

BEVERAGE PREFERENCES AND CONSUMPTION
PATTERNS OF COLLEGE STUDENTS

By

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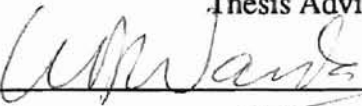
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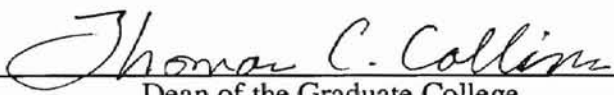
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CHAPTER I

INTRODUCTION

Food consumption has been a highly researched area in recent years except for beverages. Over 60% of Americans consume some sort of food or beverage between meals (Pao & Mickle, 1980). Beverages have become a growing market in the United States in the 90's with new products emerging yearly. Some of the newest products introduced to the market are specialty coffee, iced coffee, sports drinks, "New Age" clear beverages (Scarpa, 1993) and bottled water (Green, 1984). Eating habits develop early on in adolescence and are influenced by geography, economic & technological development, cultural determinants, religious taboos, ethnicity, marketing and peers to name a few (Gordon, 1983). A report published by the Office of Disease Prevention & Health Promotion, a division of the Department of Health & Human Services, listed improved nutrition as one of the 21 identified strategies to improve the nation's health (DHHS, 1991). High priority was placed on improving nutrition practices to reflect the dietary guidelines for Americans (USDA, 1990). One of the objectives is to avoid too much sugar, and the other, to drink alcoholic beverages in moderation.

College students represent an important segment of the United States population and their food and beverage consumption should be assessed in as much as students are generally under stress, have limited funds, and limited time to purchase and prepare meals (Khan & Lipke, 1982). Carbonated and alcoholic beverages are an integral part of the college students food consumption (Khan & Lipke, 1980; Nelson & King, 1982; Hernon, Skinner, Andrews, & Penfield, 1986; Kidorf, Lang & Pelham, 1990). This is of particular concern to nutritionists and dietitians because students tend to follow low-

caloric diets, avoid nutritious foods, and skip meals (Hernon et al, 1986). Serious consequences can result from these practices and be further aggravated by emotional problems and physical stress, while attending the University.

As nutrition educators, we need to ascertain the types of beverages preferred by college students. In addition, we need to discern their nutrition knowledge towards the consumption of beverages to more accurately and effectively develop educational tools to enhance knowledge of and compliance of the new dietary recommendations (Axelson & Brinberg, 1987).

Purpose and Objectives of the Study

The purpose of this research is to describe the beverage consumption preferences of Oklahoma State University Students who resided in the residence halls during the fall semester of 1994.

Specific objectives were to:

1. Identify the types of beverages preferred by college students.
2. Determine the amount of beverages consumed by college students during a typical day.
3. Determine if nutrition knowledge of college students affects their consumption of beverages.
4. Determine if type and frequency of exercise activities of college students affect their consumption of beverages.
5. To identify the types of beverages preferred by college students through assessing invoices and other purchasing records by Oklahoma State University Food Service.

Hypotheses

The following hypotheses were postulated for the study:

H₀₁: There will be no significant association between beverage consumption patterns of college students during a typical day and selected demographic variables: age, gender, education level, college, ethnic background, religion, and number of meals per week.

H₀₂: There will be no significant associations between nutrition knowledge and beverage consumption patterns of college students'.

H₀₃: There will be no significant associations between amount frequency and type of exercise and beverage consumption patterns of college students.

Assumptions and Limitations

The following assumptions will be recognized in this study:

1. College students will be honest in answering the questionnaire to the best of their ability.
2. Students on a 10 or 15 meal plan, may also be consuming food and beverages off campus, which may differ in types from those available in the residence halls.
3. The percentage of beverages that are purchased by the residence halls and consumed directly by students is constant over time.

The following limitations will be recognized in this study:

1. The population was limited to students living in the resident halls at OSU in the fall semester of 1994.
2. Intake of beverages in the residence halls may be a function of what is purchased and made available to the students.
3. The beverages purchased by the residence halls will not accurately reflect amounts consumed by college students because they are also used in food production and catering. Disappearance data on beverages will be more than what is actually consumed as a beverage.

Definition of Terms

For the purpose of this study, the following terms are defined so that the researchers intent is understood specifically.

College Students: Individuals who matriculated at Oklahoma State University and reside in the Residence Halls during the Fall of 1994.

