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College Students' Fruit And Vegetable Attitudes And Practices

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COLLEGE STUDENTS' FRUIT AND VEGETABLE ATTITUDES AND PRACTICES

RANGE

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College Students' Fruit and Vegetable Attitudes and Practices

(TITLE)

BY

Sheila K. Range

THESIS

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Abstract

This study used the Health Belief Model to examine fruit and vegetable practices and attitudes of college students. Three hundred eighteen students completed a questionnaire designed to assess knowledge and attitudes related to fruit and vegetable intake and students' age, gender, major area of study, living arrangements and if they had major responsibility for shopping and preparing their food. Three hundred two of these students also completed a food frequency questionnaire consisting of 43 commonly eaten fruits and vegetables that assessed frequency and variety of consumption. Means and frequency distributions described all variables. Student's t-tests and chi-square analyses determined differences in knowledge, practices, and attitudes between males and females and between students who indicated they shop for and prepare most of the food they eat (major food preparers) and those who did not (non-preparers). Pearson product moment correlations investigated relationships between attitudes and intake for the whole sample and separately for gender and food preparer subgroups.

Most students were female (66%), reported living in residence halls (70%), and reported that dining services was responsible for most of their food shopping and preparation (62%). Respondents represented a variety of major areas of study.

Mean daily intake of vegetables (2.6 servings) fell short of the recommendation. Although mean intake of fruits (2.1 servings) met the recommendation, the wide range of scores suggests a need for improvement. Data also suggest that these students have limited variety of intake. Most students correctly identified the recommended number of servings of fruits (67%) and of vegetables (63%). No differences were found in knowledge between males and females or between food preparers and non-preparers or in frequency and variety of consumption by gender; however, major food preparers had lower fruit consumption than did non-preparers.

Mean responses indicated generally positive beliefs about the health benefits of fruits and vegetables and the palatability of fruits. Responses to items about chemical residues, palatability of vegetables, and cost and convenience of fruits and vegetables were generally negative. Correlation results indicated that positive attitudes toward the palatability of fruits may facilitate fruit intake, while positive attitudes toward the health benefits of fruits and vegetables may not. Negative attitudes toward the cost of fruits and vegetables, toward the palatability of vegetables, and about chemical residues do not appear to influence intake. For major food preparers, positive attitudes about shopping for and preparation effort of fruits and vegetables may facilitate intake, while negative attitudes associated with the time

available for fruit and vegetable intake may act as a barrier.

These findings suggest that educators should reinforce college students' beliefs that fruits and vegetables are beneficial to health, that fruits are palatable, and that fruit and vegetable intake is not much effort. Education should also encourage students to translate these beliefs into greater action. Messages should be directed to college students to improve their attitudes with regard to cost, chemical residues, palatability of vegetables, and the time related to fruit and vegetable intake.

Dedication

To my parents and my maternal grandparents who planted the seeds of dedication, perseverance, and love in each other, their farm, and their family, especially me.

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Chapter 1

Introduction

Per capita consumption of fruits and vegetables has increased about ten percent in the last decade, following a trend toward increasing fruit and vegetable consumption (Putnam & Allhouse, 1993; Putnam, 1994). Consumption of generous amounts of fruits and vegetables is recommended for good health (United States Department of Health and Human Services [USDHHS] & United States Department of Agriculture [USDA], 1995), yet research indicates that the fruit and vegetable intake of the majority of United States adults does not meet current recommendations. According to a baseline study for the "Five-a-Day for Better Health" program (Subar et al., 1992), the mean fruit and vegetable intake of adults is 3.4 servings per day, falling short of the recommended five per day. Only 23% of the adults in this survey indicated they consumed the recommended level, an improvement from the 9% reporting this in a review of the National Health and Nutrition Examination Survey (NHANES) study of 1976-1980 by Patterson, Block, Rosenberger, Pee, and Kahle in 1990.

Persons most likely to consume the recommended level of fruits and vegetables are females 35-50 years of age or older who have higher income levels and who are aware of the benefits associated with fruit and vegetable consumption (Cronin, Krebs-Smith, Wyse & Light, 1982; Patterson et al.,

1990; Kant, Schatzkin, Ziegler & Nestle, 1991; Subar et al., 1992; Lutz, Smallwood & Blaylock, 1993). Males, young adults, and low income individuals have been reported to be more likely to have low fruit and vegetable intakes (Cronin et al.; Patterson et al.; Kant et al.; Subar et al., 1992; Lutz et al.).

The dietary practices of many college students have been reported to be poor (Stasch, Johnson & Spangler, 1970; Marrale, Shipman & Rhodes, 1986; Hernon, Skinner, Andrews & Penfield, 1986; Melby, Femea & Sciacca, 1986; Sneed & Holdt, 1991; Huang, Song, Schemmel & Hoerr, 1994), but little research has been done to specifically examine the fruit and vegetable consumption of this group. Although college students have been reported to be fairly knowledgeable about dietary needs, their consumption of nutrient-dense foods, including fruits and vegetables appears to be low (Stasch et al.; Marrale et al.; Hernon et al.; Melby et al.; Huang et al.).

In order to develop programs that would effectively increase fruit and vegetable intake of college students, factors that may contribute to low consumption must be identified. The Health Belief Model is a theoretical framework that can be utilized to predict factors that may affect the nutrition behavior of a group of people. For the purposes of this study, nutrition behavior is identified as the frequency of fruit and vegetable consumption, and the group is the college student population. Modifying

variables that may affect nutrition behavior include certain demographic characteristics and factors commonly identified in the literature that may act to impede or faciltate behavior. The factors examined in this study include health motivation, chemical residue concerns, palatability, convenience, and cost. For this study, examination of these factors consisted of examination of mean responses toward attitude and belief statements addressing these factors. Attitudes and beliefs are used in conjunction with each other to include this population's perceptions and ideas about the identified modifying factors. Mean responses to the various factors were correlated with consumption to identify them as either barriers or facilitators to the nutrition behavior of fruit and vegetable intake.

This study was designed to fulfill the following objectives:

1. to identify the frequency and variety of fruit and vegetable consumption of college students using a food frequency questionnaire
2. to identify college students' knowledge of recommendations for fruit and vegetable consumption
3. to determine the extent to which various factors may act as barriers or facilitators to college students' fruit and vegetable consumption
4. to investigate differences in fruit and vegetable consumption, knowledge of fruit and vegetable

consumption recommendations, and identification of various factors as barriers or facililators to fruit and vegetable consumption between male and female students and between students who shop for and prepare most of their own food and those who do not.

Chapter 2

Review of Literature

A limited amount of literature is available on the fruit and vegetable consumption of college students specifically; however, some literature is available on the overall dietary habits of college students and some is available on the fruit and vegetable consumption of Americans in general. The chapter begins with a review of the framework for this study, the Health Belief Model (HBM) (Hochbaum, 1958; Rosenstock, 1974), followed by sections on on U.S. fruit and vegetable consumption patterns, on food-related practices of college students, and on potential barriers and facilitators to fruit and vegetable consumption, especially among college students, and concludes with a brief description of the 5 A Day for Better Health program (Subar et al., 1992) designed to increase fruit and vegetable intake.

Health Belief Model

The formulation of what is now referred to as the Health Belief Model (HBM) began with research in the 1950s by Public Health Service investigators who were trying to understand the limited participation in preventive health programs (Rosenstock, 1974). They examined ways in which health programs might achieve greater effectiveness by specifically studying participants who engaged in preventive health behavior, despite lack of symptoms for any particular

disease (Hochbaum, 1958; Hayes & Ross, 1987). The original HBM focused on disease avoidance and included the following concepts: perceived susceptibility and severity, the threat posed by an illness comprised of its likelihood and potential for causing harm; perceived benefits and barriers, the value of a behavior and the estimated cost involved in the action; and cues to action, the stimulus that triggers the appropriate health behavior (Rosenstock; Becker & Maiman, 1975, Becker, Maiman, Kirscht, Haefner & Drachman, 1977).

In a review of literature on patient acceptance of recommended health behaviors and factors that act to predict compliance, Maiman and Becker (1975) identified 3 elements formulated by Rosenstock in the utilization of the HBM: readiness to take action as it relates to perceived susceptibility and severity; the individual's evaluation of a health behavior balanced between possible benefits and potential barriers; and cues to action or stimulus that initiate an appropriate health behavior. Demographic and sociopsychological variables were not thought to be causal of compliance (Becker & Maiman; Becker et al., 1977). The model was reformulated to focus on health behavior, as opposed to disease avoidance and on mediating variables, including demographic, structural, and enabling factors (Becker & Maiman; Becker et al.). The reformulation allows for increased predictive power of the model, as well as increased ability to identify differences in degrees of

health concern (Langlie, 1977; Becker et al.).

A field experiment by Becker and associates (1977) examined the health beliefs, concerns and motives of 182 mothers of obese children. The researchers noted that the HBM concepts were extended and tested with respect to dietary compliance in this study. The researchers identified dietary compliance as "somewhat unusual in the class of health behaviors" for the following reasons: threat posed to health is not immediate, action may be taken for non-health reasons (i.e. body image), and even health problems that may be related to dietary non-compliance (i.e. obesity) may not be regarded as such by many persons.

In a review of the HBM's use for a period of ten years, Janz and Becker (1984) suggested that the HBM is a useful framework for explaining and predicting acceptance of health and medical care recommendations. The researchers summarized findings to identify the most predictive HBM dimensions. "Perceived barriers" was identified as the most powerful across all studies and "perceived susceptibility" was also strongly associated with preventive health behavior.

Mullen, Hersey, and Iverson (1987) compared the ability of several models, including the HBM, to predict health behavior change. Studying 326 adults over an 8 month period, the researchers found that demographic characteristics, such as age and gender, were more important predictors of health behavior than were other components of

the HBM. Researchers indicated that demographic variables should be examined and the findings of these studies should be used in targeting messages to particular groups. Upon analysis of several components of the HBM, the researchers also indicated that barriers and enabling factors may serve an important role in a wide variety of health areas.

Further research to identify the role of modifying variables in the use of the HBM was conducted by Hayes and Ross (1987). Upon examination of factors affecting eating habits, the researchers found that age, gender, and marital status contributed to variances. For instance, older people, married people, and women were more likely to have better eating habits than their counterparts. These researchers proposed that not only health motivation, but concern with appearance, affected eating behaviors. The idea that many factors can affect the degree of health motivation and health behavior is supported by these findings.

Recent research using the HBM as a framework focused on two sets of beliefs: (a) readiness to take action that includes perceived susceptibility and severity and (b) modifying variables, such as various demographic factors, benefits and barriers. The modified form of the original HBM was utilized by Schafer, Schafer, Bultena, and Hoiberg (1993) with 630 persons to determine what food safety actions people take and the factors that may predict these actions. The findings suggest that perceived

susceptibility, health motivation, and sociodemographic factors are related to health behavior. Persons with higher perceived personal threat, higher health motivation, and females and older persons were more likely to be active in food safety behaviors.

Similar results were found by Dittus, Hillers, and Beerman (1993) in a study of 1,069 Washington state residents on the attitudes and behaviors related to pesticide residue, susceptibility to cancer and consumption of fruits and vegetables. Those respondents with higher health concern about pesticides and higher health motivation had higher fruit and vegetable consumption and also were more likely to engage in behaviors to decrease their exposure to pesticide residues than were those with lower levels of health concern, motivation, and consumption.

