parameter ↓	Grain products			Vegetables & fruits			Meat		
	t	Sig.	Power	t	Sig.	Power	t	Sig.	Power
Intercept	0.123	.902	.052	0.148	.883	.052	0.103	.918	.051
9 th grade	0.961	.338	.160	1.432	.154	.297	2.040	.042*	.529
10 th grade	2.342	.020*	.645	1.541	.125	.335	1.302	.194	.254
11 th grade ^a									
Mother's job (no)	0.208	.835	.055	1.241	.216	.235	-0.356	.722	.064
Mother's job (yes) ^a									
Age	1.437	.152	.299	1.523	.129	.329	1.665	.097	.382
Father's educ.	2.081	.039*	.545	0.184	.854	.054	-0.151	.880	.053
Mother's educ.	-0.946	.345	.156	0.072	.943	.051	0.813	.417	.128
Income	1.043	.298	.180	1.606	.110	.359	3.415	.001**	.925
Family size	0.865	.388	.138	-1.262	.208	.242	-0.308	.758	.061
Health status	1.826	.069	.444	-1.403	.162	.287	0.964	.336	.160
Dental status	-0.421	.674	.070	1.470	.143	.310	0.386	.700	.067
Weight	0.012	.990	.050	0.101	.920	.051	0.058	.954	.050
Height	-0.082	.935	.051	-0.120	.904	.052	-0.252	.801	.057
BMI	-0.139	.890	.052	-0.092	.927	.051	-0.063	.950	.050
Corrected model F (Sig.)		2.170 (.011)*			0.999 (.453)			2.140 (.013)*	
Grade F (Sig.)		3.533 (.031)*			1.272 (.282)			2.139 (.120)	
R ²		0.106			0.052			0.106	
Sample size		252			253			249	

* Significance level at $p < .05$; ** Significance level at $p < .01$

^a The rows, "11th grade" and "Mother's job (yes)," are empty because they were used as references for comparison.

Table 4.41. (continued)

Food group ⇒ Parameter ↓	Milk			Fats & sweets		
	t	Sig.	Power	t	Sig.	Power
Intercept	-0.952	.342	.158	1.339	.163	.286
9 th grade	1.665	.097	.382	0.405	.686	.069
10 th grade	0.561	.575	.086	0.777	.438	.121
11 th grade ^a						
Mother's job (no)	0.238	.812	.056	-0.507	.613	.080
Mother's job (yes) ^a						
Age	1.795	.074	.432	1.084	.279	.191
Father's educ.	-0.432	.666	.072	0.019	.985	.050
Mother's educ.	0.630	.529	.096	0.251	.802	.057
Income	2.686	.008**	.763	2.879	.004**	.818
Family size	-0.381	.703	.067	-0.339	.690	.068
Health status	0.176	.860	.054	-0.158	.875	.053
Dental status	0.433	.665	.072	-0.282	.778	.059
Weight	-0.955	.340	.158	1.349	.179	.269
Height	0.753	.452	.116	-1.458	.146	.306
BMI	0.917	.360	.150	-1.412	.159	.290
Corrected model F (Sig.)		1.499 (0.118)			1.447 (0.139)	
Grade F (Sig.)		1.904 (0.161)			0.336 (0.715)	
R ²		0.073			0.071	
Sample size		263			261	

The minus (-) sign in the column "t" signifies that the dependent variables are negatively related to the independent variables. Only two variables, income and father's education, are predictors for food intake. Income affects the consumption of food items in the meat, milk, and fats and sweets groups at a significance level of $p < .01$. This is expected since the price for the items of the three food groups is, in general, higher than that of the other groups. The plus (+) sign indicates that participants who live in families with higher incomes tended to

Table 4.42. Means of attitude scores for the five food groups by grade

Food group	Grade	Food attitudes				
		Conscious choice of food	Health concerns	Economics & time influence	Interest in foods	Foods that energize
Grain products	9 th ^a	3.289 (0.432) ^c	2.992 (0.489)	4.068 (0.476)	3.132 (0.539)	3.636 (0.840)
	10 th ^b	3.216 (0.568)	3.078 (0.647)	4.031 (0.634)	3.167 (0.709)	3.537 (0.952)
	11 th ^c	3.247 (0.408)	3.171 (0.546)	3.947 (0.562)	3.003 (0.686)	3.634 (0.802)
	Total ^d	3.249 (0.474)	3.089 (0.570)	4.010 (0.565)	3.095 (0.658)	3.602 (0.864)
Vegetables & fruits	9 th	3.534 (0.520)	4.119 (0.534)	3.957 (0.526)	3.638 (0.629)	3.599 (0.739)
	10 th	3.647 (0.524)	4.144 (0.619)	3.987 (0.680)	3.743 (0.823)	3.651 (0.938)
	11 th	3.485 (0.454)	4.188 (0.562)	3.836 (0.734)	3.710 (0.682)	3.546 (0.766)
	Total	3.554 (0.501)	4.154 (0.573)	3.921 (0.663)	3.701 (0.718)	3.597 (0.819)
Meat	9 th	3.293 (0.483)	2.582 (0.501)	3.540 (0.638)	3.082 (0.616)	3.788 (0.703)
	10 th	3.235 (0.556)	2.620 (0.520)	3.490 (0.799)	3.139 (0.722)	3.875 (0.862)
	11 th	3.290 (0.475)	2.691 (0.509)	3.502 (0.792)	3.083 (0.676)	3.931 (0.712)
	Total	3.272 (0.505)	2.636 (0.511)	3.509 (0.751)	3.102 (0.674)	3.868 (0.763)
Milk	9 th	3.221 (0.513)	3.436 (0.527)	4.210 (0.491)	3.477 (0.695)	3.710 (0.810)
	10 th	3.118 (0.638)	3.429 (0.619)	4.068 (0.653)	3.497 (0.799)	3.745 (0.877)
	11 th	3.139 (0.473)	3.319 (0.545)	4.069 (0.604)	3.441 (0.811)	3.607 (0.701)
	Total	3.155 (0.545)	3.390 (0.567)	4.109 (0.593)	3.470 (0.773)	3.683 (0.794)
Fats & sweets	9 th	2.896 (0.508)	2.208 (0.581)	3.969 (0.485)	2.955 (0.643)	2.969 (0.739)
	10 th	3.021 (0.571)	2.137 (0.525)	3.880 (0.587)	2.875 (0.711)	2.865 (0.890)
	11 th	3.077 (0.521)	2.036 (0.538)	3.757 (0.613)	2.880 (0.724)	3.042 (0.846)
	Total	3.007 (0.538)	2.119 (0.549)	3.859 (0.575)	2.889 (0.696)	2.961 (0.833)

^a N=81 ^b N=96 ^c N=108 ^d N=285

^c The numbers in () are standard deviation.

eat more foods in these food groups. Father's education also is shown to have a positive effect on the intake of grain products, with a significance level of $p < .05$.

The effect of the demographic variables on the five attitude factors is illustrated in Tables 4.43 through 4.47 for the five food groups. The interpretation of the tables is similar

Table 4.43. Parameter estimates of the five food attitudes for grain products

Attitude ⇒ Parameter ↓	Conscious choice of food			Health concerns			Economics & time influence			
	t	Sig.	Power	t	Sig.	Power	t	Sig.	Power	
Intercept	0.003	.998	.050	1.793	.074	.431	0.354	.723	.064	
9 th grade	1.539	.125	.335	-0.346	.730	.064	2.108	.036*	.556	
10 th grade	0.088	.930	.051	-0.151	.880	.053	1.131	.259	.203	
11 th grade ^a										
Mother's job (no)	1.250	.212	.238	1.433	.153	.297	0.894	.372	.145	
Mother's job (yes) ^a										
Age	1.360	.175	.273	0.681	.497	.104	1.042	.298	.180	
Father's educ.	-0.361	.718	.065	0.351	.726	.064	0.900	.369	.146	
Mother's educ.	-0.273	.785	.058	-0.177	.860	.054	-2.100	.037*	.553	
Income	0.011	.992	.050	-2.908	.004**	.825	1.903	.058	.474	
Family size	-0.301	.763	.060	-0.061	.952	.050	-1.885	.061	.467	
Health status	-0.607	.544	.093	-0.054	.957	.050	-2.143	.033*	.569	
Dental status	0.621	.535	.095	-0.459	.647	.074	1.408	.160	.289	
Weight	-0.189	.850	.054	1.511	.132	.325	-0.107	.915	.051	
Height	0.224	.823	.056	-1.517	.130	.327	0.036	.971	.050	
BMI	0.231	.818	.056	-1.563	.119	.344	0.107	.914	.051	
Corrected model F (Sig.)		0.554 (.889)			1.607 (.084)			1.559 (.097)		
Grade F (Sig.)		2.444 (.089)			0.073 (.930)			2.437 (.089)		
R ²		0.028			0.077			0.075		
Sample size		265			265			265		

* Significance level at $p < .05$; ** Significance level at $p < .01$

^a The rows, "11th grade" and "Mother's job (yes)," are empty because they were used as references for comparison.