Nutrition Knowledge: Nutrition knowledge in this study is limited to number of servings of the different food groups as suggested by the USDA food guide pyramid (Appendix A) and the number of glasses of water needed by adults daily.

Beverages: any of various liquid refreshments, including water.

Academic Year: Defined as the fall and spring semesters.

Snack: Food or beverage consumed between meals.

Serving Size: Except for the Food Guide Pyramid, serving size refers to an 8 oz. portion for all beverages.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

From the beginning of time, beverages have been an integral part in economies and the lives of people everywhere. It not only holds important economic and functional roles but a social one as well. The Boston Tea Party of 1776, is a good example historically of how important this beverage was to the colonists and to the economy of both England & America. Some beverages also hold spiritual value, as in partaking of wine during Communion, while other beverages such as herbal teas played a vital role in medicinal practices. In recent years, beverages have become increasingly more popular with the advent of new and different types of beverages. This chapter will be devoted to a review of the literature pertaining to beverage consumption by different subgroups of the population.

Water's Role in the Body

Water has a vital function in the body. It helps carry waste products and nutrients throughout the body, it fills the intracellular and extracellular fluid spaces, it helps form the structure of macromolecules and it quenches thirst (Whitney, Hamilton, Rolfes, 1990). Consequently, water makes up a big portion of an individuals body weight. An adult's body weight is approximately 50-60 percent water (Zeman, 1991). The body needs an amount of water based upon how active an individual is and his or her own

body weight. An average person needs about 8-12 cups of water daily (Whitney, Hamilton, Rolfes, 1990). These needs may be increased due to a variety of reasons.

Beverage Technology

The primary ingredient of any beverage is water, whether that beverage is milk, 100% fruit juice or carbonated beverages. Water comprises approximately 85-93% of the total volume of any beverage (Giese, 1992). Some soft drinks can be comprised of as much as 98% water.

Advanced technology has enabled a whole new arena of "specialty beverages" to emerge. Manufacturers are now fortifying fruit drinks and juices with calcium, vitamins and protein in order to make them seem healthier and appealing to the public. They can also remove the lactose from dairy products to accommodate lactose-intolerant consumers. Premium iced tea's and coffees have also been making a debut in the last several years (Scarpa, 1993). With Americans becoming more health and wellness conscious, sports drinks have also become more popular. Even the soft drink companies are continually improving their line of diet sodas, and coming out with new products such as clear colas. All this technology has come about because of the consumer's demands for healthier beverages.

Trends in US Beverage Consumption

The emergence of new food and beverages increased over the past eight years with new beverage items increasing from 832 in 1987 to 1, 845 in 1993 (Stillings, 1994). These beverages include flavored waters, juice drinks, spring & natural water, and alcohol.

Over the past 40-50 years, there has been decreases in per capita consumption of dairy products which includes milk (Stillings, 1994). In accordance with dietary recommendations that Americans decrease their consumption of whole milk, trends show

that the per capita consumption of whole milk has decreased by 62%, while the per capita consumption of low-fat milk has increased by 4,000%. Overall, milk consumption has declined. In contrast to this, when food trends were reviewed from 1909 to 1980, Welsh and Marston (1982) concluded that the per capita consumption of dairy products had increased. This was however, due to increases in cheese and low-fat milk. The use of whole milk between 1909-1913 and 1945 had increased by 26%, but between 1945 and 1980, it declined by almost 50% (Welsh and Marston, 1982). Welsh and Marston also reported that fruit and vegetable consumption more than quadrupled from 17 pounds to 77 pound per capita per year. This was mainly due to the increased use of processed juices.

The consumption of soft drinks in recent years have steadily increased due to new products and artificially sweetened soft drinks. The National Nutrition Monitoring System reports that the consumption of soft drinks has increased, with a greater increase occurring in the intake of low-calorie soft drinks over regular soft drinks. The trend between 1977 -1985 was an increase in alcoholic beverages in both men & women. This may be over reported due to the questionnaire probing for forgotten food items. In retail sales, however, there has been a declining trend of alcoholic beverages over this period of time. The increase in carbonated beverage consumption has also been confirmed by several different authors. In a study reported by Morgan, Stults, and Stampley (1985), more than 50% of the US population consumed carbonated beverages; of this 45.4% consumed regular soft drinks, while only 8.2% consumed diet soft drinks. Men between the ages of 19-24 were the primary consumers of regular soft drinks, while women aged 35-44 primarily consumed diet soft drinks (Morgan et al, 1985).Khan and Lipke (1982) Guenther (1986) and Cook, Eiler and Forker (1975) also found similar results in their studies that the consumption of carbonated beverages have increased, with an increase in diet beverages also occurring. Liebman (1992) reported in an article that tea consumption

and canned/chilled juice consumption has stayed constant from 1968-1988. She also reported that frozen citrus juice has slightly increased.