Using the same sample, Dittus, Hillers, and Beerman (1995) also examined attitudes regarding the nutritional benefits of fruits and vegetables, attitudes suggesting barriers to fruit and vegetable intake, and reported fruit and vegetable intake. This research identified some of the demographic factors that may be associated with current barriers to fruit and vegetable intake, such as income, education, and gender. Although nutrition concern was high among all groups, barrier scores were higher among low-income, low-education categories and among males. These findings suggest that variance in fruit and vegetable intake may be at least partially explained by attitude variables

and perceived barriers. Consequently, these researchers, as well as Schafer and associates (1993), suggest that further research utilizing the HBM should examine health beliefs and modifying variables in order to tailor nutrition education efforts to target groups.

The present research design utilizes fruit and vegetable consumption as the health behavior and the research population as college students. Consistent with the HBM framework, readiness to take action is defined as the perception of threat from not performing the health behavior. Modifying variables may include sociodemographic variables and perceived barriers, including attitudes or beliefs regarding convenience, cost, taste, and pesticide concerns associated with fruits and vegetables. This framework lends itself to the examination of the fruit and vegetable consumption of a specific group of people and the factors that may act to affect health behavior.

Fruit and Vegetable Consumption Patterns

According to the 5 A Day for Better Health baseline study, the average daily intake of fruits and vegetables of American adults was about 3.4 servings. This study consisted of a telephone survey of 2,837 American adults prior to the start of the 5 A Day program. Seventy-seven percent of Americans did not consume the minimum recommended number of daily servings (Subar et al., 1992). These findings were part of the baseline study to determine Americans' current fruit and vegetable consumption, as well

as their general awareness and attitudes toward diet and nutrition issues.

Food behaviors, including fruit and vegetable intake, have been reported to vary with demographic characteristics, including age, gender, and socioeconomic status (Cronin et al., 1982; Patterson et al., 1990; Kant et al., 1991; Subar et al., 1992; Lutz et al., 1994). Several researchers have used data from the second National Health and Nutrition Examination Survey (NHANES II) to examine demographic differences. Kant and colleagues found that men were more likely than women to report no consumption of fruit and that education and income levels were positively related to reported consumption of at least the recommended amount of fruits and vegetables. Patterson and colleagues found overall fruit and vegetable consumption to be relatively low with trends suggesting that men had higher consumption of vegetables, while women had higher consumption of fruits.

Similarly, in a review of findings from the Nationwide Food Consumption Survey (NFCS), Cronin and colleagues (1982) reported that fruit was consumed by only a small percentage of men, older teenagers and adults to 50 years of age). Subar and colleagues (1992) found similar results in the baseline study for the 5 A Day program. Younger adults (18-34 years) tended to consume fewer servings of fruits and vegetables per day than older (50 years of age or older) adults. Although men consumed more food than women, their intake of fruits and vegetables was lower; the median intake

for men was 3 servings per day versus 3.7 per day for women. Reports suggested that although college-educated individuals are more likely than those with less education to recognize the recommended number of daily servings (Subar et al., 1992), they do not necessarily consume the recommended level or even a substantial percentage (Melby et al., 1986).

Although current per capita consumption of fruits and vegetables is low with respect to the 1950s and 1960s (Hecht, 1985), recent disappearance data indicate that Americans have increased their consumption in the past decade (Putnam, 1994). Fruits and vegetables have been recognized as one of the fastest growing categories of products available in U.S. supermarkets (Hecht).

Food-related practices of college students

Many studies have assessed the eating behaviors of college students (Stasch et al., 1970; Hernon et al., 1986; Melby et al., 1986; Hertzler & Frary, 1989; Beerman, Jennings & Crawford, 1990; Beerman, 1991; Sneed & Holdt, 1991; Hertzler & Frary, 1992; Stewart, Keim, Voichik and Tinsley, et al., 1994; Huang et al., 1994). These studies suggest that college students often have inconsistent eating patterns, including meal-skipping and frequent snacking, and also have low intakes of nutritious foods (Hernon et al. & Melby et al.). For example, in a study designed to examine the eating practices of 1,912 Michigan State college students enrolled in an introductory nutrition class, Huang and colleagues found that 22% of these students skipped

breakfast and 80% reported snacking at least once per day on foods including potato/nacho chips, candy bars, cookies, and pizza. In a study of the fruit- and vegetable-related beliefs and behaviors of 594 young adults, Stewart and colleagues found that 69% of students rarely consumed vegetables as snacks and 67% rarely consumed fruit for snacks.

Although college students seem to be somewhat knowledgeable about appropriate dietary practices, they still engage in inappropriate practices (Stasch et al., 1970; Melby et al., 1986). Students seem to understand that certain foods, specifically fruits and vegetables, should be included in a healthful diet (Stasch et al.; Melby et al.). Melby and colleagues studied 1,226 college students and found that while 95% agreed that a healthy diet would include fruits and vegetables, 29% consumed less than 3 servings of fruit and 11% consumed less than 3 servings of vegetables per week. Similar findings by Stasch and colleagues indicated that although 25% of college students surveyed listed fruits and 21% listed vegetables as foods they may eat regularly to improve their health, students tended to dislike vegetables in general.

Despite their apparent knowledge, college students do not consume adequate amounts of fruits and vegetables (Stasch et al., 1970; Melby et al., 1986). Melby and associates indicated that 69% of these students failed to eat at least one serving of fruit per day and 43% indicated

that they ate vegetables less than once per day.

Fruit and vegetable intake of college students varies with several factors, such as gender and place of residence (Hernon et al., 1986; Melby et al., 1986; Beerman et al., 1990; Beerman, 1991). Melby and associates found that fruit and vegetable consumption was higher for students living in residence halls than for students living off-campus. Thirty-seven percent of students living in residence halls reported at least one serving daily of fruits and 62% reported at least one serving of vegetables, compared to 25% and 51%, respectively for students living off-campus. Similarly, in a study analyzing the food frequency questionnaire of 250 college students at Washington State University, Beerman and colleagues found that only 31% of off-campus students ate vegetables daily, compared to 56% of dormitory residents and 55% of students living in fraternities or sororities.

Facilitators and barriers to fruit and vegetable consumption

Americans are becoming increasingly aware of the relationship between dietary patterns and the risk reduction of certain diseases. In the last five years there has been an increase (from 57 to 63%) in the percentage of Americans who associate fruits and vegetables with a healthy diet (Food Marketing Institute [FMI] & Prevention Magazine, 1994). Thirty percent of shoppers making a dietary change in the last ten years reported eating more fruits and vegetables specifically because of health concerns (FMI,

1994). Acuff (1995) reported that 96% of the respondents in a survey entitled "Fruit and Vegetable Consumption: Consumers' Attitudes vs. Behavior" by the United Fresh Fruit and Vegetable Association agreed that more fruits and vegetables should be included in the diet. This survey consisted of 2000 households in California who were asked to estimate their daily food consumption. Subar and colleagues (1992) reported four in ten Americans recognize the connection between fruit and vegetable consumption and the reduction of cancer risk, five of ten recognize the possibility of reducing the risk of heart disease, and six of ten associated fruit and vegetable consumption with the loss or maintenance of weight.

These studies suggest that a moderate number of Americans are at least aware of the benefits associated with fruit and vegetable consumption. In fact, Acuff (1995) noted that the percentage of Americans who recognize the "5-a-day" message increased from 8 to 29% between 1991 and 1993. However, the persons more likely to recognize the actual benefits of increased fruit and vegetable consumption are those already consuming the largest quantities, mainly women aged 35-49 with an education level greater than high school (Subar et al., 1992). These findings suggest that awareness of the benefits of fruits and vegetables may facilitate higher consumption.

Although many consumers recognize that fruits and vegetables should be included in the diet (FMI and

Prevention Magazine, 1994), this is not necessarily translated into action (Acuff, 1995). Acuff reported that consumers in the United Fresh Fruit and Vegetable Association survey overestimated their consumption of fruits and vegetables by 33%. Those overestimating their consumption by the greatest amount (43%) were those aged 18-34 years. Certain persons, specifically young adults, do not act in accordance to their knowledge or beliefs about the health benefits of fruits and vegetables. These individuals do not seem to realize how few fruits and vegetables they are actually consuming may be acting as a barrier to adequate consumption.

The attitudes of college students about fruits and vegetables and healthful eating have also been studied. Neilson and Larson-Brown (1990) studied nutrition messages about fruit and vegetable consumption. Messages considered to be the most motivating focused on taste appeal and nutritious alternative choices for common foods. Vegetable messages, although generally motivating to students, were not ranked as highly as messages about fruit. The investigators suggested that this attitude may stem from the general dislike associated with vegetables from childhood.

Due to the low fruit and vegetable consumption levels frequently reported for Americans, many research efforts have focused on those factors that impede consumption, typically referred to as barriers. These barriers may include demographic characteristics, but most commonly are

factors that interfere with an individual's acting on a specific behavior. Literature on the identification of factors related to the poor eating habits reported for college students is limited; however, some research suggests that certain attitudes may be responsible for not making nutrition a priority (Sneed & Holdt, 1991; Cypel & Prather, 1993).

Convenience considerations, such as preparation time and availability, may be related to fruit and vegetable intake. Upon examining the dietary status and eating-out practices of 280 college students, Hertzler and Frary (1992) found that easy accessibility and time allowances were some reasons identified for eating out. The researchers also noted that the practice of eating out has been negatively correlated with adherence to dietary guidelines. College students' need for convenience has been significantly correlated with the number of meals eaten at fast-food restaurants (Sneed & Holdt, 1991) and has also been associated with the selection of fast-food type dishes (Huang et al., 1994). Findings of the 5 A Day program (Loughrey, Doner & Lurie, 1992) indicated that eating outside the home (or consuming restaurant food at home) may be one of the biggest potential barriers to increased fruit and vegetable consumption. Unfortunately, the choices for convenience food may limit the amount of fruits and vegetables that are included in the diet, possibly contributing to college students' low level of intake.

Although 76% of students surveyed by Nelson and King (1982) reported fresh fruits as their first choice for snacks and fruit juice as their first choice for a beverage, students indicated these were not easily accessible. For example, only carbonated beverages, chips, and candy were available in vending machines. These research findings indicate that limited availability may influence fruit and vegetable intake in the college student population.

The impact of income level and cost on fruit and vegetable intake has been examined and discussed (Cronin et al., 1982; Melby et al., 1986; Patterson et al., 1990; Kant et al., 1991; Sneed & Holdt, 1991; Loughrey et al., 1992; Lutz et al., 1993; Jeffrey, French, Raether & Baxter, 1994; Reicks, Randall & Haynes, 1994; Stewart & Tinsley, 1995). Loughrey and colleagues suggested that cost may be a potential barrier to fruit and vegetable consumption in their report of factors that may prevent increased consumption of fruits and vegetables for the 5 A Day program. A review of the USDA Economic Research Service study (1977-78) and the 1987-88 Nationwide Food Consumption Survey found that cost acts as a barrier for low income families. Families with lower incomes have lower levels of fresh vegetable consumption (Lutz et al.).

Similar results also were reported by Kant and colleagues (1991) upon analysis of 24-hour recalls of almost 12,000 individuals in the 1976-80 National Health and Nutrition Examination Survey. They found that income was

positively associated with the proportion of respondents who met the minimum number of recommended servings of fruits and vegetables. Limited income was also identified as a barrier to fruit and vegetable consumption by 30 low income mothers who were participants in focus groups conducted by Reicks and colleagues (1994). These participants perceived fruits and vegetables as expensive and noted that their purchases are limited to items on sale. Melby and colleagues (1986) noted that cost may act as a barrier to fruit and vegetable intake for off-campus college students. In contrast, price was not correlated with consumption of any food group for non-college young adults in a study by Stewart and Tinsley (1995).