Table 4.43. (continued)

Attitude ⇒ Parameter ↓	Interest in foods			Foods that energize		
	t	Sig.	Power	t	Sig.	Power
Intercept	-0.170	.865	.053	0.743	.458	.115
9 th grade	0.844	.400	.134	0.327	.744	.062
10 th grade	1.404	.162	.288	-0.601	.548	.092
11 th grade ^a						
Mother's job (no)	-0.007	.994	.050	-0.263	.793	.058
Mother's job (yes)						
Age	-0.141	.888	.052	0.604	.546	.092
Father's educ.	0.811	.418	.127	1.081	.281	.190
Mother's educ.	-1.985	.048*	.507	-0.268	.789	.058
Income	0.174	.862	.053	-1.485	.139	.316
Family size	0.064	.949	.050	1.231	.219	.232
Health status	0.114	.909	.051	-0.518	.605	.081
Dental status	0.190	.849	.054	2.266	.024*	.617
Weight	-0.579	.563	.089	0.522	.602	.082
Height	0.511	.610	.080	-0.619	.537	.095
BMI	0.485	.628	.077	-0.516	.606	.081
Corrected model F (Sig.)		1.082 (.375)			1.034 (.419)	
Grade F (Sig.)		1.031 (.358)			0.855 (.426)	
R ²		0.053			0.051	
Sample size		265			265	

to that of Table 4.41. The factors that are estimated to be significant are mentioned in the following description of results. Age seems to make the respondents more conscious about choosing foods in the vegetables and fruits group and also in the meat group, with a significance level of $p < .05$. Father's education is shown to positively affect both "interest in foods" and "foods that energize" in the meat group ($p < .05$). With higher level of

Table 4.44. Parameter estimates of the five food attitudes for vegetables and fruits

Attitude ⇒ Parameter ↓	Conscious choice of food			Health concerns			Economics & time influence		
	t	Sig.	Power	t	Sig.	Power	t	Sig.	Power
Intercept	-1.225	.222	.230	0.000	1.000	.050	0.609	.543	.093
9 th grade	2.294	.023*	.628	0.818	.414	.129	1.336	.183	.265
10 th grade	3.282	.001**	.905	0.364	.716	.065	1.194	.234	.221
11 th grade ^a									
Mother's job (no)	0.952	.342	.158	0.230	.819	.056	0.159	.874	.053
Mother's job (yes) ^a									
Age	2.558	.011*	.722	1.408	.160	.289	0.426	.671	.071
Father's educ.	-0.423	.675	.071	1.730	.085	.407	1.124	.262	.201
Mother's educ.	1.496	.136	.319	-0.272	.786	.058	-0.632	.528	.096
Income	-2.809	.005**	.799	-1.140	.255	.206	1.313	.190	.258
Family size	-0.197	.844	.054	0.250	.803	.057	-0.832	.406	.132
Health status	-1.545	.124	.337	-2.238	.026*	.606	-1.657	.099	.379
Dental status	2.210	.028*	.595	1.709	.089	.399	2.131	.034*	.565
Weight	-1.401	.163	.287	-0.410	.682	.069	0.326	.745	.062
Height	1.321	.188	.260	0.255	.799	.057	-0.309	.758	.061
BMI	1.499	.135	.321	0.492	.623	.078	-0.284	.777	.059
Corrected model F (Sig.)	2.279 (.007)**			1.157 (.312)			1.170 (.302)		
Grade F (Sig.)	5.411 (.005)**			0.402 (.670)			0.937 (.393)		
R ²	0.106			0.057			0.057		
Sample size	265			265			265		

* Significance level at $p < .05$; ** Significance level at $p < .01$

^a The rows, "11th grade" and "Mother's job (yes)," are empty because they were used as references for comparison.

education for the fathers the participants may have more interest in foods in the meat group because they have more resources.

Mother's education is shown to be negatively related to "economics and time influence" and "interest in foods" in the grain products group, and with "health concerns"

Table 4.44. (continued)

Attitude ⇒ Parameter ↓	Interest in foods			Foods that energize		
	t	Sig.	Power	t	Sig.	Power
Intercept	-0.750	.454	.116	1.446	.149	.302
9 th grade	-05.06	.613	.080	1.003	.317	.170
10 th grade	-0.338	.736	.063	0.487	.627	.077
11 th grade ^a						
Mother's job (no)	0.724	.469	.111	1.015	.311	.173
Mother's job (yes) ^a						
Age	-0.727	.468	.112	0.536	.593	.083
Father's educ.	0.873	.384	.140	0.789	.431	.123
Mother's educ.	-0.431	.667	.071	-1.228	.221	.231
Income	0.535	.593	.083	0.271	.787	.058
Family size	-1.431	.154	.297	0.448	.654	.073
Health status	-1.926	.055	.483	-0.088	.930	.051
Dental status	1.023	.307	.175	0.845	.399	.134
Weight	-1.321	.188	.260	1.178	.240	.217
Height	1.199	.232	.223	-1.278	.202	.247
BMI	1.313	.190	.258	-1.156	.249	.210
Corrected model F (Sig.)		0.894 (.560)			0.562 (.883)	
Grade F (Sig.)		0.130 (.878)			0.580 (.561)	
R ²		0.044			0.028	
Sample size		265			265	

and “interest in foods” in the meat group,” and positively related to the “conscious choice of foods” in the milk group ($p < .05$). With a higher level of mother’s education there seems to be more economics and time restrictions on the eating of grain products and the participants are less interested. Students with a highly educated mother tend to think it is good for their health to eat less of the meat group, and seem to be less interested in the meat group. Higher

education of the mother has a positive effect on “conscious choice of food” in the milk group.

Income has a negative effect on “health concerns” for grain products and conscious choice of fruits and vegetables ($p < .01$). The respondents with higher income seem to

Table 4.45. Parameter estimates of the five food attitudes for the meat group

Attitude ⇒ Parameter ↓	Conscious choice of food			Health concerns			Economics & time influence		
	t	Sig.	Power	t	Sig.	Power	t	Sig.	Power
Intercept	0.229	.819	.056	0.937	.350	.154	0.436	.664	.072
9 th grade	1.778	.077	.425	0.576	.565	.088	1.922	.056	.482
10 th grade	0.708	.480	.109	0.323	.747	.062	0.879	.380	.141
11 th grade ^a									
Mother's job (no)	-0.950	.343	.157	1.110	.268	.197	1.278	.203	.247
Mother's job (yes) ^a									
Age	1.066	.040*	.539	1.376	.170	.278	1.186	.237	.219
Father's educ.	0.213	.831	.055	0.959	.339	.159	0.859	.391	.137
Mother's educ.	0.218	.827	.055	-1.997	.047*	.512	-0.650	.516	.099
Income	1.228	.221	.231	0.524	.601	.082	2.997	.003**	.848
Family size	0.399	.690	.068	-0.679	.498	.104	-0.712	.477	.109
Health status	0.536	.592	.083	-0.144	.886	.052	-1.364	.174	.274
Dental status	-0.340	.734	.063	0.703	.483	.108	0.571	.569	.088
Weight	0.204	.838	.055	0.650	.516	.099	0.346	.730	.064
Height	-0.178	.859	.054	-0.812	.418	.128	-0.344	.731	.064
BMI	-0.189	.850	.054	-0.682	.496	.104	-0.309	.757	.061
Corrected model F (Sig.)		0.870 (.585)			0.970 (.481)			1.558 (.098)	
Grade F (Sig.)		2.009 (.136)			0.178 (.837)			2.191 (.114)	
R ²		0.043			0.048			0.075	
Sample size		265			265			265	

* Significance level at $p < .05$; ** Significance level at $p < .01$

^a The rows, “11th grade” and “Mother's job (yes),” are empty because they were used as references for comparison.

Table 4.45. (continued)

Attitude ⇒ Parameter ↓	Interest in foods			Foods that energize		
	t	Sig.	Power	t	Sig.	Power
Intercept	0.466	.642	.075	-1.081	.281	.190
9 th grade	0.645	.519	.098	-0.004	.997	.050
10 th grade	0.457	.648	.074	-0.052	.958	.050
11 th grade ^a						
Mother's job (no)	-0.963	.336	.160	-1.128	.261	.202
Mother's job (yes) ^a						
Age	0.195	.846	.054	0.830	.407	.131
Father's educ.	2.028	.044*	.524	2.262	.025*	.615
Mother's educ.	-2.415	.016*	.672	-0.931	.353	.153
Income	2.571	.011*	.726	-0.483	.630	.077
Family size	-0.347	.729	.064	-0.444	.657	.073
Health status	-0.931	.353	.153	-0.724	.470	.111
Dental status	-0.426	.670	.071	0.794	.428	.124
Weight	0.106	.916	.051	-1.385	.167	.281
Height	-0.216	.829	.055	1.267	.206	.243
BMI	-0.117	.907	.052	1.450	.148	.303
Corrected model F (Sig.)		1.229 (.259)			0.889 (.565)	
Grade F (Sig.)		0.209 (.812)			0.003 (.997)	
R ²		0.060			0.044	
Sample size		265			265	

consider it good for their health to eat less grain products and to be less conscious in choosing vegetables and fruits. Income has a positive influence on the economics and time factor ($p < .01$) and "interest in foods" ($p < .05$) for the meat group. Higher income appears to be associated with fewer economics and time-related restrictions in eating foods in the meat group and makes the respondents more interested in the meat group.