Consumption Behavior of Different Subgroups of the US

Geographic location

Throughout different geographic locations, food and beverage consumption varies widely. This is indicated by a study conducted by Cook, Eiler and Forker (1975). Consumers were interviewed in Albany, Syracuse & New York City. Milk consumption was found to be significantly less in New York than in Syracuse and Albany. New York City respondents reported more fruit juice and fruit drink consumption than did the other two towns in upper New York State. Soft drink consumption was also higher in New York than Syracuse and Albany. Guenther (1986) also did a study of beverages which included intakes by region. He found that Southerners drank less milk, juice and alcoholic beverages and more soft drinks and tea than those who lived in the Northeast, Midwest, and Western regions of the US among teenagers.

Age

Beverage consumption also changes with age. NHANES I data showed that elderly individuals aged 55 and older had a higher consumption of coffee and tea, vegetable fats, and non-citrus fruits food groups out of the combined 32 food groups (Murphy, Everett & Dresser 1989). Other beverages, such as orange juice, vitamin C enriched drinks, cola beverages, artificially sweetened beverages, wine and liquor were found not to change much with seasonal adjustments among the elderly. In Guenther's (1986) study of beverages and American teenagers, he reported that teenagers drank more soft drinks and milk than juice, fruit drinks, coffee, tea and alcoholic beverages. In the study conducted by Cook, Eiler and Forker (1975), differences in consumption and types of beverages between the different age groups was found. In adults, consumption of

coffee, tea, liquor, beer and wine were highest where as adolescents were more likely to drink milk and soft drinks. Decreases in the consumption of milk were also found to be lower in the adults and young adult group versus the adolescent groups. NHANES I data also reported a decline of milk consumption of persons aged 1-5 (Morgan et al. 1989).

Race

NHANES I data reported that between black and whites, black males were more likely to drink whole milk than white males; but white females drank more whole milk than black females (Morgan et. al 1989). More current research, contradicted the NHANES I data. In New York State, young adult black males drank less milk than their white counterparts. (Cook et al., 1975). In the same study, white women also consumed more milk than black women. White males from New York also drank more soft drinks, coffee or tea, and fruit juices, while black males drank more alcoholic beverages and water (Cook et al., 1975). Among the females from New York, whites drank more milk, coffee or tea, fruit juices and liquor, while black females drank more beer or wine, soft drinks and water (Cook et al. 1975). The study by Guenther (1986) indicated that among teenagers, intakes of juice and soft drinks were similar between whites and blacks; but consumption of milk, fruit drinks, coffee, tea and alcoholic beverages differed. Wyant and Meiselman (1984) conducted a study of food preferences among military personnel. The surveyed group was broken into 4 subgroups: black men, black women, white women, and white men. Fruit and vegetable juices, fruit drinks, and iced tea were found to be preferred more by blacks. White respondents indicated a greater preference for milk and tomato juice than did blacks.

College Students

Khan (1980) conducted a survey of 1200 students at Albright College in Pennsylvania to determine beverage preferences of college students. His results indicated

that the majority of students, selected cola-type beverages. Cola-type beverages were also found to be the most popular type of carbonated beverages. Tea and coffee were the least chosen beverages. He also found that men preferred more chocolate milk and fruit flavored drinks, and women were more likely to prefer non-cola type of drinks. For most other beverages, except tea and coffee, more than one serving was selected. Khan and Lipke (1982) also found that beverages contributed widely to snacking. A majority of college students who snacked, consumed carbonated beverages as a snack. Nelson and King (1982), also had some observations on snaking and beverage preferences of university students. In a poll taken on a university campus, they found that among beverages as snacks, fruit drinks were chosen most frequently followed by milk, iced tea, carbonated drinks, and coffee. This was somewhat contradictory to other research which showed that carbonated beverages were usually chosen first as snacks. In other literature on food consumption of college students, Hernon et al. (1986), concluded that women consumed fewer servings of fluid milk, alcoholic beverages and other beverages compared with men. Another study undertaken by Stasch, Johnson, and Spangler (1970), showed that almost one-third of the 394 students surveyed reported that they drank milk with every meal, and that an additional one-third drank milk at least once a day. As a snack, they also found that soft drinks were the most commonly chosen snack at college and at home.