Several researchers have suggested the need for making fruits and vegetables more economically attractive (Patterson et al., 1990; Kant et al., 1991; Jeffrey et al., 1994; Reicks et al., 1994). Patterson and colleagues suggested that the affordability of fruits and vegetables may be increased for some by improved availability through societal commitment to food programs, such as school lunch and elderly meal programs. Reicks and colleagues suggest that practical purchasing advice should be designed to counteract the barrier of cost. An observational study of the cafeteria habits of 700 university employees by Jeffrey and colleagues indicated that making fruits and vegetables more economically attractive was an effective strategy for changing food purchasing behavior. Fruit and salad

purchases of the university cafeteria population increased by three times the baseline level when prices were reduced by 50%. Consumption levels above baseline were also noted in follow-up results despite baseline pricing. Hence, cost was identified as either a barrier or facilitator depending on whether it was perceived as high or low.

Taste is reported to be a very prevalent and powerful factor influencing food selection. Ninety percent of the respondents in the 1994 FMI and Prevention Magazine Survey indicated that taste was the most important factor in their food selection. Taste preferences have been recognized as factors in food selection with the college student population and young adults (Melby et al., 1986; Huang et al., 1994; Stewart & Tinsley, 1995). In a study of factors influencing food choice for young adults, Stewart and Tinsley found taste to be one of the strongest factors influencing consumption frequency of the food groups. Taste preferences also were noted as a possible factor influencing the food selection of fast food-type items for 1,912 college students in a study by Huang and colleagues. Similarly, Subar and colleagues (1992) noted that those with the lowest taste preference for fruits and vegetables were found in the lowest quartile of consumption in the 5 A Day baseline study. Loughrery and associates (1992) reported that taste was one factor that influenced fruit and vegetable consumption more than concerns related to health and nutrition.

Although consumer concerns about pesticides have decreased from 79% to 72% between 1993 and 1994, according to the FMI and Prevention Magazine study (1994), these numbers indicate that concern is still prevalent. Research has attempted to identify consumer characteristics related to high levels of concern (Sachs, Blair & Richter, 1987; Ott, 1990; Goldman & Clancy, 1991; Dittus & Hillers, 1993; Dittus et al., 1993; Auld, Kendall & Chipman, 1994). Some of these characteristics include age, income, educational level, and overall environmental concern (Sachs et al.; Ott; Goldman & Clancy; Dittus & Hillers; Dittus et al.). In a study of the attitudes of 300 shoppers toward the purchase of certified pesticide residue-free fresh produce, Ott reported that although younger individuals may be seen as being more concerned about the environment, older consumers (over 40 years old) are actually more concerned. Results of this study, however, also indicate that there is a relationship between college attendance and concern about pesticide use. Dittus and colleagues suggested that although concern about pesticide use exists, it does not appear to affect consumption of fruits and vegetables. In their survey of 1,069 Washington state residents, they found that even those individuals who indicated high levels of pesticide concern had slightly higher nutrition behavior scores than those with lower levels of pesticide concern. They noted, though, that although consumption does not appear to be affected, consumption might be even higher if

appear to be affected, consumption might be even higher if the concern about the health effects of pesticide use did not exist.

5 A Day for Better Health program

The 5 A Day for Better Health program was developed to encourage all Americans to eat at least 5 servings of fruits and vegetables per day (Subar et al., 1992), in an effort to help meet the nation's Healthy People 2000 Objectives (United States Department of Health and Human Services [USDHHS], 1991). The program development was based on a similar program developed in California and was sponsored by the National Cancer Institute (NCI) and the Produce for Better Health Foundation (PBHF). The program is unique in that it is the first national program to emphasize the positive effects of fruit and vegetable consumption on the prevention of certain diseases, especially cancer (Subar et al., 1992).

The two-phase approach which includes community and research efforts has targeted many groups (Havas et al., 1994). The community component consists of efforts to reach consumers at the local level through the retail sector and state-sponsored programs (Havas et al., 1994). Industry has continued to initiate coordinating programs and has monitored the success of the 5 A Day program. Many industry members believe that selling fruits and vegetables will not occur simply by associating their consumption with health but that more active marketing of the sensory attributes of

fruits and vegetables is needed. Retailers are being recognized and applauded for the efforts not only to increase fruit and vegetable buying, but for providing tours, demonstrations, and literature on the benefits of fruits and vegetables. These efforts also provide consumers with nutrition information and new, easy, tasty product preparation techniques (Duff). Several age groups have been targeted by individual states, including high school students in Louisiana, and elementary students in Alabama, Minnesota, and Georgia (Havas et al. 1994). Also, pregnant women have been targeted in Maryland and work-site programs have been implemented in Arizona, Massachusetts, and Washington (Havas et al. 1994).

Ultimately, this program is a result both of research to tailor educational efforts and of community interventions to educate groups about the benefits of fruit and vegetable consumption. The program has been commended as a model for public-private partnerships that utilize both community education and research efforts (Havas et al., 1994). It is also important to note that guidelines for increasing fruit and vegetable consumption are inherent in the USDHHS and USDA's Dietary Guidelines for Americans (1995) and the USDHHS' Healthy People 2000 Objectives (1991). Programs, such as 5 A Day, emphasize the importance of compliance with these types of recommendations.

Review of the available literature indicates that fruit and vegetable intake is lower than recommended and may be

affected by many factors. Also, based upon this review, it is apparent that a relationship exists between the health behavior of fruit and vegetable consumption and various attitudes, beliefs, and modifying factors. Further examination of this relationship serves as an impetus for continued research.

Chapter 3

Methodology

This study was developed to identify college students' frequency and variety of fruit and vegetable consumption and knowledge of fruit and vegetable intake recommendations, to determine the extent to which various factors may be perceived as barriers or facilitators to consumption, and to compare these variables between male and female students and between students who shop for and prepare most of their own food and those who do not. The data collection instrument included a food frequency questionnaire (FFQ), knowledge and behavior questions, and attitude statements (see Appendix A). The data were collected during a regular class period of an introductory nutrition class at a Midwestern university. The sample was a non-probability convenience sample. Frequency and variety scores were created by the researchers to further assess consumption. All statistival analyses were conducted using the Statistical Analyses System (SAS) (SAS Institute, 1989.)

Data Collection Instrument

A self-report food frequency questionnaire (FFQ) was developed to describe the frequency and variety of college students' fruit and vegetable consumption within the past month. The FFQ method has been reported as valid for describing dietary patterns or food habits, especially related to long-term health effects, and for identifying

groups at extremes of intake (Zulkifli & Yu, 1992). The FFQ used for this study listed 43 different fruits and vegetables that were selected based on the most commonly eaten fruits and vegetables identified for nutrition labeling (Kurtzweil, 1993) and upon consultation with the university dining services personnel. Students were asked to estimate their intake of these fruits and vegetables in the past month using a six-point response scale (Dittus et al., 1995) that ranged from "don't eat" to "once or twice per day." To account for less frequently eaten foods that may contribute to intake (Krebs-Smith, Heimendinger, Subar, Patterson & Pivonka, 1995; Zulkifli & Yu), students were given the opportunity to indicate frequency of consumption of one "other" fruit and one "other" vegetable not included on our list. To test reliability, students also were presented with standard serving sizes (Dittus et al., 1995) and asked directly how many of these servings of fruit and of vegetables and how many different kinds of fruits and of vegetables they eat in a usual day.

The questionnaire also included thirty-seven attitude and belief statements to assess the extent to which students perceived eating fruits and vegetables to be beneficial to their health and the extent to which various factors potentially were barriers to their fruit and vegetable consumption. Items were adapted from prior research (Dittus et al., 1995) or were developed specifically for this study. Students responded to each of these items on a four-point

scale ranging from strongly disagree to strongly agree.

Perceived threat to health was assessed with 5 items that addressed relationship between fruit and vegetable intake and cancer, heart disease, intestinal problems, weight maintenance, or general health. Factors assessed as potential barriers to fruit and vegetable consumption included cost (5 items), convenience (13 items), palatability (10 items), and chemical residues (4 items). These factors were selected for assessment based on prior literature reports (Ott, 1990; Dittus & Hillers, 1993, Dittus et al., 1994; Dittus et al., 1995) and investigator experience with this population.

Seven items adapted from prior research with young adults (Stewart et al., 1994) assessed the frequency of various fruit and vegetable consumption practices. Practices assessed included consuming (a) green salad at lunch or dinner, (b) at least two vegetables at dinner, (c) a vegetable (excluding salad) at lunch, (d) fruit or fruit juice for breakfast, (e) fruit for dessert, (f) raw vegetables for snacks, and (g) raw or dried fruit for snacks. Students responded to these items using a four-point scale ranging from never to usually.

Two multiple choice questions adapted from Stewart and colleagues (1994) assessed students' knowledge of recommendations for fruit and vegetable consumption. Questions asking students who shops for and prepares most of the food they eat while at school, and asking their gender,

age, major field of study, and place of residence also were included in the questionnaire.

Two items were included to assess if fruit and vegetable consumption differed by season of the year for the respondents. These items were included because of the time of the year that this study was conducted.

The initial questionnaire was pilot tested with 32 college students who were not part of the study sample. Results of this test suggested that a number of the attitude statements did not "make sense" to residence hall students who did almost no food preparation. Thus for the final study the statements were divided into two groups, sixteen to be completed only by participants who indicated they prepare most of the food they eat.

Data Collection

The questionnaire was administered during the fourth week of the spring semester to college students enrolled in seven sections of an introductory general education nutrition course at a Midwestern university. This sample was a non-probability convenience sample composed of students with a variety of majors (Monsen & Cheney, 1992). The questionnaires were completed in the first 25 minutes of a regular class period. The researcher was present to explain the purpose, provide instructions, answer questions and review the questionnaires for completeness. Students who reported they were 24 years of age or older were excluded from analyses in order to get a more accurate

representation of traditional-age college students.

Data Analyses

Frequency and variety scores were determined by first converting FFQ responses for each fruit and for each vegetable to a monthly basis. A "0" monthly frequency score was assigned to each response that indicated that fruit or vegetable was consumed less than once per month. For responses of 1-3 times per month, a frequency score of "2" (as an average) was assigned. Responses of once per week were assigned a "4". A "12" was assigned to responses of 2-4 times per week (average of 3 per week x 4 weeks per month) and similarly, a "45" was assigned to responses of 1-2 times per day (average of 1.5 per day x 30 days per month). Monthly frequency scores were then divided by 30 days to obtain daily frequency scores.

Variety scores were calculated using the created daily frequency scores. For each daily frequency score of less than 2 (indicating consumption of that fruit and vegetable less than once per month), a variety score of "0" was assigned. A variety score of "1" was assigned for all daily frequency scores greater than or equal to 2 (i.e. 2, 4, 12, 45), thus indicating consumption of that fruit or vegetable at least once per month. These variety scores were then summed for all fruit and for all vegetables listed on the FFQ to determine monthly variety scores for fruits and for vegetables for each respondent. These variety scores thus estimated the number of different fruit and the number of

different vegetables each student consumed in the past month.

Descriptive statistics were computed for these and for all other study variables for the whole sample, and separately for males and females and for those who indicated they shop for and prepare most of their own food (termed major food preparers for this study) and those who indicated they do not (termed non-preparers for this study). Students' t-tests were performed to investigate differences in all consumption variables and in knowledge between males and females and between major food preparers and non-preparers. Chi-square analyses were used to investigate differences in specific fruit and vegetable practices between males and females and between the major food preparers and non-preparers. Pearson product moment correlations were computed to examine relationships between fruit and vegetable frequency scores and responses to the attitude items. These correlational analyses were conducted for the whole sample and separately for males and females and for the major food preparers and non-preparers. All statistical analyses were conducted using the Statistical Analyses System (SAS) (SAS Institute, 1989).