Health status is shown to be negatively related to the economics and time factor of the “grain products” ($p < .05$), “milk” ($p < .01$), and “fats and sweets” groups ($p < .05$). Poor health status seems to make the respondents feel less restricted in eating the above three food groups. For “health concerns” attitudes there is a negative relationship between health status

Table 4.46. Parameter estimates of the five food attitudes for the milk group

Attitude ⇒ Parameter ↓	Conscious choice of food			Health concerns			Economics & time influence		
	t	Sig.	Power	t	Sig.	Power	t	Sig.	Power
Intercept	0.541	.589	.084	2.078	.039	.544	0.543	.588	.084
9 th grade	1.022	.308	.175	1.893	.060	.470	1.735	.084	.408
10 th grade	-0.191	.849	.054	1.729	.085	.406	0.287	.774	.059
11 th grade ^a									
Mother's job (no)	0.305	.760	.061	-0.497	.619	.079	0.979	.329	.164
Mother's job (yes) ^a									
Age	1.019	.309	.174	1.345	.180	.268	0.865	.388	.138
Father's educ.	-1.210	.227	.226	0.478	.633	.076	0.816	.415	.128
Mother's educ.	2.498	.013*	.701	-0.866	.388	.139	-0.480	.631	.077
Income	-0.318	.751	.062	-0.442	.659	.072	0.728	.467	.112
Family size	1.267	.206	.243	-0.371	.711	.066	-0.973	.332	.163
Health status	-0.067	.947	.051	-1.120	.264	.200	-3.284	.001**	.905
Dental status	0.024	.981	.050	0.533	.595	.083	1.085	.279	.191
Weight	0.352	.725	.064	1.855	.065	.455	0.161	.872	.053
Height	-0.458	.648	.074	-1.880	.061	.465	-0.166	.868	.053
BMI	-0.269	.788	.058	-1.819	.070	.441	-0.122	.903	.052
Corrected model F (Sig.)		1.139 (.327)			0.845 (.612)			1.460 (.133)	
Grade F (Sig.)		1.540 (.216)			1.906 (.151)			2.639 (.073)	
R ²		0.056			0.042			0.070	
Sample size		265			265			265	

* Significance level at $p < .05$; ** Significance level at $p < .01$

^a The rows, “11th grade” and “Mother's job (yes),” are empty because they were used as references for comparison.

Table 4.46. (continued)

Attitude ⇒ Parameter ↓	Interest in foods			Foods that energize		
	t	Sig.	Power	t	Sig.	Power
Intercept	0.204	.839	.055	0.041	.967	.050
9 th grade	-0.010	.992	.050	1.594	.112	.355
10 th grade	-0.122	.903	.052	1.283	.201	.248
11 th grade ^a						
Mother's job (no)	0.461	.645	.074	-0.435	.664	.072
Mother's job (yes) ^a						
Age	-0.347	.729	.064	1.480	.140	.314
Father's educ.	-0.576	.565	.088	0.658	.511	.101
Mother's educ.	0.604	.546	.092	-1.305	.193	.255
Income	-0.794	.428	.124	-0.839	.402	.133
Family size	0.141	.888	.052	1.405	.161	.288
Health status	-1.216	.225	.228	-0.908	.365	.148
Dental status	1.161	.247	.212	1.701	.090	.395
Weight	-0.157	.876	.053	-0.097	.922	.051
Height	0.082	.935	.051	0.018	.986	.050
BMI	0.209	.835	.055	0.160	.873	.053
Corrected model F (Sig.)		0.472 (.939)			0.968 (.483)	
Grade F (Sig.)		0.015 (.985)			1.281 (.280)	
R ²		0.024			0.048	
Sample size		265			265	

and vegetables and fruits ($p < .05$), but a positive relationship between health status and fats and sweets ($p < .05$). The respondents in poor health seem to think that it is good to eat more vegetables and fruits, but bad to eat more fats and sweets. Health status also is shown to be positively related to interest in fats and sweets, with $p < .01$. Having good health seems to make one less afraid to be more interested in fats and sweets.

The influence of dental status is shown to be significant ($p < .05$) in the evaluation of “foods that energize” for grain products, conscious choice of vegetables and fruits, and economics and time factor for vegetables and fruits. Those having good dental health seem to evaluate highly the energy value of grain products, to be highly conscious in choosing vegetables and fruits, and to feel less restriction in eating vegetables and fruits.

Table 4.47. Parameter estimates of the five food attitudes for fats and sweets

Attitude ⇒ Parameter ↓	Conscious choice of food			Health concerns			Economics & time influence		
	t	Sig.	Power	t	Sig.	Power	t	Sig.	Power
Intercept	-0.095	.924	.051	0.729	.467	.112	0.804	.422	.126
9 th grade	-1.011	.313	.172	1.097	.274	.194	1.917	.056	.480
10 th grade	-0.515	.607	.081	1.362	.174	.274	1.415	.158	.291
11 th grade ^a									
Mother's job (no)	0.665	.507	.102	0.107	.915	.051	0.823	.411	.130
Mother's job (yes)									
Age	0.060	.952	.050	0.308	.759	.061	0.483	.629	.077
Father's educ.	1.656	.099	.378	0.070	.944	.051	-0.484	.629	.077
Mother's educ.	0.366	.715	.065	-1.175	.241	.216	-0.062	.951	.050
Income	0.556	.579	.086	-0.013	.989	.050	1.407	.161	.289
Family size	-0.889	.375	.144	0.079	.937	.051	-0.576	.565	.088
Health status	0.950	.343	.157	2.300	.022*	.630	-2.318	.021*	.637
Dental status	0.012	.991	.050	-1.066	.287	.186	0.399	.690	.068
Weight	-0.374	.709	.066	0.615	.539	.094	0.343	.732	.063
Height	0.365	.715	.065	-0.571	.568	.088	-0.413	.680	.070
BMI	0.381	.704	.067	-0.735	.463	.113	-0.356	.722	.065
Corrected model F (Sig.)		1.554 (.099)			1.160 (.310)			1.257 (.240)	
Grade F (Sig.)		0.574 (.564)			0.935 (.394)			1.838 (.161)	
R ²		0.074			0.057			0.061	
Sample size		265			265			265	

* Significance level at $p < .05$; ** Significance level at $p < .01$

^a The rows, “11th grade” and “Mother's job (yes),” are empty because they were used as references for comparison.

Table 4.47. (continued)

Attitude ⇒ Parameter ↓	Interest in foods			Foods that energize		
	t	Sig.	Power	t	Sig.	Power
Intercept	1.692	.092	.392	-0.246	.806	.057
9 th grade	-0.402	.688	.069	1.671	.096	.384
10 th grade	-0.914	.361	.149	0.204	.839	.055
11 th grade ^a						
Mother's job (no)	1.327	.186	.262	1.139	.256	.206
Mother's job (yes)						
Age	-1.114	.266	.199	1.747	.082	.413
Father's educ.	0.191	.848	.054	1.032	.303	.177
Mother's educ.	-0.665	.506	.102	-0.698	.486	.107
Income	0.486	.627	.077	0.635	.526	.097
Family size	1.123	.263	.201	-1.550	.122	.339
Health status	3.339	.001**	.914	0.583	.561	.089
Dental status	-0.857	.392	.137	0.318	.750	.062
Weight	1.297	.196	.253	-0.150	.881	.053
Height	-1.386	.167	.282	0.196	.845	.054
BMI	-1.347	.179	.269	0.186	.853	.054
Corrected model F (Sig.)		1.443 (.140)			1.129 (.335)	
Grade F (Sig.)		0.506 (.604)			2.616 (.075)	
R ²		0.070			0.055	
Sample size		265			265	

Summary

This section answers the three research questions posed in the Introduction regarding the relationships between food intake and food attitudes, and the effect of grade level and other demographic factors on food intake and food attitudes.

The answer to the first question, "Are there any relationships between food intake and food attitudes?" is summarized in Table 4.39, indicating that 4 of the total 25 relationships

between food intake (five groups) and food attitudes (five factors) are estimated to have a significant correlation. They are all positively correlated, with significance levels of $p < .01$.

The effect of grade level on food intake is not found in any of the food group intake at the significance level of $p < .01$. The grade level effect on food attitudes is found to be significant only in vegetables and fruits, between 10th and 11th in “conscious choice of food” at $p < .01$.

The effect of the demographic factors on food intake is detected only in income and father’s education. The effect of income is most apparent with a significance level of $p < .01$ for intake in the meat, milk, and fats and sweets groups which, in Korea, generally are more expensive than the other food groups. Food attitudes also are found to be affected by some of the demographic factors such as age, father’s education, mother’s education, income, health status, and dental status, with significance levels of $p < .05$ or $p < .01$.

CHAPTER V. SUMMARY AND CONCLUSIONS

A survey has been carried out to examine food intake and food attitudes of female secondary school students in Seoul, Korea, to provide baseline data to develop nutrition education programs, and to improve the home economics curriculum for secondary school students in Korea. The instruments for the food intake and food attitudes were administered, together with the demographic instrument to a sample of 285 students. The sample was comprised of 81 students from 9th, 96 from 10th, and 108 from 11th grade.

The questionnaire to investigate food intake consisted of six tables requesting the serving frequency and serving size of the various food items that were selected based on the preliminary survey. The six tables were assigned to the five food groups included in the Korean Food Tower, which consists, starting from the bottom, of (a) grain products, (b) vegetables and fruits, (c) meat group, (d) milk group, and (e) fats and sweets, with one extra for the seasonal vegetables and fruits to cover them separately. The attitude instrument had been developed by Amos (1999), and validated in a previous study. It has 22 items to measure food attitudes for the five food groups. The format consists of a five-point Likert-type scale, with 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree. The reliability of the attitude scale for the present study was calculated using Cronbach's coefficient alpha for each food group: 0.74 and 0.72 for vegetables and fruits and milk groups; and 0.58, 0.57, and 0.52 for grain products, meat, and fats and sweets groups, respectively. The 22 attitude items are classified into five factors to evaluate the participants' attitudes regarding (a) conscious choice of food, (b) health concerns, (c) economics and time influence, (d) interest in foods, and (e) foods that energize. The reliabilities for factors 1, 2,

3, 4, and 5 are 0.69, 0.74, 0.84, 0.62, and 0.74, respectively. The questionnaire for demographic data includes grade, mother's employment status, age, father's education, mother's education, income, number of family members, health status, dental status, weight, and height.

The results from analyzing the participants' food intake are summarized as follows, showing the main items in the five food groups, with the mean standardized daily serving frequency in parentheses.