Women

The Nationwide Food Consumption Survey reported results collected from the 1986 Continuing Survey of Food Intakes by Individuals Women 19-50 years and their children 1-5 years which was conducted by the U.S. Department of Agriculture (NMDHNIS, 1987). Changes were observed from 1977 to 1985 by women from whole milk to low-fat milk consumption. In 1986, the intakes of fruit juices were closer to the intakes reported in 1977 than those reported in 1985. This report also indicated that low-

calorie soft drinks were higher in 1986 than reported in 1985 and 1977. There was also a difference in consumption among different age groups of women. Older women had lesser intakes of soft drinks than did the younger women. Low-calorie soft drinks were most often drunk by approximately one-half of older women compared to one-third drunk by younger women. In a study done by Stasch et al. (1970), researchers found that men consumed more milk than women. A higher percentage of women than men disliked beer was reported by Wyant and Meiselman (1984). They also indicated that men over women were more willing to drink milk, where as women requested fruit or fruit juice.

Food Guide Pyramid

The Dietary Guidelines for Americans was released in 1980 and has had several revisions since then. Current Guidelines were issued in 1990 (Appendix B) (Welsh, Davis, and Shaw, 1992). They are as follows.

- * Eat a variety of foods,
- * Maintain healthy weight,
- * Choose a diet low in fat, saturated fat and cholesterol,
- * Choose a diet with plenty of vegetables, fruits, and grain products,
- * Use sugars only in moderation,
- * Use salt and sodium in moderation, and
- * If you drink alcoholic beverages, do so in moderation.

The food guide pyramid was developed in 1990 and released in 1992 as a graphic representation of the Dietary Guidelines. The pyramid is broken down into five groups, the breads, pasta rice and starch group, the vegetable group, the fruit group, the meat group and the milk group (Welsh et al, 1992). At the top of the pyramid are oils, sweets, and fats, many of the beverages on the market today are classified under this category except for milk and 100% fruit juice.

Summary

Beverages have a significant function in the human body and also in society. Some provide us with nutrients our body needs, such as riboflavin from milk, and

vitamin C from fruit juice and other vitamins and minerals from water. Carbonated beverages as snacks or alcoholic beverages at social gatherings provide social enjoyment. Recommendations have been made concerning two beverages, that of alcohol and that of increasing the consumption of low-fat milk. While percapita data showed that the overall sales of alcohol had decreased consumption among adults is still high. Several studies revealed that carbonated beverages continues to increase in the diet, while milk consumption decreases even though consumption of low-fat milk has increased.

CHAPTER III

METHODS

This chapter identified the methods that were followed by the researcher to fulfill the objectives of the study. Research design, population and sample, data collection including instrumentation and procedure, and data analysis were included in this chapter.

Research Design

The research design was a survey in the form of a mailed questionnaire. Surveys are used in research to describe and quantify characteristics of a defined population (Monsen, 1992). This research survey was designed to identify preferences and consumption patterns of beverages by college students. The dependent variables in this study were the preferences and consumption of beverages. The independent variables were demographic characteristics, nutrition knowledge, and the type and frequency of exercise engaged in by college students.

Population and Sample

The population selected for this study was drawn from students registered at the Residential Life Offices in the fall semester of 1994. From this population, a computer generated random sample of 1,000 students was chosen to be mailed the research questionnaire. The questionnaires were distributed through campus mail to the selected students residing in six separate residence halls.

Data Collection

Development of Instrument

The questionnaire (Appendix C) was developed using beverages provided by inventory records from the Oklahoma State University Food Service, and parts adapted from the questionnaire of Kellie Bryant (1994) to gather information to meet the objectives previously stated in Chapter I. The questions used were mostly multiple choice types. In order to check for validity, clarity, content, formatting and the time necessary to complete the questionnaire, the research instrument was pre-tested by students enrolled in a graduate foodservice management course, and then again by selected nutritional science graduate students. Modifications were made based on recommendations and responses from these students, and the graduate committee.

The instrument was divided into two sections: general information, and nutrition awareness, and beverage consumption questions. Section I included demographic variables, questions about meal plans and snacking, types of beverages and on which occasions they were consumed, health and wellness questions and questions about type and frequency of exercise. Section II consisted of questions designed specifically to measure consumption of a variety of beverages over a typical day and weekend.