Chapter 4

Results

Respondent characteristics

Of the 341 questionnaires administered to college students 24 years of age or younger, 318 (93%) completed only by students aged 18-23 years old, were included in analyses to identify respondent characterisitics, responses to individual attitude items, knowledge, and specific fruit and vegetable consumption practices. The final number used for analysis of the food frequency questionnaire (FFQ) data was 302 (89%). Only these 302 students were included in analyses to estimate the frequency and variety of fruit and vegetable consumption and to investigate relationships between consumption and attitude items. Sample size for a few other analyses was somewhat smaller than these numbers due to additional missing data.

The mean age of students in the sample was 19.4 years. The majority (66%) was female and most (70%) reported living on-campus in residence halls. Consistent with these living arrangements, 62% indicated that university dining services prepared most of the food they eat; only 85 (27%) identified themselves as the major food preparer. Participating students represented a variety of major areas of study. Table 1 presents details of respondent characteristics.

Fruit and vegetable consumption

Fruit and vegetable intake was assessed by two methods,

Table 1
Respondent characteristics

Characteristic	n	%
Age		
18 years old	127[a]	40
19	82	26
20	52	16
21	36	11
22	12	4
23	8	3
Gender		
Male	108	34
Female	208	66
Major area of study		
Science related (i.e. Biology, Chemistry, and Zoology)	72	23
Non-Science related (i.e. Business, Music)	60	19
Education (Science or Non-Science)	60	19
Undeclared	55	17
Home Economics (Dietetics, Foods and Business, other)	45	14
Physical Education/Health	24	8
Living Arrangements		
On-Campus		
Residence Hall	222	70
University Apartments	10	3
Off-Campus		
By themselves or with a roommate	50	16
With parents	25	8
With spouse and/or children	3	1
Majority of food preparation		
Dining Services	197	62
Themselves or equally with others	85	27
Roommate, parent or spouse	24	8
"Eating out"	11	3

[a]Data missing from some questionnaires (will not equal total due to missing data)

the FFQ and questions directly asking students how many servings of fruits and of vegetables they eat in a usual day. To establish reliability of the FFQ, correlational analyses between the two assessments were performed for fruits and for vegetables. All were significant at the .0001 level. The correlation coefficients were as follows: daily fruit (r=.55), daily vegetable (r=.44), monthly variety of fruit (r=.51), and monthly variety of vegetable (r=.44). These suggest that the different measures were at least moderately consistent.

Mean daily frequency and monthly variety of intake for the total FFQ sample, for males and females, and for the major food preparers and non-preparers are presented in Table 2. Daily consumption of fruit for all FFQ respondents ranged from 0 to 11 servings with a mean of 2.1 servings; daily consumption of vegetables ranged from 0 to 14 servings with a mean of 2.6 servings. The monthly variety of fruit consumption for all FFQ respondents ranged from 0-21 with a mean of 8.9 different kinds of fruits; monthly variety of vegetable consumption ranged from 3-17 with a mean of 9.4 different kinds of vegetables.

Students' t-tests were conducted to compare all four mean frequency and variety intake variables between males and females and between major food preparers and non-preparers. Results indicated no significant differences in any of the four measures between males and females. Both mean daily frequency of fruit consumption and monthly

Table 2
Mean frequency and variety of fruit and vegetable intake[a] of college students by gender and major food preparer

	Mean ± standard deviation				
		Gender		Major Food Preparer	
	Total (n=302)	Males (n=101)	Females (n=199)	Yes (n=81)	No (n=219)
Daily Frequency[b]					
Fruit	2.1±1.8	2.1±1.9	2.1±1.8	1.8±1.7*	2.3±1.8
Vegetable	2.6±2.0	2.7±2.4	2.6±1.8	2.3±1.7	2.7±2.1
Monthly Variety[b]					
Fruit	8.9±4.4	8.5±4.4	9.1±4.4	7.8±4.4**	9.4±4.3
Vegetable	9.4±3.7	9.0±4.0	9.6±3.6	9.7±3.6	9.3±3.8

[a]Assessed by food frequency questionnaire

[b]Number of servings per day

*Significant at p<.05

**Significant at p<.01

variety of fruit consumption were lower for major food preparers than for the non-preparers.

Frequency distribution data for daily frequency of fruit and of vegetable intake are presented in Table 3. According to FFQ results, nearly one-third of the students (31%) consumed less than one serving of fruit and almost one-half (47%) consumed less than 2 servings of vegetables. Results indicate that over half (58%) of these students did not consume the minimum recommended two servings of fruit and over two-thirds (69%) failed to consume the minimum recommended three vegetable servings. Results were similar for males and females and for the major food preparers and non-preparers.

Frequency distribution data for monthly variety of fruit and of vegetable intake are presented in Table 4. FFQ data indicate that one-fourth (25%) of the students consumed less than 6 different kinds of fruits a month. About one-third of males (31%) and over one-third of the major food preparers (36%) consumed less than 6 different kinds of fruits per month. Sixteen percent of males, 14% of the whole sample and of the non-preparers, and 13% of females consumed less than 6 different kinds of vegetables a month, while only 10% of the major food preparers consumed less than this amount.

Frequencies of various specific fruit and vegetable consumption practices for the whole sample are presented in Table 5. Results for males and females and for the major

Table 3
Frequency distribution: Daily frequency of fruit and vegetable intake[a] of college students by gender and major food preparer

Daily Frequency[b]	Total (n=302)		Gender				Major Food Preparer			
			Males (n=101)		Females (n=199)		Yes (n=81)		No (n=219)	
Fruit	n	%[c]	n	%[c]	n	%[c]	n	%[c]	n	%[c]
0<1	92	31	30	30	61	31	32	40	59	27
1<2	83	27	33	33	50	25	23	28	60	27
2<3	54	18	17	17	37	19	11	14	43	20
3<4	33	11	7	7	25	12	8	10	24	11
4<5	17	6	4	4	13	7	2	2	15	7
5<6	12	4	5	5	7	4	3	4	9	4
6+[d]	11	3	5	5	6	3	2	2	9	4
Vegetables										
0<1	56	19	22	22	34	17	18	22	38	17
1<2	85	28	27	27	57	29	27	33	57	26
2<3	67	22	22	22	45	23	12	15	55	25
3<4	40	13	11	11	29	15	10	12	30	14
4<5	24	8	5	5	18	9	7	9	16	7
5<6	10	3	4	4	6	3	4	5	6	3
6+[e]	20	7	10	10	10	4	3	4	17	8

[a]Assessed by food frequency questionnaire
[b]Number of servings
[c]Column percents may equal 100 due to rounding
[d]Maximum number reported = 11 servings
[e]Maximum number reported = 14 servings

Table 4
Frequency distribution: Monthly variety of fruit and vegetable intake[a] of college students by gender and major food preparer

Monthly Variety[b]	Total (n=302)		Gender				Major Food Preparer			
			Males (n=101)		Females (n=199)		Yes (n=81)		No (n=219)	
Fruit	n	%	n	%	n	%	n	%	n	%
0<3	21	7	8	8[c]	13	6	9	11	12	6
3<6	54	18	23	23	30	15	20	25	33	15
6<9	65	22	21	21	44	22	17	21	48	22
9<12	80	26	22	22	57	29	21	26	58	26
12<15	47	16	18	18	29	15	7	9	40	18
15<18	28	9	6	6	22	11	5	6	23	11
18<21	6	2	3	3	3	2	2	2	4	2
21	1	0	0	0	1	0	0	0	1	0
Vegetables										
0<3	7	2	3	3	4	2	0	0	7	3
3<6	34	11	13	13	21	11	8	10	26	12
6<9	84	28	34	34	49	25	24	30	59	27
9<12	92	30	22	22	69	35	23	28	68	31
12<15	54	18	18	18	36	17	17	21	37	17
15<18	29	10	10	10	19	10	9	11	20	9
18<21	2	1	1	1	1	0	0	0	2	1
21	0	0	0	0	0	0	0	0	0	0

[a]Assessed by food frequency questionnaire
[b]Number of servings
[c]Column percent not equal to 100 due to rounding

Table 5
Frequency of various fruit and vegetable consumption practices of college students

Practice	Total Sample (n=318)							
	Never		Sometimes		Often		Usually	
	n	%	n	%	n	%	n	%
Eat green salad at lunch or dinner	36	11	102	32	88	28	92	29
Eat at least two vegetables (not green salad) at dinner	72	23	162	51	57	18	27	8
Eat a vegetable (not green salad) at lunch	64	20	159	50	62	20	33	10
Eat fruits or drink fruit juice for breakfast	36	11	67	21	86	27	129	41
Eat fruits for dessert	42	13	140	41	86	27	50	16
Eat raw vegetables for snacks	90	28	147	46	58	18	23	7[a]
Eat raw or dried fruits for snacks	95	30	123	39	74	23	26	8

[a]Row percent not equal to 100 due to rounding

food preparer and the non-preparers are presented in Table 6 and 7, respectively. Approximately two-thirds (68%) of the students indicated that they often (27%) or usually (41%) eat fruits or drink fruit juice for breakfast and over half (57%) reported they often (28%) or usually (29%) eat green salad at lunch or dinner. Slightly fewer than one-third (30%) indicated they often (20%) or usually (10%) eat a vegetable (not a green salad) at lunch; about the same proportion (31%) indicated they often (23%) or usually (8%) eat raw or dried fruits for snacks. Over one-fourth reported they never eat raw vegetables (28%) or raw or dried fruits (30%) for snacks. "Sometimes" was the most popular response categories for almost all the various fruit and vegetable practices.

Chi-square analyses were performed to investigate differences in these fruit and vegetable consumption practices between males and females (Table 6) and between the major food preparers and non-preparers (Table 7). Results indicated that females were somewhat more likely than males to eat salad at lunch or dinner ($p<.05$), eat fruits for dessert ($p<.01$), and eat raw vegetables for snacks ($p<.01$). These results also indicated that the major food preparers were more likely than the non-preparers to eat raw vegetables as snacks ($p<.05$), eat raw or dried fruits as snacks ($p<.05$), and eat fruits or drink fruit juice for breakfast ($p<.01$). The non-preparers were more likely to eat green salad at lunch or dinner ($p<.01$).

Table 6
Comparision of the frequency of specific fruit and vegetable consumption practices by gender

Practice	Male (n=108)								Female (n=208)							
	Never		Sometimes		Often		Usually		Never		Sometimes		Often		Usually	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Eat green salad at lunch or dinner	17	16	42	39	25	23	24	22*	19	9	59	28	63	30	67	32
Eat at least two vegetables (not green salad) at dinner	29	27	55	51	16	15	8	7	42	20	106	51	41	20	19	9
Eat a vegetable (not green salad) at lunch	24	22	52	48	24	22	8	7[a]	40	19	105	51	38	18	25	12
Eat fruits or drink fruit juice at breakfast	13	12	21	19	29	27	45	42	23	11	46	22	56	27	83	40
Eat fruits for dessert	24	22	39	36	24	22	21	19**	18	9	100	48	62	30	28	13
Eat raw vegetables for snacks	43	40	45	42	15	14	5	4**	46	22	101	48	43	21	18	9
Eat raw or dried fruits for snack	35	32	45	42	19	18	9	8	58	28	78	38	55	26	17	8

[a]Row percent not equal to 100 due to rounding
*Distribution significantly different from females, chi-square analyses, $p<.05$
**Distribution significantly different from females, chi-square analyses, $p<.01$

Table 7
Comparison of the frequency of specific fruit and vegetable consumption practices by major food preparer

Practice	Yes (n=85)								No (n=231)							
	Never		Sometimes		Often		Ususally		Never		Sometimes		Often		Usually	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Eat green salad at lunch or dinner	11	13	36	42	25	29	13	15[a]	25	11	65	28	63	27	78	34*
Eat at least two vegetables (not green salad) at dinner	17	20	46	54	16	19	6	7	54	23	115	50	41	18	21	9
Eat a vegetable (not green salad) at lunch	19	22	45	53	17	20	4	5	45	20	112	48	45	20	29	13
Eat fruits or drink fruit juice at breakfast	6	7	16	19	35	41	28	33*	30	13	51	22	50	22	100	43
Eat fruits for dessert	14	17	42	49	19	22	10	12	28	12	97	42	67	29	39	17
Eat raw vegetables for snacks	21	25	36	42	16	19	12	14**	68	29	110	48	42	18	11	5
Eat raw or dried fruits for snack	31	37	22	26	24	28	8	9**	62	27	101	44	50	22	18	8

[a]Row percent not equal to 100 due to rounding
*Distribution significantly different, chi-square analyses, $p < .01$
**Distribution significantly different, chi-square analyses, $p < .05$

Responses to questions assessing whether their fruit and vegetable consumption differs with seasonal availability indicated these students believe that it does, at least to some extent. Most (72%, n=219) indicated that their fruit consumption differs from a slight to moderate extent, while most (78%, n=246) indicated that their vegetable consumption either did not differ or differed to a slight extent.