1. Grain products: "rice" (2.00), "biscuits, crackers, cookies" (0.71), "bread groups combined" (0.71), "Ra Myon and noodles" (0.50), "barley" (0.36), and "Ddokbokgi, ddokguk" (0.32).
2. Vegetables and fruits: "cabbage kimchi" (1.41), "radish" (0.97), "vegetables in mixed foods" (0.83), "laver" (0.67), and "green onion, leek, garlic, onion" (0.58).
3. Seasonal (frequency in season): "citrus fruit" (1.72), "watermelon" (1.08), "apple" (1.02), and "grapes" (1.01).
4. Meat: "soybean paste, red pepper paste" (0.60), "egg, quail's egg" (0.59), and "beef, pork, chicken in mixed foods (stew, fried rice, etc.)" (0.57).
5. Milk: "milk" (0.87) and "ice cream" (0.57).
6. Fats and sweets: "tea" (0.64), "candies, chocolate" (0.54), "carbonated beverages" (0.53), and "corn oil, soybean oil" (0.50).

It may be concluded that the participants eat rice, cabbage kimchi, radish, and soybean or red pepper paste most frequently in regular meals with milk, ice cream, tea, and seasonal fruits such as citrus fruit, apple, watermelon, and grapes most frequently eaten for snacks or for dessert. The mean of the total standardized serving frequency in each food group was 10%

to 77% above what is recommended by the dietary guideline of the KNS except in fats and sweets, where it is 12.5% below. In contrast, a substantial percentage of the participants were found to fall short of the recommendation in more than one food group, only 20% satisfying the guideline in all five groups. An unbalanced diet was an apparent fact that characterized the respondents' food intake.

Several facts emerged from examining the food attitudes of the participants. The most evident was their responses to the items asking about the influence of economics and time on food choice. The values of medians and modes were 4.0 or above, with means near 4.0 for all food groups except the meat group (mean=3.51). This indicates that, for the majority, there are no serious external restrictions such as economics, time, or other noticeable obstacles that may limit food consumption in general. The second fact regards the exceptionally favorable attitudes toward vegetables and fruits, which were highly rated on all five factors, with means ranging from 3.55 to 4.15. The third regards the unfavorable attitude towards fats and sweets (median, mode, and mean all near 2.15) with regard to health concerns. Fats and sweets were rated close to neutral in the other factors, except in economics and time influence. The meat group also was considered unfavorably in "health concerns" (mean, median, and mode all near 2.65). The meat group was rated favorably in "foods that energize" (mean=3.87, median and mode=4.00) and "conscious choice of food" (mean=3.27, median=3.29 mode=3.43), and near neutral in "interest in foods" (mean=3.10, median and mode=3.00). The mean scores of the milk group were all on the "agree" side. Grain product was rated nearly neutral in "health concerns" (mean=3.09) and "interest in foods" (mean=3.09) and rated favorably in regard to "foods that energize" (mean=3.60) and "conscious choice of food" (mean=3.25).

Most of the participants do not consider “economics and time influence” to be a factor limiting their food consumption. Their food attitudes may be characterized by (a) the favorable evaluation for vegetables and fruits in all five factors considered in this study and (b) the unfavorable evaluation of the meat and fats and sweets groups in health concerns. The participants also gave a favorable evaluation to the energy value of all the food groups except fats and sweets.

An unbalanced diet was pointed out previously as one of the serious concerns facing adolescents. As shown in Table 4.28, all five food groups have a significant percentage of respondents who do not meet the recommended standards for food consumption. It was shown that 65.7% and 54.7% of the participants were in need of food from the fats and sweets and meat groups, respectively. It is interesting to note that in “health concerns” these two groups are unfavorably rated. Another fact that is apparent in comparing the food intake and food attitudes is that a substantial percentage of the respondents eat less than the recommended amount of the other three food groups (grain products, vegetables and fruits, and milk) even without any single score of their mean, median, or mode on the “disagree” side in attitudes.

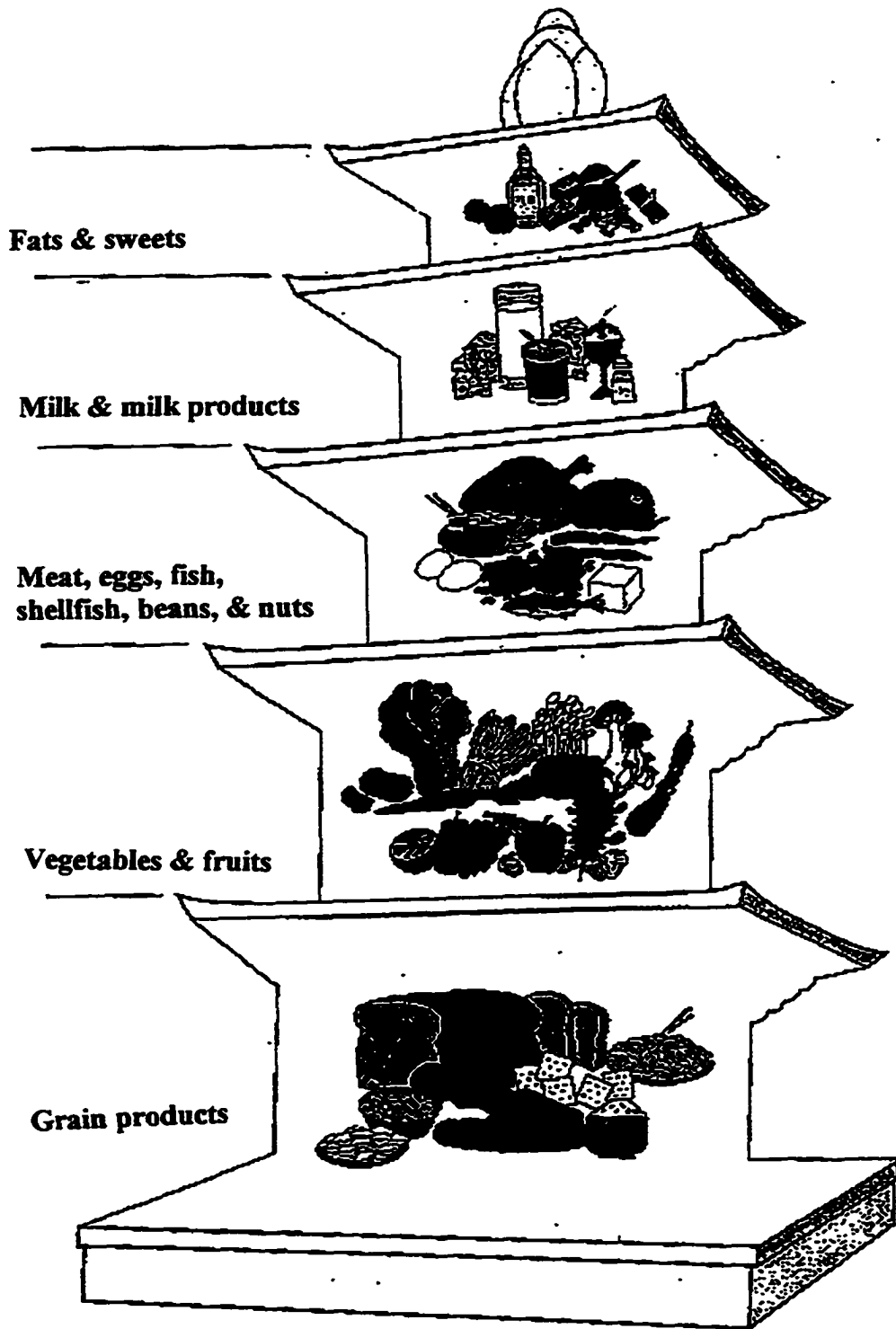
The results of the analyses conducted to answer the three research questions posed in the Introduction regarding the relationships between food intake and food attitudes, and the effect of grade level and other demographic factors on food intake and food attitudes follow. Of the total of 25 relationships between food intake (five groups) and food attitudes (five factors), 4 were found to have significant correlations ($p < .01$): (a) vegetables and fruits intake and interest in food, (b) vegetables and fruits intake and foods that energize, (c) milk group intake and conscious choice of food, and (d) milk group intake and economics and

time influence. These four were all positively correlated, with a significance level of $p < .01$. The effect of grade level on food intake was not found in any of the food group intake at the significance level of $p < .01$. The grade level effect on food attitudes was found to be significant only in vegetables and fruits, between 10th and 11th, with respect to “conscious choice of food” at $p < .01$.

The effect of the demographic factors on food intake was detected only with income ($p < .01$) and father’s education ($p < .05$). The effect of income was most apparent, with significance level of $p < .01$ on the intake of the meat, milk, and fats and sweets groups, which, in Korea, generally are more expensive than the other food groups. Some of the demographic factors such as age, father’s education, mother’s education, income, health status, and dental status also were found to affect food attitudes at significance level of $p < .05$ or $p < .01$.

It is reasonable to conclude that the food intake and food attitudes are correlated with each other and could be changed through nutrition education programs aimed at developing healthy food attitudes and behaviors that will meet the nutritional needs of adolescents. In turn, the students will be better able to handle the rigors of school and related activities.

APPENDIX A: KOREAN FOOD TOWER



Fats & sweets

Milk & milk products

**Meat, eggs, fish,
shellfish, beans, & nuts**

Vegetables & fruits

Grain products

Korean Food Tower

APPENDIX B: PRELIMINARY CHECKLIST

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

September 1, 1998

College of Family and Consumer Sciences
Department of Family and Consumer
Sciences Education and Studies
219 MacKay Hall
Ames, Iowa 50011-1120
PH 515 294-6444
FX 515 294-4493
EM fcseds@iastate.edu


To: Selected students at Suh-Moon Girl's High School

RE: Identifying representative food items using a food frequency checklist.

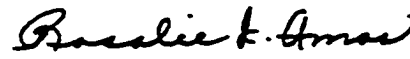
The purpose of this survey is to identify representative food items of the adolescent group using a food frequency checklist that contains foods, frequency of eating, and amount eaten at one time. Your honest responses will be valuable for the research.