Procedure

A cover letter (Appendix C) was developed and included instructions on how to complete the questionnaire. The cover letter was printed on letterhead from the Department of Nutritional Sciences, and the research questionnaire was printed on yellow bond paper. An incentive was offered to those who completed and turned in the questionnaire. Subjects were assured that all information recorded on the questionnaire would remain confidential and that the data collected would be analyzed as a consolidated result. Dr. Robert Huss, Director of Residential Life at Oklahoma State University,

provided duplication of the cover letter, the questionnaires and the printing of address labels. Questionnaires were distributed through campus mail and the respondents were given two weeks to complete and return the questionnaire to the front desk of each residence hall.

Data Analysis

Responses to the questionnaire were tabulated and coded for analysis. The data were analyzed using the Statistical Analysis System (SAS) computer program (Helwig & Council, 1979). ANOVA, t-tests, descriptive statistics, and Duncan's multiple range tests were the statistical procedures used. The level of significance was established at $p \leq .05$ unless otherwise specified by the researcher.

All questionnaires received within two weeks of the mailing were included in the data analysis. Except for the incentive offered with the return of the questionnaire, no further effort was made to increase participation. Of the 1,000 surveys mailed to students, 319 were returned, yielding a response rate of 32%.

The Instrument

The responses which were given for the number of servings consumed were coded "A" for Never consumed and "B" for consumed less than once per day. Number of 8 ounce glasses per day and on a typical weekend were the values provided by the respondents.

Data from demographics, nutrition knowledge, exercise patterns and consumption questions, were collapsed into specific groupings for statistical analysis. Nutrition knowledge on the food guide pyramid in each food group was collapsed into below, recommended, and above the recommended amount of servings per day. Exercise patterns were collapsed into aerobic exercise and intramural sports. Aerobic exercise included: biking, swimming, running, walking, racquetball, stairmaster, and tennis.

Intramural sports included: weight lifting, volleyball, football, soccer, softball, golf, and martial arts.

The beverages in the consumption section were collapsed into different groups. Milk was condensed into 5 groups: whole milk, low-fat milk, skim milk, milkshakes, and other. The fruit juice category was collapsed into 4 categories: orange juice; lemonade; a group that contained apple, cranberry, cranapple, pineapple, grape and grapefruit juices; and other juices. Vegetable juice was condensed into tomato and V-8 juice. Water was categorized into tap or non-tap water, while carbonated beverages were divided into cola-type, diet cola-type, uncola, and other. Miscellaneous beverages included: iced tea, other types of tea, coffee, other types of coffee, hot chocolate, and sports drinks. Alcohol included: beer, wines, and liquor. Each category of beverage groupings were also analyzed such as total milk, total juice, total water, total carbonated beverages, total teas, total coffees, and total alcohol groups. "Other" categories under each category of beverages were thrown out because of insufficient available data. The fruit punch/drink category and consumption of beverages in a typical week-end were not analyzed due to a poor response rate to these questions. The hypotheses were then analyzed for significance at the $p \leq 0.05$ level.

CHAPTER IV

RESULTS AND DISCUSSION

This research is the third in a series of studies conducted at the residence halls of Oklahoma State University between 1993 and 1995. Plato (1993), studied the consumption of fruits and vegetables of college students, while Bryant (1994), studied the nutrition awareness and consumption of meat. The Director of Residential Life, Dr. Robert Huss requested that a study of beverage consumption be conducted to complete the series.

Characteristics of Respondents

As described in Chapter III, 1000 questionnaires were mailed to students' residing in six residence halls during fall 1994. The response rate was 32% (N=319). Sixty-three percent of the respondents were females while 37% were males (Table I). Three-fourths of the students were between the ages of 17 to 20, while one-fifth were between 21 and 25. Almost 75% of the respondents were freshmen and sophomores. The remaining 25% were upper classmen, graduates and special students (Table I). About 40% of the students were enrolled in the College of Arts & Sciences. This is as expected since the majority of the students were under classmen. (Fig. 1). In contrast, 45% were from the Colleges of Engineering, Business and Agriculture.