Knowledge

The majority of students correctly answered the two questions about current recommendations for fruit and vegetable intake. Results are presented in Table 8. Sixty-seven percent of the sample chose the correct fruit recommendation and 63% chose the correct vegetable recommendation. Students' t-tests indicated no significant differences in knowledge of either recommendation between males and females or between the major food preparers and non-preparers.

Attitudes

All students were asked to respond to five health motivation, ten palatability, four chemical residue, and two convenience attitude items. Mean responses to these items for the total sample, for males and females, and for the major food preparers and non-preparers are presented in Table 9. Results indicated generally positive responses to 4 health motivation items, 4 palatability items, and 1 convenience item. There were no positive responses to items addressing chemical residues.

Table 8
Frequency distribution: Knowledge of fruit and vegetable consumption recommendations[a] of college students by gender and major food preparer

	Total[b] (n=318)		Gender				Major Food Preparer			
			Males (n=108)		Females (n=208)		Yes (n=85)		No (n=231)	
Fruit recommendation	n	%	n	%	n	%	n	%	n	%
1-2 servings	8	3	5	5	3	1[c]	2	2	6	3
2-4	212	67	70	65	140	67	57	67	153	66
3-5	90	28	30	28	60	29	26	31	64	28
6-11	7	2	2	2	5	2	0	0	7	3
Vegetable recommendation										
1-2 servings	7	2	6	6	1	0	31	37	6	3
2-4	105	33	38	35	67	32	31	37	74	32
3-5	200	63	62	58	136	65	52	61	146	64
6-11	4	1	1	1	3	1	1	1	3	1

[a]According to the Food Guide Pyramid (USDA & USDHHS, 1992)
[b]Data missing from some questionnaires (will not equal total due to missing data)
[c]Column percent not equal to 100 due to rounding

Table 9
Mean responses[a] to individual attitude items for college students by gender and major food preparer

Attitude statement	Mean±Standard Deviation				
		Gender		Major food preparer	
	Total[b] (n=318)	Male (n=108)	Female (n=208)	Yes (n=85)	No (n=231)
Health Motivation Fruits and vegetables provide many of the vitamins and minerals I need to be healthy.	2.6±0.7	2.6±0.7	2.6±0.6	2.5±0.6	2.6±0.7
I don't think eating plenty of fruits and vegetables will reduce my risk of getting heart disease.[c]	2.2±0.7	2.0±0.8	2.2±0.7*	2.1±0.7	2.2±0.7
Eating plenty of fruits and vegetables may help me lose or maintain my weight and keep me from getting too fat.	2.1±0.7	2.2±0.7	2.1±0.7	2.2±0.7	2.1±0.7
I will be less likely to develop intestinal problems if I eat plenty of fruits and vegetables.	2.0±0.7	2.0±0.8	2.1±0.6	2.0±0.8	2.0±0.6
I believe that I will be less likely to get some types of cancer if I eat a lot of fruits and vegetables.	1.9±0.7	1.9±0.7	1.9±0.7	2.0±0.7	1.9±0.7
Chemical Residues I believe that chemicals remaining on fruits and vegetables build upon my body and cause cancer.	1.8±0.7	1.6±0.8	1.7±0.7	1.7±0.7	1.7±0.7
Chemical residues that may remain on fruits and vegetables are not major health concerns to me.	1.5±0.8	1.5±0.8	1.5±0.7	1.6±0.8	1.5±0.7
In my opinion, people are overly concerned about chemical residues on fruits and vegetables.	1.4±0.7	1.5±0.8	1.4±0.7	1.4±0.7	1.4±0.7
My health can suffer due to chemical residues that may remain on fruits and vegetables.[c]	1.4±0.7	1.4±0.7	1.4±0.7	1.3±0.6	1.4±0.7

Table 9 (con't)

Attitude Statement	Mean±Standard Deviation				
		Gender		Major food preparer	
	Total (n=318)	Male (n=108)	Female (n=208)	Yes (n=85)	No (n=231)
Palatability					
I don't like the way most fruits taste.[c]	2.3±0.8	2.2±0.8	2.3±0.8	2.1±0.9	2.3±0.7*
Most fruits look very appetizing.	2.2±0.7	2.2±0.6	2.2±0.7	2.2±0.6	2.2±0.7
In general, many fruits do not taste as good as most other foods.[c]	2.0±0.8	1.9±0.9	2.1±0.8*	2.1±0.8	2.0±0.8
I like the texture of most fruits.	2.0±0.6	2.0±0.7	2.0±0.6	2.0±0.7	2.0±0.6
I do not consider fruits to be among my favorite foods.[c]	1.9±0.9	1.8±0.9	2.0±0.8**	1.9±0.8	1.9±0.8
I think the texture of many vegetables is undesirable.[c]	1.8±0.8	1.6±0.8	1.8±0.7*	1.8±0.9	1.6±0.9
Some vegetables are my favorite foods.	1.7±0.9	1.4±0.9	1.8±0.9***	1.8±0.9	1.6±0.9
Most cooked vegetables do not look very appetizing.[c]	1.7±0.8	1.6±0.8	1.7±0.9	1.8±0.9	1.6±0.8
I think that vegetables taste just as good as most other foods.	1.6±0.8	1.5±0.9	1.7±0.8*	1.8±0.9	1.6±0.8
I like the way most vegetables taste.	1.6±0.9	1.4±0.8	1.7±0.9*	1.8±0.9	1.6±0.9
Convenience					
Many fruits can make fast and convenient snacks.	2.5±0.7	2.4±0.7	2.5±0.7	2.5±0.6	2.4±0.7
I don't think vegetables are convenient enough to be good snacks.[c]	1.9±0.7	1.8±0.8	2.0±0.7	2.0±0.7	1.9±0.8

[a]Response scale: 0=strongly disagree, 1=disagree, 2=agree, 3=strongly agree
[b]Data missing from some questionaires (will not equal total due to missing data)
[c]Negative items reversed for scoring
*Significant at p<.05
**Significant at p<.01
***Significant at p<.001

Frequency distribution data indicate that most of the students agreed or strongly agreed with items addressing the relationship between health and fruit and vegetable consumption. According to these data, most of the students agreed or strongly agreed that fruits and vegetables provide many of the vitamins and minerals they need to be healthy (95%, n=305), that eating plenty of fruits and vegetables may help them lose or maintain their weight (87%, n=277), or make them less likely to develop intestinal problems (87%, n=276), heart disease (86%, n=275) or some types of cancer (76%, n=241).

Frequency distribution data for palatability items indicate that most of the students agreed or strongly agreed that most fruits look very appetizing (91%, n=290), that they like the way most fruits taste (87%, n=278), that they like the texture of most fruits (86%, n=273), that many fruits taste as good as most other foods (76%, n=243), and that they consider fruits to be among their favorite foods (74%, n=237).

Less than half of the respondents agreed that vegetables taste just as good as most other foods (45%, n=143), that they like the way most vegetables taste (44%, n=140), and that some vegetables are their favorite foods (43%, n=137). Only about one-third agreed that the texture of many vegetables can be desirable (30%, n=95) and that most vegetables can look very appetizing (29%, n=93).

Frequency distribution data also indicate that nearly

all of the respondents (94%, n=299) agreed or strongly agreed that many fruits can make fast and convenient snacks, while only about half (53%, n=169) agreed that they think vegetables are convenient enough to be snacks.

Frequency distribution data for chemical residue items indicate that about half of students agreed or strongly agreed that chemical residues that may remain on fruits and vegetables are major health concerns to them (53%, n=168) and that their health can suffer due to chemical residues that may remain on fruits and vegetables (50%, n=160). One-half of the students also disagreed or strongly disagreed that people are not overly concerned about chemical residues on fruits and vegetables (50%, n=159) and that chemicals that may remain on fruits and vegetables may build in their body and cause cancer (50%, n=159).

Student's t-tests were conducted to compare mean responses to individual attitude items for males and females and for major food preparers and non-preparers. Results indicate that females were more likely than males to believe that fruit and vegetable consumption will reduce risk for heart disease ($p<.05$) and to believe that vegetables can make convenient snacks ($p<.05$). Females also were more likely than males to believe that vegetables ($p<.001$) and fruits ($p<.01$) were among their favorite foods, that the taste of fruits ($p<.05$) and of vegetables ($p<.05$) is just as good as other foods, that they like the taste of vegetables ($p<.05$), and that the texture of many vegetables is

desirable ($p<.05$). Major food preparers were less likely ($p<.05$) to respond positively to the way fruits taste. There were no significant differences between the major food preparers and non-preparers with respect to health motivation and convenience beliefs. There were no significant differences in chemical residue beliefs between either males and females or between the major food preparers and non-preparers.

Only those students who indicated they were major food preparers were asked to respond to the cost and to the other convenience items. Mean responses to these items are presented in Table 10. Results indicate positive responses to 3 of the 13 convenience items and 1 of the 5 cost items.

Most of these students agreed or strongly agreed with the following items addressing convenience: it doesn't take very long to prepare fruits (83%, n=67) and the time it takes to prepare fruit is worth the extra effort (80%, n=64). Somewhat fewer students agreed or strongly agreed that the time it takes to prepare and cook vegetables fits into their schedule (68%, n=54) and that it does not take too long too prepare and cook vegetables (76%, n=61). The majority of students disagreed or strongly disagreed to the following items addressing convenience: shopping for fruits and vegetables at the store is too time-consuming (85%, n=69), that the time it takes to prepare vegetables is not worth the extra effort (76%, n=61), and that the extra time needed to prepare and cook vegetables does not fit into

Table 10
Mean responses[a] of college student major food preparers to individual attitude items addressing cost and convenience.

Attitude Statement	Mean ± Std. Dev. Major food preparer (n=85)
Convenience	
It doesn't take very long to prepare fruits.	2.0±0.8
Shopping for fruits & vegetables at the store is too time-consuming.[c]	2.0±0.7
The time it takes to prepare fruits is worth the extra effort.	2.0±0.7
The time it takes to prepare vegetables is not worth the extra effort.[c]	1.9±0.8
It takes too long to prepare and cook vegetables.[c]	1.9±0.7
The extra time needed to prepare and cook vegetables does not fit into my schedule.[b]	1.8±0.8
The time it takes to prepare and cook vegetables fits into my schedule.	1.8±0.7
I would eat more fruits if someone else prepared them for me.[c]	1.5±0.9
I will probably eat more vegetables when I have more time.[c]	1.3±0.8
I would not eat vegetables more often, even if someone else prepared them for me.	1.1±0.9
I would not eat more fruit even if I had more time.	1.1±0.8
Cost	
I believe that fruits and vegetables are worth their cost.	2.1±0.6
Fruits and vegetables are relatively cheap snack foods.	1.9±0.8
Fruits and vegetables are too expensive for my budget.[c]	1.9±0.7
How much fruits and vegetables cost is not important to me.	1.6±0.8
I would eat more fruits and vegetables if I had more money to spend on food.[c]	1.4±0.8

[a]Response scale: 0=strongly disagree, 1=disagree, 2 = agree, 3=strongly agree
[b]Data missing from some questionnaires
[c]Negative items reversed for scoring

their schedule (70%, n=57). About one-half (51%, n=41) of the students disagreed or strongly disagreed that they would eat more fruits if someone else prepared them. Consistent with the negative mean responses, most of the students disagreed or strongly disagreed that they would not eat more fruits (72%, n=58) or more vegetables (62%, n=49) even if they had more time. Also, most (68%, n=55) of the students disagreed or strongly disagreed that they would not eat vegetables more often, even if someone else prepared them.