Thank you for participating in our research.

Sincerely,


Kyeung-Eun K. Park
Graduate Student
Department of Family and Consumer
Sciences Education and Studies

Telephone: 515-292-7886
Email: kekpark@iastate.edu


Dr. Rosalie J. Amos
Associate Professor and Chair
Department of Family and Consumer
Sciences Education and Studies

Telephone: 515-294-6444

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

September 1, 1998


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서문 여고 학생 여러분께


이 설문 조사서는 식품섭취 빈도 조사표를 이용하여 청소년들이 주로 섭취하는 대표 식품들을 알고자 하는데 그 목적이 있습니다. 여러분의 정직한 응답이 이 연구에 크게 도움이 될 것입니다.

참여해 주셔서 감사합니다.

Sincerely,


Kyeung-Eun K. Park
Graduate Student
Department of Family and Consumer
Sciences Education and Studies

Telephone: 515-292-7886
Email: kekpark@iastate.edu


Dr. Rosalie J. Amos
Associate Professor and Chair
Department of Family and Consumer
Sciences Education and Studies

Telephone: 515-294-6444

APPENDIX C: INSTRUMENT

The objectives of the research are to examine Korean adolescents' food intakes relative to the Korean food tower and food attitudes, and to determine the relationships among the participants' food intakes and food attitudes. The results will be used to better understand adolescents' food behavior and to develop nutrition education programs for Korean adolescents.

You will remain anonymous. Please do not put your name on your questionnaire. Additionally, your responses on the questionnaire will be pooled so as to review group results. You may withdraw from the study at any time without any prejudice to you.

It will take about 30-40 minutes to complete the questionnaire. We would appreciate your cooperation. Thank you.

Sincerely,

Kyeung-Eun Park
Graduate Student
Department of Family and Consumer
Sciences Education and Studies
Telephone: 515-292-7886
Email: kekpark@iastate.edu

Rosalie J. Amos, Ph.D.
Associate Professor and Chair
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Telephone: 515-294-6444
FAX: 515-294-4493

Food Frequency

This section is about your usual eating habits. You must think back over the past year and answer how often you usually eat the foods listed and how much of them you eat.

First check (✓) for the section, HOW OFTEN?, you eat each food on the average. Then, for the section, HOW MUCH?, check (✓) whether the usual amount of that food you eat is small, medium, or large compared to the medium amounts shown.

- . Small : ½ the medium serving or less
- . Medium : approximately the medium serving
- . Large : at least 1½ times the medium serving

For example, if you eat cooked rice, on the average, two times every day, check (✓) the column under “2 times per day or more” for “rice” to answer the question HOW OFTEN?. Next, if you usually eat a medium size 1 bowl of rice, check (✓) the column under “medium” on the “rice” to answer the question HOW MUCH?. This shows the medium size 1 bowl of rice you usually eat is the medium serving of rice.

PLEASE DO NOT SKIP any foods. Be sure to fill in HOW OFTEN? and HOW MUCH? for each food.

Grain products	HOW OFTEN?									HOW MUCH?				
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Your serving size			Examples of medium size serving	
										Small	Medium	Large		
Rice													1 bowl of cooked rice 210g	
Barley														Cereal 30g
Glutinous rice														
Other grains: job's tears, oatmeal, millet, sorghum														1 bowl of Cooked noodles 300g or dried noodles 90g
Cereals														
Ra Myon														Cooked starch vermicelli 90g or dried 30g
Noodle (cholmyun, chajangmyun, chambbong, udong kalguksoo, etc.)														3 slices of bread 100g
Starch vermicelli (japchae, sundae filling, etc.)														Cookie 30g
Pizza, spaghetti														1 medium dish of ddokbokgi 100g
Loaf bread (toast, sandwich, etc.)														
Dock marked bread, cake, cream-jam bread, doughnuts														2-3 slices of rice cake 100g
Hamburger bun or hot dog bun														
Biscuits, crackers, cookies														
Ddokbokgi, ddokguk														
Other rice products: shiruduck, injulmi, songpyon, yacksik, popped rice														

Vegetables & Fruits	HOW OFTEN?									HOW MUCH?			Examples of medium size serving
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Your serving size			
										Small	Medium	Large	
Bean sprouts													Raw spinach, bean sprouts, radish root, carrot, cabbage 70g Cooked vegetable 45g Cabbage kimchi 60g Radish kimchi 50g Onion 50g Burdock 25g 1 small potato 100g Fresh sea mustard 70g ½ cup of fruit juice 100g 1 soup bowl of vegetable soup
Peppers-green, red													
Green leafy vegetables (spinach, lettuce, radish leaves, perilla leaf, etc.)													
Carrot													
Cabbage kimchi													
Radish													
Green onion, leek, garlic, onion													
Squash, zucchini													
Lotus root, braken, burdock, bellflower root													
Potatoes													
Sweet potatoes													
Mushrooms													
Laver													
Sea-mustard, tangle													
Banana													
Canned fruits (peach, pineapple, citrus fruits, etc.)													
100% fruit or vegetable juices													
Vegetables in mixed foods (soup, stew, frying rice, japchae, bibimbab, etc.)													

Seasonal vegetables and fruits. (Check how often you eat them when they are in season and how much you eat.)

Seasonal Vegetables & Fruits	HOW OFTEN?										HOW MUCH?			
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Your serving size			Examples of medium size serving	
										Small	Medium	Large		
Corn														Cucumber 70g 1 medium tomato 200g Strawberry 200g Watermelon 200g Other fruits 100g 1 medium citrus fruit ½ medium apple
Cucumber														
Tomatoes														
Persimmon														
Citrus fruit,														
Strawberry														
Pear														
Peach														
Apple														
Watermelon														
Melones														
Plum														
Grapes														

Meat, Eggs, Fish, Shellfish, Beans, & Nuts	HOW OFTEN?										HOW MUCH?			
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Your Serving Size			Examples of medium size serving	
										Small	Medium	Large		
Beef														Raw beef, pork, & chicken 60g (including bones, 80-90g) Sausage & ham 40g
Pork														
Chicken, turkey														
Ham														
Sausage, bacon														
Beef, pork, chicken in mixed foods (stew, fry rice, etc.)														

Meat, Eggs, Fish, Shellfish, Beans, & Nuts	HOW OFTEN?									HOW MUCH?			Examples of medium size serving
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Your Serving Size			
										Small	Medium	Large	
Egg, quail's egg													1 medium egg 50g 1 piece of hair tail, mackerel, Pacific saury, & Alaska pollack 70g Shellfish 80g Fish paste 50g Anchovies 15g Beans 20g Nuts 13g Tofu 80g Soybean paste 15g
Organ meats (liver, kidney, etc.)													
Tuna, hair tail, yellow croaker, Alaska pollack													
Mackerel, Pacific saury													
Squid, shrimp, clam, solen													
Anchovies, icefishes													
Fish paste, fish sausage													
Soybean paste, red pepper paste													
Beans, nuts													
Tofu													
Seeds-perilla, sesame													

Milk & Milk products	HOW OFTEN?									HOW MUCH?			Examples of medium size serving
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Your Serving Size			
										Small	Medium	Large	
Milk													1 cup of milk 200g 1½ slices of cheese 30g 1 cup of yogurt 180g 1 cup of ice cream 100g
Cheese													
Yogurt													
Ice cream													

Fats & Sweets	HOW OFTEN?									HOW MUCH?			Examples of medium size serving
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Your serving size			
										Small	Medium	Large	
Perilla oil, sesame oil													1 teaspoon of vegetable oil 5g 1 teaspoon of butter & mayonnaise 6g 1 cup of carbonated beverages, 200g 1 cup of tea, cocoa
Corn oil, soybean oil													
Margarine, butter													
Mayonnaise, salad dressing													
Candies, chocolate													
Jam													
Carbonated beverages													
Tea Cocoa													

Food Attitudes

This section is about your attitudes relative to the food groups. Read the following statements and please write the number that best describes your opinion about these food consumption practices as they relate to your consumption of the five food groups. Please record a separate response for each food group.

Five food groups

- *Grain products* includes rice, bread, noodle, cereals, and other grain products.
- *Vegetable and fruit group* includes potatoes, green beans, corns, and seaweeds as well as all the vegetables and fruits.
- *Meat group* includes meat, poultry, fish, shellfish, eggs, nuts, beans and bean products..
- *Milk group* includes milk, cheese, yogurt, and ice cream.
- *Fat and Sweet group* includes butter, margarine, oil, candy, and carbonated beverages

Key: 1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

	Grain Products	Vegetables & Fruits	Meat group	Milk group	Fats & Sweets
1. I would feel healthier if I would eat more					
2. I eat better when I eat with others.					
3. I eat better when I eat at home.					
4. I have no interest in learning more about eating					
5. Teenage girls are concerned about eating more					
6. I do not know what to do when it comes to new choices for					
7. I need to make a conscious effort to consume the recommended servings of					

This section is about your attitudes relative to the food groups. Read the following statements and please *write the number* that best describes your opinion about these food consumption practices as they relate to your consumption of the five food groups. Please record a *separate response for each food group*.

Key: 1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

	Grain Products	Vegetables & Fruits	Meat group	Milk group	Fats & Sweet
8. My parents have a limited budget to purchase these foods.					
9. Consuming a variety of these foods will decrease my risk of heart disease.					
10. I do not have enough time to eat these foods.					
11. I am not concerned about how much I consume of these foods.					
12. Individuals who eat these foods are health conscious.					
13. I do not care if I eat these foods.					
14. I can learn to like these foods.					
15. I think I eat enough of these foods.					
16. Individuals who consume these foods are healthier.					
17. Nothing keeps me from eating these foods.					
18. Individuals who consume these foods are more energetic.					
19. I eat these foods only if they are available.					
20. Individuals who consume these foods are female weight watchers.					
21. Individuals who consume these foods are athletes.					
22. When I eat these foods, I am afraid of the residues of pesticides.					