Nearly all (89%, n=71) of the students agreed or strongly agreed that fruits and vegetables are worth their cost. The majority of students agreed or strongly agreed that fruits and vegetables are not too expensive for their budget (79%, n=63) and that fruits and vegetables are relatively cheap snack foods (71%, n=57). About one-half of the students agreed or strongly agreed that how much fruits and vegetables cost is not important to them (55%, n=44) and that they would eat more fruits and vegetables if they had more money to spend on food (52%, n=39).

Relationship between consumption and attitude and belief statements

Pearson product moment correlational analyses were performed to examine relationships between individual attitude and belief statements and FFQ-estimated consumption variables. Significant correlations are presented in Table 11.

The health motivation belief addressing weight

Table 11
Relationship between fruit and vegetable consumption and attitude statements for college students: Significant correlation coefficients

Attitude Statement	Fruit		Vegetable	
	Daily Frequency	Monthly Variety	Daily Frequency	Monthly Variety
Health Motivation Eating plenty of fruits and vegetables (F&V) may help me lose or maintain my weight and keep me from getting fat.	.14*	.15**	.21***	.16**
I will be less likely to develop intestinal problems if I eat plenty of F&V.	---	.13*	---	---
I believe that I will be less likely to get some types of cancer if I eat a lot of F&V.	---	.20***	.18**	.16**
Chemical Residues Chemical residues that may remain on F&V are not major health concerns to me.	---	-.13*	---	---
Palatability I don't like the way most fruits taste.	.14*	.23****	---	---
Most fruits look very appetizing.	.12*	.19***	---	---
In general, many fruits do not taste as good as most other foods.	.14*	.14*	---	---
I like the texture of most fruits.	.17*	.24****	---	---
I do not consider fruits to be among my favorite foods.	.24****	.33****	---	---
I think the texture of many vegetables is undesirable.	---	---	.23****	.23****
Some vegetables are my favorite foods.	---	---	.30****	.37****
Most cooked vegetables don't look very appetizing.	---	---	---	.28****
I think that vegetables taste just as good as other foods.	---	---	.26****	.35****
I like the way most vegetables taste.	---	---	.33****	.40****

Table 11 (con't)

Attitude Statement	Fruit		Vegetable	
	Daily Frequency	Monthly Variety	Daily Frequency	Monthly Variety
Convenience Many fruits make fast and convenient snacks.	.12*	---	---	---
I don't think vegetables are convenient enough to be good snacks.	---	---	.19***	.15*

* Significant at p<.05
** Significant at p<.01
*** Significant at p<.001
**** Significant at p<.0001

maintenance was positively, but weakly, correlated with all consumption variables. The belief that eating a lot of fruits and vegetables will reduce the risk of developing some types of cancer was positively, but weakly, correlated with daily vegetable intake and with monthly variety of fruit, and of vegetable intakes. The belief that intestinal problems will be less likely when eating plenty of fruits and vegetables was positively, but weakly, correlated with monthly variety of fruit intake. Correlation results were similar for males and females and for the major food preparers and non-preparers (data not presented here).

Only one item addressing chemical residues was correlated with consumption. The belief that chemical residues on fruits and vegetables are not a major health concern was negatively, but weakly correlated with monthly variety of fruit intake. It may be important to note that for males only, daily vegetable intake ($r=.24$, $p<.05$), daily fruit intake ($r=.23$, $p<.05$), and monthly variety of fruit intake ($r=.21$, $p<.05$) were negatively, but weakly, correlated with the belief that health can suffer due to chemicals remaining on fruits and vegetables. All other correlations between consumption and chemical residue beliefs were similar for males and females and for the major food preparers and non-preparers (data not presented here).

Each of the four consumption variables was weakly correlated with certain palatability and convenience items for the total sample. Daily frequency of fruit consumption

was positively correlated with the belief that they like the way most fruits taste, that fruits look very appetizing, that they think fruits taste as good as most other foods, that they like the texture of most fruits, that they consider fruits to be among their favorite foods, and that they think fruit can be a convenient snack. Monthly variety of fruit intake was similarly correlated with these palatability beliefs for fruit, except it was not correlated with the item addressing convenience of fruit. Results were similar for males, females, major food preparers, and non-preparers (data not presented here).

Daily vegetable intake was positively correlated with the students' belief that the texture of many vegetables is desirable, that vegetables are a favorite food, that vegetables taste just as good as most other foods, and that they like the way most vegetables taste. Monthly variety of vegetable intake was similarly correlated with palatability beliefs and the item addressing the convenience of vegetables, except that monthly variety of intake was correlated with the belief that vegetables can be appetizing. Results were similar for males, females, the major food preparers, and non-preparers (data not presented here).

Correlational analyses were also performed to examine relationships between each of the four consumption variables and the attitude and belief statements addressing convenience that only the major food preparers completed.

Results are presented in Table 12. Daily fruit consumption and variety of fruit consumption were positively, but weakly, correlated with the following convenience items: shopping for fruits and vegetables at the store is not too time-consuming and the time it takes to prepare fruits is worth the extra effort. Daily fruit intake and monthly variety of fruit intake were negatively, but weakly correlated with the belief that more fruit would not be eaten even if more time were available. Daily vegetable and monthly variety of intake were also weakly correlated with the belief that shopping for fruits and vegetables is not too time-consuming and the belief that the time to prepare vegetables is worth the effort. Monthly variety of intake was also weakly, but negatively correlated with the belief that more vegetables would not be eaten even if more time were available ($r=-.27$, $p<.05$) and the belief that more vegetables would not be eaten even if someone else prepared them.

Correlational analyses were also performed to examine relationships between each consumption variable and beliefs about the cost of fruits and vegetables by those who identified themselves as the major food preparer. Daily fruit and monthly variety of fruit intakes were not correlated with any of these items. However, the belief that fruits and vegetables are worth their cost was positively correlated with both daily vegetable intake and variety of vegetable intake.

Table 12
Relationship between fruit and vegetable consumption and attitudes for college student major food preparers: Significant correlation coefficients

Attitude Statement	Fruit		Vegetable	
	Daily Frequency	Monthly Variety	Daily Frequency	Monthly Variety
Convenience				
Shopping for F&V at the store is too time consuming.	.27*	.35**	.32**	.30**
The time it takes to prepare fruits is worth the extra effort.	.29*	.30**	---	---
The time it takes to prepare vegetables is not worth the extra effort.	---	---	.29*	.29**
I will probably eat more vegetables when I have more time.	---	---	---	-.27*
I would not eat vegetables more often, even if someone else prepared them for me.	---	---	---	-.30**
I would not eat more fruit even if I had more time.	-.29*	-.45***	---	---
Cost				
I believe that F&V are worth their cost.	---	---	.27**	.35**

*Significant at p<.05
**Significant at p<.01
***Significant at p<.001

Chapter 5

Discussion

Fruit and vegetable consumption

The mean daily fruit intake scores and the mean daily vegetable intake scores indicate that at least some college students are meeting the minimum number of servings recommended for fruit, but not for vegetables (USDA and USDHHS, 1992). However, the wide range of scores for both daily fruit and daily vegetable intake and the proportion of students who did not consume the minimum servings of fruit (58%) and of vegetables (69%) suggest that there is still a great need for improvement for many of these students. It is important to note that the food frequency method (FFQ) used in this study also tends to inflate consumption estimates (Zulkifli & Yu, 1992; Krebs-Smith et al., 1995), so an even greater need for improvement of fruit and vegetable intake may exist than is already suggested.

These frequency of intake findings agree with those of Acuff (1995) who reported that young individuals surveyed did not consume the minimum number of fruits and vegetables recommended by the Food Guide Pyramid (USDA and USDHHS, 1992). The findings of this study also are similar to those of the 5 A Day baseline study that suggested that young individuals are not likely to consume a substantial amount of fruits and vegetables (Subar et al., 1992). In contrast, less than one-third of the adult population in the NHANES II

survey failed to meet either of the recommendations (Patterson et al., 1990). This suggests that fruit and vegetable consumption of college students may be lower than those of the general adult population.

Results of the present study indicate that nearly one-third (31%) of the students consumed less than one serving of fruit per day and 49% consumed less than two servings of vegetables per day. This is somewhat consistent with Melby and associates (1986) reported that 69% of students in their study failed to consume at least one serving of fruit per day and 46% consumed only 1 to 2 servings of vegetables per day.

Results of the present study also indicate that variety of fruit and vegetable intake was somewhat limited for these college students. Huang and associates (1994) also found that fruit intake was limited to only a few popular fruits. Patterson and colleagues (1990) noted that those individuals in the NHANES II survey who reported eating a higher number of servings of fruits or vegetables daily were more likely to have a greater variety than those who reported eating fewer servings. If this is the case, increasing daily fruit and vegetable intake of this college population would also improve variety of intake.

Student's t-tests indicated no differences between males and females in either frequency or variety of intake. This finding is unlike that of the 5 A Day baseline study which indicated that the mean consumption of fruits and of

vegetables of females is higher than that of males by almost two-thirds of a serving (Subar et al., 1992). Cronin and associates (1982) reported that when certain foods are consumed by a small percentage of the population, demographic characteristics may not predict consumption. This may have been a factor in this study since mean frequency of fruit and vegetable consumption for the respondents was low.

In this study there were no differences in frequency or variety of vegetable consumption between major food preparers and non-preparers. Beerman and associates (1990) suggested that vegetable consumption may be lower for those students living off-campus or without access to dormitory or Greek housing food service. In the present study however, both frequency and variety of fruit consumption were lower for major food preparers than for non-preparers. These findings are similar to those of Melby and colleagues (1986) and Beerman and colleagues (1991) that suggested fruit and vegetable consumption is lower and selection is limited for those students who live off-campus and do not have access to university dining services.

Specific fruit and vegetable intake behaviors may contribute to frequency and variety of intake. The specific practices most likely to contribute to higher intake for most of the college students in this study were eating fruit or drinking fruit juice at breakfast and eating green salad at lunch or dinner. This follows the pattern found in the 5

A Day baseline study of the United States adult population whose most popular fruit and vegetable choices were green salad and orange or grapefruit juice (Subar et al., 1992). Similarly, Huang and colleagues (1994) found that green salad was amoung the most frequently chosen foods by college students in their study. Results of the present study indicated that over one-fourth of the students do not consume fruits or vegetables as snacks and less than one-third regularly eat a vegetable at lunch. Stewart and associates (1994) also reported that most of the young adults in their study rarely consumed fruit and vegetables as snacks and rarely ate vegetables at lunch.

Certain fruit and vegetable practices may contribute to frequency and variety of intake among various groups of college students. Although mean frequency of fruit and vegetable intake did not differ by gender, results of this study suggest that college females are more likely than college males to eat salad at lunch or dinner, eat fruit for dessert, and eat raw vegetables as snacks. Stewart and colleagues (1994) also reported that young adult females were more likely than males to eat vegetables as snacks.

Results of the present study suggest that major food preparers are more likely to eat fruits and vegetables as snacks and more likely to eat fruit and drink fruit juice for breakfast than are non-preparers. The non-preparers are more likely to eat green salad at meals. These findings are not entirely consistent with those of Melby and colleagues

(1986), Beerman (1990), and Beerman and associates (1991) who indicated that students without dormitory food service are less likely in general to select and consume fruits and vegetables than those with such service. Perhaps snacking on fruits and vegetables was less common among residence hall students in the present study due to limited accessibility, while these students were also more likely to eat salad, possibly due to greater accessibility.

Knowledge

The majority of college students in this study appear to be knowledgeable about fruit and vegetable consumption recommendations. Hence, low levels of fruit and vegetable intake can not necessarily be attributed to lack of knowledge. Similarly, Subar and colleagues (1992) and Melby and colleagues (1986) suggested that although college-educated individuals are more likely than those who are less educated to correctly recognize the minimum recommended servings of fruits and vegetables, they are not necessarily more likely to consume recommended amounts.

Attitude and belief statements

The majority of college students in this study believed positively in the relationship between fruit and vegetable consumption and health. These findings are similar to those of previous research. Stasch and colleagues (1970) and Melby and colleagues (1986) suggested that the majority of college students are likely to believe fruits and vegetables should be included in a healthful diet. Subar and

colleagues (1992), the FMI and Prevention Magazine (1994), and Acuff (1995) suggested that most American adults recognize the relationship between fruit and vegetable consumption and decreased risk of developing certain diseases.

Female students in this study were more likely to believe that fruit and vegetable consumption could decrease risk of heart disease than were males. This finding is similar to that of the 5 A Day baseline study that indicated 59% of women recognized the general health benefits of fruit and vegetable consumption compared to only 45% of men. Although the majority of students believed that eating a lot of fruits and vegetables could decrease risk of some types of cancer, the mean response for this belief was lower than that of any other health motivation statement. Similarly, in the 5 A Day study only 4 in 10 American adults recognized this relationship, as opposed to a higher number of respondents believing in other fruit and vegetable consumption and disease relationships (Subar et al., 1992).

All palatability items associated with fruit were responded to positively by the majority of students in this study. Conversely, all palatability items associated with vegetables were responded to somewhat less positively by the majority of the students. These results are comparable to those of Neilson and Larson-Brown (1990) who found that messages about vegetables were not ranked as highly by college students as were those about fruit. The majority of

college students in the present study also were somewhat less likely to agree that vegetables can make convenient snacks, in comparison to fruits. Female students were more likely than male students to respond positively to palatability items and to believe vegetables were convenient snacks, in comparison to fruits. Females generally are reported to have more positive attitudes than males toward fruits and vegetables (Subar et al., 1992). The non-preparers were more likely to believe positively about the way fruits taste. Perhaps this finding may be partially explained by the idea that students living in residence halls may have easier accessibility to a larger variety of, and possibly, higher quality fruits and vegetables.

The majority of students in the present study indicated somewhat negative attitudes towards chemical residues on fruits and vegetables. This finding is not unlike that of Ott (1990) who indicated that a positive relationship existed between college attendance and chemical residue concerns.

For those cost and convenience items asked only of the major food preparers, responses were generally negative. Only those items associated with shopping for fruits and vegetables, and the worth of and effort associated with fruit and vegetable intake were responded to positively. The negative attitudes associated with the cost and convenience of fruits and vegetables may be common among students who do not have access to university dining

services (Melby et al., 1986; Beerman et al., 1990). It is also important to note that negative attitudes toward the convenience of fruits and vegetables may also be related to or affected by negative attitudes about the palatability of fruits and vegetables (Huang et al., 1994).

Relationship between consumption and attitudes

The Health Belief Model posits that the likelihood that a person will act on a certain health behavior depends at least partly on that person's perception of the benefits and barriers to action. The health motivation items addressed the students' perceptions of the health benefits of fruit and vegetable consumption in this study. Although mean responses were generally positive for the health motivation items, the only one that correlated with all fruit and vegetable consumption variables was the belief that eating fruit and vegetables would help maintain weight. This was expected for a college age population. Younger individuals are less likely than older persons to recognize the health benefits of fruits and vegetables, and even if they believe in the benefits they do not commonly translate them into action (Subar et al., 1992). However, the recognition of the relationship of weight maintenance to fruit and vegetable consumption may have more relevance to this population. According to Health Belief Model concepts, susceptibility to being or becoming overweight may be perceived as more realistic for this group than is susceptibility to heart disease or intestinal problems.

However, their beliefs about the relationship between susceptibility to cancer and fruit and vegetable consumption are worth noting, as this belief was correlated with three of the four consumption variables. Hence, the awareness of these benefits may be acting as either a barrier or facilitator of this population.

All of the attitude statements addressing chemical residues on fruits and vegetables were responded to negatively by the total sample, by males and females and by the major food preparers and non-preparers. However, only one of these attitudes was negatively, but weakly correlated with consumption. These results suggest that attitudes toward chemical residues probably are not a barrier to consumption among college students. This is similar to findings by Dittus and colleagues (1995) that suggested that although pesticide concern existed, it did not appear to affect consumption.

All positive mean responses to palatability items were associated with fruit. All palatability items for vegetables were responded to negatively. Positive correlations were found between at least one consumption variable and all palatability items. Although mean responses to the vegetable items were somewhat more negative than responses to fruit items, results suggest that negative attitudes about the palatability of fruits and vegetables probably are acting as barriers to consumption. On the other hand, positive attitudes to the palatability of

fruit may be acting as facilitators to fruit consumption. Perhaps this may be a result of the fact that vegetables are more available than fruits in fast-food establishments. However, it is also important to note that mean consumption of vegetables was higher for the students in this study than was mean fruit consumption. This is comparable to findings of the 5 A Day baseline study that suggested American adults eat more vegetables, yet their taste preference is higher for fruits (Subar et al., 1992).

Results of the present study also indicated that positive responses by the major food preparers to several convenience attitude items were correlated with consumption. These items included the time that it takes to shop for fruits and vegetables and the preparation time for fruits and vegetables being worth the effort. This suggests that positive beliefs about shopping for fruits and vegetables and believing they are worth the effort may be facilitators to consumption. Although there were negative responses to some convenience items, the only items negatively correlated with consumption were the beliefs that fruit and vegetable consumption will increase when more time is available and also that fruit and vegetable consumption would increase if someone else did the preparation. In other words, time may be acting as a barrier if students believe that increasing fruit and vegetable intake requires more time. Similarly, Melby and associates (1986) and Beerman and associates (1990) noted that limited availability or the inconvenience

associated with fruits and vegetables may be contributing to lower intake for off-campus students. Also, Huang and colleagues (1994) noted that convenience and palatability may be contributing to the intake of fast food-type dishes that generally do not include fruits and vegetables. Hence, convenience and time may be acting together as barriers to fruit and vegetable consumption.

Although responses to cost items were generally negative, these were not correlated with consumption. However, the positive response to fruits and vegetable being worth their cost was correlated with consumption. Hence, cost does not appear to be a barrier to fruit and vegetable consumption for respondents who identified themselves as the major food preparer. Similarly, Stewart and Tinsley (1995) found that cost was not correlated with consumption of any food group for young adults. In contrast, Melby and associates (1986) noted that cost may act as a barrier to students without access to university dining services. Finally, it is important to note that the relationships in this study are not that strong, and therefore other factors not assessed in this study also may be influencing intake.

Chapter 6

Summary, Conclusions, and Implications

Summary

The objectives of this research were: 1) to identify the frequency and variety of fruit and vegetable consumption of college students using a food frequency questionnaire (FFQ), 2) to determine the extent to which various factors may affect this consumption, 3) to identify college students' knowledge of recommendation for fruit and vegetable consumption, and 4) to investigate differences in fruit and vegetable consumption, knowledge of fruit and vegetable recommendations, and examination of various factors as barriers or facilitators to fruit and vegetable consumption between males and females and between those who shop for and prepare most of their own food (major food preparers) and those who do not (non-preparers).

The design of this study utilized the Health Belief Model with fruit and vegetable consumption as the health behavior and the research population as college students. Consistent with the Health Belief Model framework, perceived susceptibility, and modifying variables, such as sociodemographic factors and perceived barriers were examined with regard to the fruit and vegetable consumption of college students.

Three hundred eighteen college students (66% female) in an introductory nutrition class at a Midwestern university

completed a questionnaire that included specific fruit and vegetable practices and attitude items addressing concepts that may be perceived as barriers or facilitators to fruit and vegetable consumption. Three hundred two of these students returned food frequency questionnaires complete enough to be analyzed. Frequency distributions and means were used to describe fruit and vegetable consumption, knowledge, and attitudes. Student's t-tests and chi-square analyses were conducted to examine differences in consumption and attitudes between males and females and the major food preparers and non-preparers. Pearson product moment correlations were performed to determine if relationships existed between attitudes and consumption and if the FFQ was reliable with respect to consumption estimated by the respondents.

Students ranged in age from 18-23 years with a mean age of 19.4 years. A variety of major areas of study were indicated by the respondents. The majority of respondents (70%, n=222) indicated that they lived in residence halls on campus. Consistent with this, 62% (n=197) reported dining services to be responsible for the majority of their shopping and food preparation. Only 85 of the students indicated that they were responsible for the majority of their shopping and food preparation (major food preparer).

Although the mean daily intake of fruit for the students met the minimum recommended number of servings by the Food Guide Pyramid (USDA and USDHHS, 1992), the mean

intake of vegetables fell below the recommended level. The wide range of scores suggest that improvement is still necessary. Results also indicate that variety of fruit and vegetable consumption is limited for these students. No differences in mean consumption existed between males and females; however, the non-preparers had greater mean fruit consumption than did the major food preparers.

Some differences in fruit and vegetable practices were found among the groups of students. Although mean consumption did not differ by gender, females were more likely than males to eat green salad at lunch or dinner and raw or dried fruits and raw vegetables as snacks. The major food preparers were also more likely to eat fruits and vegetables as snacks and fruit or fruit juice at breakfast, while the non-preparers were more likely to eat vegetables at meals.

The majority of students were able to recognize the minimum number of recommended servings for fruits (67%, n=212) and for vegetables (63%, n=200). No mean differences in knowledge were found among the groups.

Responses to attitude items that addressed health motivation and the palatability of fruit were generally positive. However, responses to attitude items that addressed chemical residues, the palatability of vegetables, cost, and convenience were generally negative.

Since some of these attitudes were correlated with frequency or variety of consumption, they were identified as

possible barriers or facilitators to consumption for this population. Correlations indicated that positive attitudes toward the palatability of fruit may act as a facilitator, while attitudes regarding the health benefits of fruits and vegetables, although positive, do not necessarily act as facilitators, although the individual item regarding weight maintenance may act as a facilitator for the college student population. These results also indicated that although responses to cost and chemical residues were generally negative, these concepts can not necessarily be identified as barriers to consumption since few correlations between these items and consumption were found. However, it appears that certain convenience items may act as either barriers or facilitators the major food preparers. Positive correlations between beliefs that fruits and vegetables are worth the effort and are not too time-consuming to shop for suggests that these may act as facilitators to intake. Conversely, these students' beliefs that fruit and vegetable intake may require more time than is available suggest that time may act as a barrier to intake for this group.

It is important to note that although palatability items were rated more positively by females, these beliefs were not correlated with intake for either females or males, although some specific fruit and vegetable practices were more frequently performed by females. A positive attitude toward the taste of fruit may also have acted as a facilitator to the non-preparers, since their mean

consumption of fruit was significantly different than that of the major food preparers. Also, the difference in consumption between these two groups may partially be explained by differences in specific fruit and vegetable practices.