Demographic Information

Direction : Please check (✓) the answer to the following questions.

1. How old are you?

<input type="checkbox"/> 14 years	<input type="checkbox"/> 17 years
<input type="checkbox"/> 15 years	<input type="checkbox"/> 18 years
<input type="checkbox"/> 16 years	

2. What is the highest year in school reached by your parents?

Father:	Mother:
<input type="checkbox"/> Elementary	<input type="checkbox"/> Elementary
<input type="checkbox"/> Middle school	<input type="checkbox"/> Middle school
<input type="checkbox"/> High school	<input type="checkbox"/> High school
<input type="checkbox"/> College graduate	<input type="checkbox"/> College graduate
<input type="checkbox"/> Bachelors degree	<input type="checkbox"/> Bachelors degree
<input type="checkbox"/> Masters degree	<input type="checkbox"/> Masters degree
<input type="checkbox"/> Ph.D	<input type="checkbox"/> Ph.D.

3. Does your mother work outside the home?

<input type="checkbox"/> Yes	<input type="checkbox"/> No
------------------------------	-----------------------------

4. What is your parents' income level per month?

<input type="checkbox"/> Less than or equal to \$500	<input type="checkbox"/> Between \$1,500 and \$2,000
<input type="checkbox"/> Between \$500 and \$1,000	<input type="checkbox"/> Between \$2,000 and \$2,500
<input type="checkbox"/> Between \$1,000 and \$1,500	<input type="checkbox"/> Greater than \$2,500

5. How many members in your family are living together now (include yourself)?

<input type="checkbox"/> 1	<input type="checkbox"/> 6-7
<input type="checkbox"/> 2-3	<input type="checkbox"/> 8 or above
<input type="checkbox"/> 4-5	

6. How is your health status?

<input type="checkbox"/> Poor	<input type="checkbox"/> Good
<input type="checkbox"/> Average	<input type="checkbox"/> Excellent

7. How is your dental condition?

<input type="checkbox"/> Poor	<input type="checkbox"/> Good
<input type="checkbox"/> Average	<input type="checkbox"/> Excellent

8. What are your body weight and height? (Please put the numbers.)

Body weight	<input type="text"/> kg
Height	<input type="text"/> cm

이 연구는 한국의 식품구성 탐과 한국인의 식품에 대한 태도에 관련된 한국 중고생들의 음식물 섭취실태를 조사하기 위한 것으로, 참여자들의 음식물 섭취와 식품에 대한 태도간의 상관관계를 측정하게 됩니다. 연구결과는 한국 중고생들의 음식물 섭취실태를 보다 정확하게 이해함으로써 그들에게 적합한 영양교육 프로그램을 개발하는데 이용될 것입니다.

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설문조사에는 약 30-40 분이 소요될 것으로 보이며, 참여자들의 협조에 감사드립니다.

Kyung-Eun Park
박 경은

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식품 섭취 빈도

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먼저 평균적으로 얼마나 자주 섭취하고 있는지를 “섭취 빈도”에 표시하고, 이어서 얼마나 많이 섭취하고 있는지를 “1 회 섭취 량”에 표시하시기 바랍니다. 1 회 섭취 량의 대, 중, 소 구분은 다음과 같습니다.

소	:	기준 섭취 량의 0.5배 이하
중	:	기준 섭취 량
대	:	기준 섭취 량의 1.5배 이상

예를들어, 쌀밥을 하루에 두 번 섭취하면 “쌀” 식품항목의 “섭취 빈도”에 “하루 2회 이상”에 표시하고, 이어서 한 번에 섭취하는 분량이 밥 1 공기 이면 밥 1 공기가 “중”일 경우의 기준 섭취 량이므로 “1 회 섭취 량”에 “중”에 표시합니다.

각 식품항목에 대하여 한 항목도 빠짐이 없이 “섭취 빈도”와 “1 회 섭취 량”에 답하여 주시기 바랍니다.

곡류	섭취 빈도										1 회 섭취 량			"중"일 경우의 기준 섭취 량
	월	월	월	주	주	주	주	하루	하루	당신의 1회 섭취 량				
	1회 미만	1회	2-3 회	1 회	2 회	3-4 회	5-6 회	1 회	2회 이상	소	중	대		
쌀														*밥 1 공기 210g
보리														
참쌀														*씨리얼 30g
기타 곡류: 울무, 귀리, 기장, 수수														*국수 1 그릇 300g 또는 마른 국수 90g
씨리얼														
라면류														*삼은 당면 90g 또는 마른 당면 30g
국수류 (짜장면, 짜장면, 잡뽕, 우동, 칼국수 등)														
당면류 (잡채, 순대속 등)														
피자, 스파게티														*식빵 3 조각 100g
식빵류 (토스트, 샌드위치 등)														*쿠키 30g
곰보빵, 케익, 크림-잼 빵, 도우넛														*떡볶이 중간 크기 1접시 100g
햄버거 빵, 핫도그 빵														
비스킷, 크래커, 쿠키														*떡 2-3 조각 100g
떡볶이, 떡국														
기타 쌀 떡류: 시루떡, 인절미, 송편, 약식, 쌀 떡볶이														

계절별 채소류 및 과일류. (많이 나는 계절에 섭취하는 빈도와 1 회 섭취 량을 표시하기 바랍니다.)

계절별 채소류 및 과일류	섭취 빈도									1 회 섭취 량			
	월	월	월	주	주	주	주	하루	하루	당신의 1회 섭취 량			
	1회 미만	1회	2-3 회	1 회	2 회	3-4 회	5-6 회	1 회	2회 이상	소	중	대	
옥수수													*오이 70g *토마토 중간 것 1개 200g *딸기 200g *수박 200g *귤 중간 것 1개 100g *사과 중간 것 0.5개 100g *기타 과일류 100g
오이													
토마토													
감													
귤, 오렌지,													
자몽													
딸기													
배													
복숭아													
사과													
수박													
참외, 멜론													
자두													
포도													

고기, 생선, 알류, 조개류, 두류 및 견과류	섭취 빈도							1 회 섭취 량					
	월 1회 미만	월 1회	월 2-3 회	주 1 회	주 2 회	주 3-4 회	주 5-6 회	하루 1 회	하루 2회 이상	당신의 1회 섭취 량			
										소	중	대	
쇠고기													*쇠고기 1점시, 돼지고기 1점시, 닭다리 1개 (조리전 60g, 뼈 포함해서 80-90g)
돼지고기													
닭고기, 칠면조 햄													*햄, 소시지 40g *계란 중간 것 1개 50g
소시지, 베이컨 고기가 들어간 음식(죽, 김치찌개, 전골, 볶음밥 등)													*갈치, 고등어, 콩치, 동태 1토막 70g
계란, 메추리고기 알 간, 콩팥 등 내장류													*조개류 80g *어묵 50g
참치, 갈치, 조기, 명 태, 동태													*멸치 15g
고등어, 콩치													*콩 20g
오징어, 새우, 조개, 맛살													*전과류 13g
멸치, 방어포													*두부 80g
어묵, 어육소시지													*된장 15g
된장, 고추장 콩 (완두콩은제의), 견과류 (밤, 땅콩, 잣, 호두 등)													
두부													
개종류-참깨, 들깨													

우유 및 유제품	섭취 빈도										1 회 섭취 량	
	월 1회 미만	월 1회	월 2-3 회	주 1 회	주 2 회	주 3-4 회	주 5-6 회	하루 1 회	하루 2회 이상	당신의 1회 섭취 량	당신의 1회 섭취 량	“중”일 경우의 기준 섭취 량
우유												*우유 1컵 200g
치즈												*치즈 1.5장 30g
요구르트												*요구르트 1컵 180g
아이스크림												*아이스크림 1컵 100g
유지방 및 당류												
참기름, 들기름												
옥수수기름,												*식용유 1작은술 5g
콩기름												*버터 1작은술 6g
마가린, 버터												*마요네즈 1작은술 6g
마요네즈, 샐러드												*탄산음료 1컵 200g
드레싱												*차, 코코아 1잔
사탕, 초콜렛												
젤												
탄산음료 (콜라, 사이다 등)												
차												
코코아												

식품에 대한 태도

여기에서는 다섯 가지 식품군에 대한 여러분의 태도를 알아보고자 합니다. 아래에 기술한 다섯 가지 식품군에 대한 설명을 잘 읽고 각 식품군에 대한 여러분의 식습관을 생각해보신 후 물음에 답하여 주시길 바랍니다. 다섯 가지 식품군 모두에 대하여 각각 순자로 답하시되 여러분의 의견 또는 습관을 가장 잘 반영하는 경우에 해당하는 "5" 에서부터 가장 그렇지 아니한 경우의 "1" 까지 구별하여 주시길 바랍니다.

다섯 가지 식품군

- 1) 곡류: 쌀, 빵, 국수, 씨리얼 등 곡류를 재료로 하는 식품
- 2) 채소류 및 과일류: 감자, 완두콩, 옥수수, 해초류를 포함하는 각종 채소류 및 과일류
- 3) 육류: 각종 육류, 닭, 칠면조 등 가금류, 생선류, 조개류, 계란, 찹, 호두 등 전과류, 콩류
- 4) 우유류: 우유, 치즈, 요구르트, 아이스크림
- 5) 유지류 및 당류: 버터, 마아가린, 식용유, 사탕, 탄산 음료류

참고: 1=전혀 그렇지 않다 2=그렇지 않다 3=그저 그렇다 4=그렇다 5=전적으로 그렇다

	곡류	채소류 및 과일류	육류	우유류	유지류 및 당류
A. 이 식품군은 많이 먹을수록 건강에 좋다.					
B. 이 식품군은 여럿이 함께 먹을 때 더 먹게 된다.					
C. 이 식품군은 집에서 더 잘 먹게 된다.					
D. 이 식품군을 먹는 것에 대하여 더 알고 싶은 것이 없다.					
E. 이 식품군의 섭취에 대한 관심은 10대의 여학생들 사이에 더 높다.					
F. 이 식품군의 새로운 식품을 대하게 될 때 어떻게 해야할 지 잘 모르겠다.					
G. 이 식품군을 섭취시 권장 섭취량에 신경을 써 그에 준하여 먹는다.					
H. 이 식품군은 부모님의 경제 형편이 넉넉지 않아 마음대로 못 먹는다.					

여기에서는 다섯 가지 식품군에 대한 여러분의 태도를 알아보고자 합니다. 아래에 기술한 다섯 가지 식품군에 대한 설명을 잘 읽고 각 식품군에 대한 여러분의 식습관을 생각해보신 후 물음에 답하여 주시길 바랍니다. 다섯 가지 식품군 모두에 대하여 각각 숫자로 답하시되 여러분의 의견 또는 습관을 가장 잘 반영하는 경우에 해당하는 "5" 에서부터 가장 그렇지 아니한 경우의 "1" 까지 구별하여 주시길 바랍니다.

참고: 1=전혀 그렇지 않다 2=그렇지 않다 3=그저 그렇다 4=그렇다 5=전적으로 그렇다

	곡류	채소류 및 과일류	육류	우유류	지방류 및 당류
I. 이 식품군에 속한 여러 가지 음식을 먹으면 심장계통의 질환에 걸릴 염려가 줄어든다.					
J. 이 식품군은 먹는 데 시간이 많이 걸려 마음대로 못 섭취한다.					
K. 이 식품군은 섭취량에 구애받지 않고 먹는다.					
L. 이 식품군은 건강에 관심이 많은 사람들이 즐겨 먹는다.					
M. 이 식품군의 섭취에는 별 관심이 없다.					
N. 이 식품군은 마음만 먹으면 좋아할 수 있다.					
O. 이 식품군은 충분히 섭취하는 편이다.					
P. 이 식품군을 섭취하는 사람들은 더 건강하다.					
Q. 이 식품군은 내 마음대로 먹을 수 있다.					
R. 이 식품군을 섭취하는 사람들은 더 활동적이다.					
S. 이 식품군은 구하기 쉬울 때만 먹는다.					
T. 이 식품군은 몸무게에 신경을 쓰는 여성들이 주로 먹는다.					
U. 이 식품군은 운동선수들이 주로 먹는다.					
V. 이 식품군을 먹을 때면 잔류 농약이 있을까 걱정된다.					

조사대상자의 일반적 사항

다음의 질문에 답해주시기 바랍니다.

1. 당신의 나이가?
 ___14세
 ___15세
 ___16세
 ___17세
 ___18세

2. 당신의 부모님의 학력?
 아버지:
 ___초등학교 졸업
 ___중학교 졸업
 ___고등학교 졸업
 ___전문대 졸업
 ___학사
 ___석사
 ___박사
 어머니:
 ___초등학교 졸업
 ___중학교 졸업
 ___고등학교 졸업
 ___전문대 졸업
 ___학사
 ___석사
 ___박사

3. 어머니가 집밖에서 일을 하십니까?
 ___예
 ___아니오

4. 당신의 부모님의 월평균 수입?
 ___70 만원 이하
 ___70과 140 만원 사이
 ___140과 210 만원 사이
 ___210과 280 만원 사이
 ___280과 350 만원 사이
 ___350 만원 이상

5. 당신을 포함하여 같이 살고 있는 가족수?
 ___1
 ___2-3
 ___4-5
 ___6-7
 ___8 이상

6. 당신의 건강상태?
 ___나쁘다
 ___보통이다
 ___좋다
 ___아주 좋다

7. 당신 치아의 건강상태?
 ___나쁘다
 ___보통이다
 ___좋다
 ___아주 좋다

8. 당신의 몸무게와 키?
 몸무게 ___kg
 키 ___cm

APPENDIX D: HUMAN SUBJECTS APPROVAL

APPENDIX E: LETTERS

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

November 10, 1998

College of Family and Consumer Sciences
Department of Family and Consumer
Sciences Education and Studies
219 MacKay Hall
Ames, Iowa 50011-1120
PH 515 294-6444
FX 515 294-4493
EM fcseds@iastate.edu

Cho Ha Keup, Principal
Suh-Moon Girls' High School
1514, Bangbae Dong, Socho Gu,
Seoul, KOREA

Dear Ha Keup Cho:

As a graduate student in the Department of Family and Consumer Sciences Education and Studies I am conducting a study under the guidance of Dr. Rosalie Amos, to learn about adolescents' food intake and food attitudes.

I would like to have the instrument for this research administered to the students at the 3rd year level in the middle school and at the 1st and 2nd year level in the high school. I will make contact with one of the teachers to administer my instrument.

Thank you for your cooperation, I am enclosing a sample permission letter. Would you please return a permission letter by return FAX. I will need the original back to put in my dissertation.

Sincerely,

Kyeong-Eun Park

Kyeong-Eun Park
Graduate Student
Telephone: 515-292-7886
Email: kekpark@iastate.edu

Rosalie J. Amos

Rosalie J. Amos, Ph.D.
Associate Professor and Chair

Cho Ha Keup, Principal
Suh-Moon Girls' High School
1514, Bangbae Dong, Socho Gu,
Seoul, KOREA

November 9, 1998

To Whom It May Concern:

Kyeung-Eun Park will be conducting a survey of secondary school students to determine their food intake using a food frequency instrument as part of her Ph.D. work in the Department of Family and Consumer Sciences Education and Studies, Iowa State University.

As principal of Suh-Moon Girl's High School, I support and endorse her work. The findings will be supportive to develop nutrition education programs for adolescents in Korea.

If I can be of any further assistance, please feel free to contact me.

Sincerely,


Cho Ha Keup, Ed.D.
Principal

Instruction to the Administering Teachers

Enclosed are the questionnaires to determine food intakes and food attitudes. We appreciate your cooperation in administering the instrument to the students. Directions are included on the survey questionnaire. It will take about 40-50 minutes to administer. Ten minutes will be needed to give directions, and most of the students should complete the questionnaire in 30-40 minutes. We would be grateful if you would send the questionnaires back soon after administering them.

We want you to explain the following points to the students before they begin. Please read the directions aloud to the students. Feel free to respond to any students who may have questions about the directions or have questions about the items on the questionnaire.

Directions for students:

1. You have been selected to help with a research study being conducted at Iowa State University by Kyeung-Eun Park as part of her work on a Ph.D. degree. You may choose not to participate in the study.
2. The collected questionnaires will be entirely confidential. Please do not write your name on the questionnaire.
3. The information that is collected will be used for a group summary to contribute to the improvement of nutrition education programs for Korean adolescents.
4. Please answer the questions honestly and as completely as you can.

We appreciate the time you have taken to assist us with this research and thank you for your cooperation and support.

Sincerely,

Kyeung-Eun Park
Graduate Student
Telephone: 515-292-7886
Email: kekpark@iastate.edu

Rosalie J. Amos, Ph.D.
Associate Professor and Chair
Telephone: 515-294-6444
FAX: 515-294-4493

설문조사에 협조하시는 선생님들께

학생들의 음식물 섭취실태와 식품에 대한 태도를 측정하기 위한 이 설문조사에 협조를 아끼지 아니하시는 선생님들께 먼저 감사를 드립니다. 동봉한 설문지에는 설문의 응답에 필요한 안내문이 포함되어 있으며, 설문 실시에는 총 40-50 분이 소요될 것으로 추정됩니다. 설문 응답 안내에 약 10 분이 소요될 것이며, 그 후 30-40 분 정도면 대부분의 학생들이 응답을 마칠 것으로 생각됩니다. 설문 실시 후 가급적 빠른 시간 내에 회수된 설문지를 저희에게 보내 주시면 고맙겠습니다.

선생님께서서는 설문 실시 전에 다음 몇 가지 사항을 학생들에게 주지시켜 주시길 바랍니다. 우선 설문지에 있는 안내문을 가급적 큰 소리로 읽어 학생들의 주의를 환기시켜 주신 후 안내문이나 설문지 문항에 대한 학생들의 질문에 친절히 답해 주시기 바랍니다.

다음

1. 학생들은 미국 아이오와 주립대학의 박 경은이 박사학위 취득의 일환으로 수행하는 연구에 협력자로 선정되었으며, 원하지 않을 경우 불참할 수 있습니다.
2. 이 설문조사는 익명으로 수행되는 바 참여자들은 설문지에 성명을 기재하지 않게 되어 있습니다.
3. 수집된 설문결과는 참여자들이 소속된 집단의 음식물 섭취에 관련된 경향을 분석하는데 사용될 것이며 나아가 한국의 중고생들을 위한 영양교육 프로그램을 개선하는데 도움이 될 것입니다.
4. 이 연구의 성공을 위하여 참여자들의 정직하고도 성실한 답변을 바랍니다.

이 연구를 위하여 여러분들이 할애해 주신 시간과 협조에 감사드립니다.