Limitations

The results of this study can not necessarily be generalized to the general college student population. Participants in the study were enrolled in an introductory nutrition course. This may elicit some inherent bias, as the class was chosen by many of the respondents as an elective course, to fulfill a general education requirement. Hence, these students may have a greater knowledge of or interest in nutrition than is characteristic of the general college student population.

Since availability of fruits and vegetables may be somewhat limited during the winter months, the assessment of frequency and variety of intake during this season also may be considered a limitation. For this reason, two questions addressed this concern. Most respondents indicated that their fruit and vegetable consumption differed only slightly with seasonal availability. Also, although respondents were asked to estimate consumption within the last month and cautioned not to include winter break, not following these directions could have affected intake estimates.

The methods used to collect data also may be considered a limitation. All food intake assessment methods, including

the FFQ method, are limited in their ability to accurately determine dietary intake. The FFQ method has been reported (Zulkifli & Yu, 1992; Krebs-Smith et al., 1995) to inflate consumption data as respondents seldom accurately estimate serving sizes. Also, the more specific food items in a given food group that are included on the FFQ, the more likely consumption will be overestimated. If specific food estimates are high and are summed, this further overestimates consumption levels. However, this method is commonly used for collecting food intake data both quickly and economically with large samples (Zulkifli & Yu, 1992; Krebs-Smith et al., 1995).

Conclusions

Upon analysis of the FFQs, this study suggests that fruit and vegetable intake of college students is low and that vegetable intake falls short of the current recommendation. Also, the results indicate that this population consumes a limited variety of fruits and vegetables. The wide range of scores for both frequency and variety suggest that there is a need for increasing fruit and vegetable consumption in this population. Mean frequency and variety of consumption was found not to differ by gender; however both frequency and variety of fruit intake was lower for those students who indicated they were the major food preparer. Some differences in specific fruit and vegetable practices were found among the groups of students; however no mean differences in the knowledge of

current fruit and vegetable consumption recommendations was found. The majority of students were able to correctly identify the current fruit and vegetable serving recommendations.

College students may also tend to believe that fruits are the palatable, that fruit and vegetable intake benefits health, and that eating fruits and vegetables is worth the effort. However, they may tend to feel less positively about the cost of fruits and vegetables, the palatability of vegetables, chemical residues, and the convenience of fruits and vegetables as it relates to available time. Correlation results indicate that positive attitudes toward fruits may be facilitators to fruit consumption and positive attitudes toward the effort associated with fruits and vegetables may also be facilitator to those students who identified themselves as the major food preparer. Although responses about the health benefits of fruits and vegetables were positive, this fact may not necessarily be acting to greatly influence intake, except in the case of weight maintenance. Results indicate that although attitudes about the cost of fruits and vegetables and the chemical residues that may remain on fruits and vegetables were generally negative, attitudes were not necessarily translated into action. Hence, these factors probably can not be considered barriers to the college student population in general or to the students who identify themselves as major food preparers. However, negative attitudes with respect to the time

associated with fruit and vegetable consumption were also associated with negative behavior. Therefore, lack of time may be a barrier to college students who shop for and prepare most of their own food. As mean responses and correlations were similar for males and females and the major food preparers and non-preparers, these results may be generalized to the college student population as a whole.

Implications

These findings do not necessarily suggest specific barriers or facilitators to fruit and vegetable consumption for the college student population. However, they may serve as an impetus for further fruit and vegetable behavior studies of this population. For instance, messages regarding fruit and vegetable consumption should continue to emphasize the positive beliefs of this population and seek to understand the less positive beliefs. Further research may focus on more comprehensive dietary intake assessments, such as food recalls. Also, focus groups may attempt to further identify the perception of certain factors as faciliatators or barriers for this population.

The findings of this study may be beneficial for nutrition educators and health professionals as they develop educational materials and programs to increase fruit and vegetable consumption. The need for this type of research has increased due to efforts initiated by programs such as 5 A Day. Recent findings suggest that research should continue to examine factors that affect dietary behaviors.

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COLLEGE STUDENTS' FRUIT AND VEGETABLE
ATTITUDES AND PRACTICES

The purpose of this study is to identify the attitudes and practices of college students with regards to fruit and vegetable consumption. Your help is greatly appreciated! THANK YOU!

General Instructions: Please use a pencil and the computer answer sheet provided for your responses.

For questions 1 and 2 use this scale:

a - none
b - 1 serving
c - 2 servings
d - 3 servings
e - 4 servings
f - 5 servings
g - 6 or more servings

1. If one serving is one piece of fruit, 1/2 cup of fruit, or 3/4 cup of fruit juice overall how many servings of fruit do you usually eat in one day?

2. If one serving is 1/2 cup of vegetables or 3/4 cup of vegetable juice, overall how many servings of vegetables do you usually eat in one day?

For questions 3 and 4 use this scale:

a - don't eat any
b - only 1 kind
c - 2 kinds
d - 3 kinds
e - 4 kinds
f - 5 kinds
g - 6 or more kinds

3. How many different kinds of fruits do you eat in a usual day?

4. How many different kinds of vegetables do you eat in a usual day?

For questions 5 and 6 use this scale:

a - not at all
b - slight extent
c - moderate extent
d - great extent

5. To what extent does how much fruit you eat vary with seasonal availability?

6. To what extent does how many vegetables you eat vary with seasonal availability?

As best as you can remember, on the average, how many servings of each of the following fruits and vegetables did you eat in the last 30 days (1 month)? Indicate using this scale:

a - don't eat
b - less than once a month
c - 1-3 times per month
d - once per week
e - 2-4 times per week
f - once or twice per day

A serving equals 1 whole piece or cup of raw fruit or vegetable, 1/2 cup cooked fruit or vegetable, or 3/4 cup of fruit or vegetable juice.

For example, if you eat 3, 1/2 cup servings of applesauce a week, blacken in the letter e for question 7.

Please respond to fruits and vegetables in both columns.

7. Apple juice or sauce
8. Apples
9. Apricots or nectar
10. Asparagus
11. Avocados
12. Bananas
13. Beets
14. Broccoli
15. Cabbage and/or slaw
16. Cantaloupe
17. Carrots
18. Cauliflower
19. Celery
20. Cherries
21. Corn
22. Cranberry juice or sauce
23. Cucumbers
24. Dried fruit, raisins
25. Grapefruit or juice
26. Grapes or juice
27. Green beans
28. Green peas
29. Green peppers
30. Honeydew melon
31. Kiwi fruit
32. Lettuce, leafy or head
33. Mixed fruit/cocktail
34. Mushrooms
35. Nectarines
36. Onions
37. Oranges or juice
38. Peaches
39. Pears
40. Pineapple
41. Plums
42. Potatoes, all types
43. Radishes
44. Spinach
45. Strawberries, other berries
46. Sweet potatoes or yams
47. Tomatoes, sauce or juice
48. Watermelon
49. Zucchini, other summer squash

If in the last month, you ate a fruit or vegetable not included in the list above, please specify on the line provided and indicate the frequency (using the above scale) on the computer answer sheet.

50. Other fruit _____
51. Other vegetable_____

Choose the response you believe is correct.

52. The number of servings of <u>vegetables</u> recommended per day is:
    a. 1-2 b. 2-4 c. 3-5 d. 6-11

53. The number of servings of <u>fruit</u> recommended per day is:
    a. 1-2 b. 2-4 c. 3-5 d. 6-11

Indicate how often you do each of the following using this scale:

a - never
b - sometimes
c - often
d - usually

54. Eat green salad at lunch or dinner

55. Eat at least two vegetables (not green salad) at dinner

56. Eat a vegetable (not green salad) at lunch

57. Eat fruits or drink fruit juice for breakfast

58. Eat fruit for dessert

59. Eat raw vegetables for snacks

60. Eat raw or dried fruit for snacks

Please indicate your level of agreement with each of the following statements using this scale:

a - strongly disagree
b - disagree
c - agree
d - strongly agree

61. I will be less likely to develop intestinal problems if I eat plenty of fruits and vegetables.

62. In general, many fruits do not taste as good as most other foods.

63. Fruits and vegetables provide many of the vitamins and minerals I need to be healthy.

64. Many fruits can make fast and convenient snacks.

65. In my opinion, people are overly concerned about chemical residues on fruits and vegetables.

66. I think that vegetables taste just as good as most other foods.

67. Eating plenty of fruits and vegetables may help me lose or maintain my weight and keep me from getting too fat.

Please remember to use this scale:

a - strongly disagree
b - disagree
c - agree
d - strongly agree

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68. My health can suffer due to chemical residues that may remain on fruits and vegetables.

69. I don't think vegetables are convenient enough to be good snacks.

70. I do not consider fruits to be among my favorite foods.

71. I like the way most vegetables taste.

72. Most cooked vegetables do not look very appetizing.

73. I don't think eating plenty of fruits and vegetables will reduce my risk of getting heart disease.

74. Some vegetables are my favorite foods.

75. I don't like the way most fruits taste.

76. Chemical residues that may remain on fruits and vegetables are not major health concerns to me.

77. I think the texture of many vegetables is undesirable.

78. Most fruits look very appetizing.

79. I believe that I will be less likely to get some types of cancer if I eat a lot of fruits and vegetables.

80. I like the texture of most fruits.

81. I believe that chemicals remaining on fruits and vegetables can build up in my body and cause cancer.

Please give us some information about yourself.

82. What is your gender?
    a. Male
    b. Female

83. What is your age?
    a. 18 or younger
    b. 19
    c. 20
    d. 21
    e. 22
    f. 23
    g. 24 or older

84. What is your major area of study?
    a. Home Economics - Dietetics
    b. Home Economics - Foods and Business
    c. Home Economics - Other
    d. Science related - i.e. biology, chemistry, zoology
    e. Non-science related - i.e. business, music
    f. Education - science concentration
    g. Education - non-science concentration
    h. Physical education - Health
    i. Undeclared

85. Where do you live?
    a. on campus in a residence hall
    b. on campus in university apartments (Terrace Lane or University Court)
    c. in a fraternity or sorority
    d. off campus by yourself or with a roommate
    e. off campus with your parents
    f. off campus with a spouse and/or children

86. Here at EIU, who shops for and prepares <u>most</u> of the food you eat? (Choose <u>one</u> response)
    a. I do, or share equally with roommate(s), parent or spouse
    b. a roommate, parent or spouse
    c. I eat at dining services most of the time
    d. I eat out most of the time

***If you answered "a" to question 86, please continue with items 87-102.**

Please remember to use this scale:
a - strongly disagree
b - disagree
c - agree
d - strongly agree

***If you answered "b", "c" or "d" to question 86, you have completed the survey - THANK YOU for your cooperation!**

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87. Fruits and vegetables are relatively cheap snack foods.

88. The extra time needed to prepare and cook vegetables does not fit into my schedule.

89. I would not eat more fruit, even if I had more time.

90. Shopping for fruits and vegetables at the store is too time-consuming.

91. I would eat fruits more often if someone else prepared them for me.

Please remember to use this scale:

a - strongly disagree
b - disagree
c - agree
d - strongly agree

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92. It doesn't take very long to prepare fruits.

93. The time it takes to prepare vegetables is not worth the extra effort.

94. I will probably eat more vegetables when I have more time.

95. I believe that fruits and vegetables are worth their cost.

96. The time it takes to prepare fruits is worth the extra effort.

97. Fruits and vegetables are too expensive for my budget.

98. The time it takes to prepare and cook vegetables fits into my schedule.

99. I would not eat vegetables more often, even if someone else prepared them for me.

100. How much fruits and vegetables cost is not important to me.

101. It takes too long to prepare and cook vegetables.

102. I would eat more fruits and vegetables if I had more money to spend on food.

Your help is greatly appreciated! THANK YOU VERY MUCH!