박 경은
가정대 교육학과
박사과정

Rosalie J. Amos, Ph.D.
가정대 교육학과
부교수 및 학과장

APPENDIX F: ADDITIONAL TABLES

Appendix F.1. The 22 attitude items and their item-total correlation coefficients

Attitude items ↓	Food group ⇒	Grain Products	Vegetables & Fruits	Meat group	Milk group	Fats & sweets
A. I would feel healthier if I would eat more		0.354	0.380	0.279	0.356	0.215
B. I eat better when I eat with others.		0.139	0.191	0.188	0.062	0.205
C. I eat better when I eat at home.		0.203	0.234	0.251	0.357	0.212
D. I have no interest in learning more about eating		0.013	0.193	0.177	0.198	0.054
E. Teenage girls are concerned about eating more		0.046	0.361	0.076	0.291	0.146
F. I do not know what to do when it comes to new choices for		0.036	0.079	0.076	-0.002	-0.052
G. I need to make a conscious effort to consume the recommended servings of		0.008	-0.042	-0.054	0.087	-0.084
H. My parents have a limited budget to purchase these foods.		0.168	0.146	0.163	0.052	-0.016
I. Consuming a variety of these foods will decrease my risk of heart disease.		0.279	0.288	0.183	0.324	0.156
J. I do not have enough time to eat these foods.		0.049	0.244	0.097	0.225	-0.024
K. I am not concerned about how much I consume of these foods.		0.121	0.423	0.127	0.371	0.137
L. Individuals who eat these foods are health conscious.		0.385	0.457	0.223	0.378	0.276
M. I do not care if I eat these foods.		0.285	0.446	0.345	0.469	0.235
N. I can learn to like these foods.		0.373	0.500	0.337	0.515	0.350
O. I think I eat enough of these foods.		0.392	0.420	0.427	0.392	0.309
P. Individuals who consume these foods are healthier.		0.436	0.418	0.314	0.430	0.282
Q. Nothing keeps me from eating these foods.		0.298	0.519	0.383	0.472	0.293
R. Individuals who consume these foods are more energetic.		0.319	0.362	0.193	0.348	0.330
S. I eat these foods only if they are available.		0.089	0.083	0.026	0.071	-0.089
T. Individuals who consume these foods are female weight watchers.		0.115	0.463	0.099	0.304	0.206
U. Individuals who consume these foods are athletes.		0.274	0.331	0.156	0.285	0.226
V. When I eat these foods, I am afraid of the residues of pesticides.		-0.035	0.260	0.033	0.032	0.165

Appendix F.2. Factor loading of factor 1

Item	Grain Products	Vegetables & Fruits	Meat Group	Milk Group	Sweets & Fats
B	0.312	0.645	0.444	0.605	0.656
C	0.777	0.021	0.277	-0.110	0.734
E	-0.158	0.215	0.348	0.581	0.212
F	0.021	-0.234	0.008	-0.174	-0.192
G	-0.020	-0.106	0.090	0.427	-0.125
N	0.450	-0.038	0.677	0.375	0.186
O	0.523	0.011	0.709	-0.013	0.090

Appendix F.3. Factor loading of factor 2

Item	Grain Products	Vegetables & Fruits	Meat Group	Milk Group	Sweets & Fats
A	0.582	0.670	0.674	0.469	0.435
I	0.628	0.158	0.534	0.493	-0.222
L	0.589	0.434	0.727	0.737	0.678
P	0.595	0.556	0.704	0.703	0.626
T	0.636	0.565	0.146	0.522	0.527
V	0.035	0.386	0.053	0.037	0.578

Appendix F.4. Factor loading of factor 3

Item	Grain Products	Vegetables & Fruits	Meat Group	Milk Group	Sweets & Fats
H	0.636	0.744	0.732	0.660	0.680
J	0.133	0.312	0.533	0.662	0.263
Q	0.613	0.409	0.451	0.358	0.372
S	0.603	0.711	0.678	0.366	0.587

Appendix F.5. Factor loading of factor 4

Item	Grain Products	Vegetables & Fruits	Meat Group	Milk Group	Sweets & Fats
D	0.666	0.144	-0.092	0.638	0.737
K	-0.398	0.564	-0.755	0.158	-0.058
M	0.363	0.626	0.029	0.455	0.124

Appendix F.6. Factor loading of factor 5

Item	Grain Products	Vegetables & Fruits	Meat Group	Milk Group	Sweets & Fats
R	0.762	0.390	-0.231	0.023	0.737
U	0.545	0.359	-0.648	0.238	0.271

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ACKNOWLEDGMENTS

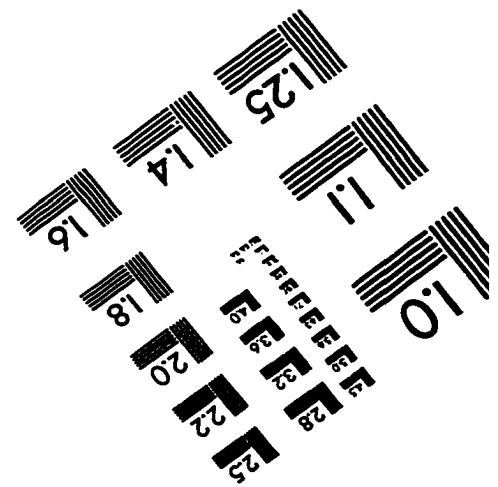
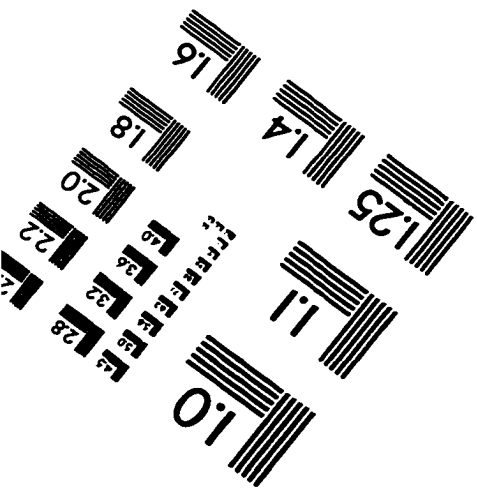
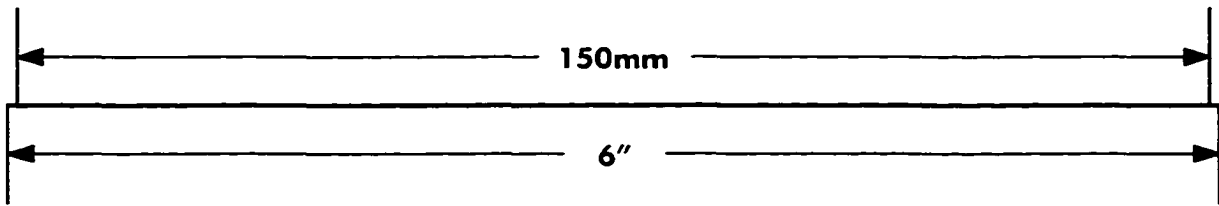
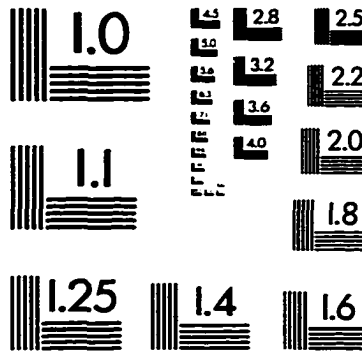
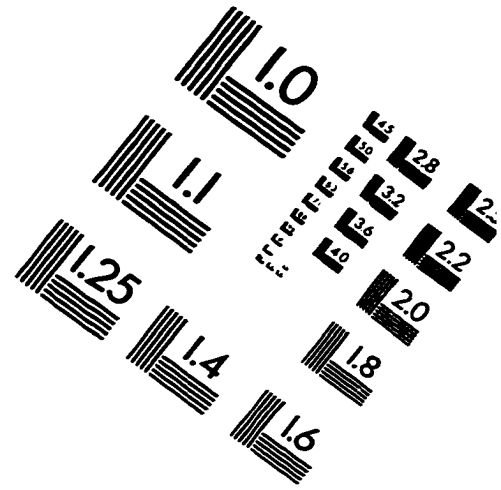
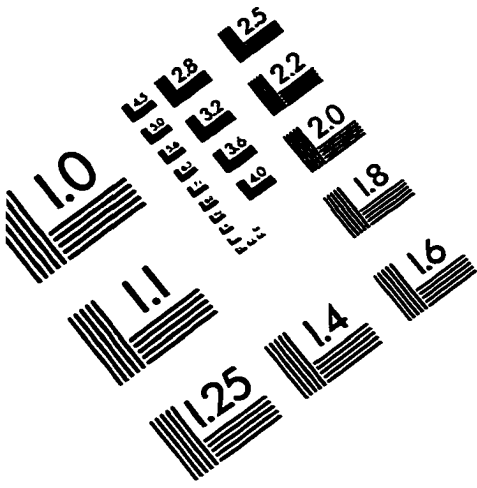
My heart is full of thankfulness to everything that helps me thus far in the work I have just finished. My teachers, friends and family members have constantly supported me through many loving sacrifices and tearful prayers that I never think I deserve.

My first appreciation goes to Dr. Rosalie J. Amos, my major professor, who knows when and how to encourage me without which this work would not be possible. My gratitude extends to the committee members including Drs. Sally K. Williams, Cheryl O. Hausafus, Mary Jane Oakland, and Mack C. Shelley. Special thanks are due to Dr. Hausafus for her positive encouragement on my initial enrollment in FCEDS as well as for her valuable advice in the data analysis. The help from Dr. Shelley in the statistical analysis is also acknowledged.

The time and effort of the participating students in Suh-Moon Girls' High School are greatly appreciated, along with the help from Dr. Ha Keup Cho, the principal, and Jung-Hwa Lee, the implementing teacher who is my sister in-law.

My parents are also to be greatly acknowledged for their unceasing love, support and prayers. Last of all, my husband, Jang-Sik, and two sons, Paul and Cheol-Woo, are heartily recognized for their being with me throughout the difficult journey with faith and patience.

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