The majority of the residence hall students during the fall of 1994 were caucasian (N=258, 81%). Asian /Oriental students was the largest ethnic group comprising 6.3% of the 319 respondents, while 5.3% were of Native American Heritage (Fig. 2). These

Table I
 DEMOGRAPHIC VARIABLES OF RESPONDENTS
 (N=319)

Variables	N*	%	Variables	N*	%
<u>Gender</u>			<u>Religion*</u>		
Male	118	37.0	Protestant	146	46.6
Female	<u>201</u>	<u>63.0</u>	Catholic	34	10.9
	319	100.0	Jewish	1	0.3
			Mormon	2	0.6
			Muslim	2	0.6
			Other	<u>128</u>	<u>40.9</u>
				317	99.9
<u>Age Group</u>					
17-20	242	75.9			
21-25	62	19.4			
26-30	11	3.4			
Over 30	<u>4</u>	<u>1.3</u>			
	319	100.0			
<u>Educational Level</u>					
Freshman	183	57.4			
Sophomores	48	15.0			
Junior	40	12.5			
Senior	33	10.3			
Graduate	12	3.8			
Special	<u>3</u>	<u>0.9</u>			
	319	100.0			

* Responses total less than 319 because not all respondents answered all questions.

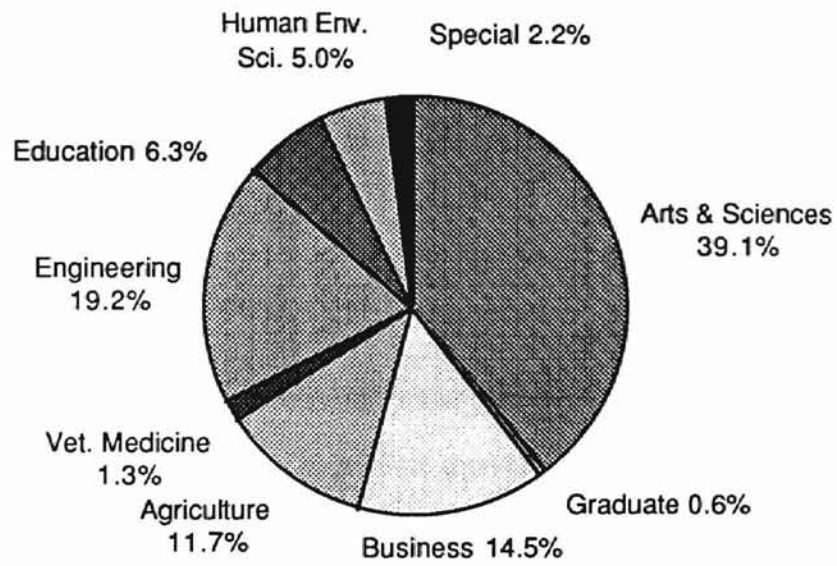


Figure 1. Percentage of students enrolled in each college

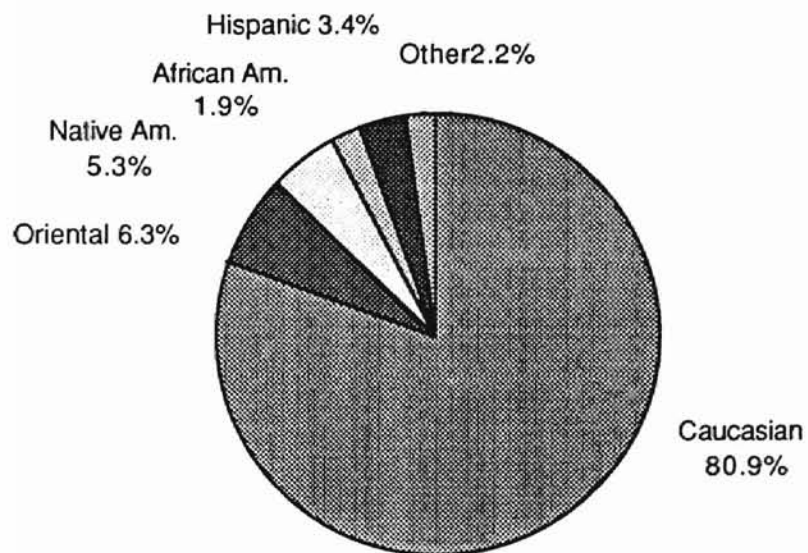


Figure 2. Percentage of students by ethnic background

findings are consistent with Plato(1993) and Bryant (1994) for all the afore mentioned variables. Religion was also included as a demographic variable to study its effect on beverage consumption. Of the students surveyed, 47% responded that they were Protestant, while 41% classified themselves as "other". Thirty-four students (11%) claimed to follow the Catholic religion and 1.5 % claimed they followed the Jewish, Mormon or Muslim religion (Table I).

Consumption Patterns of College Students

Almost all the students purchased a meal plan (N=289, 91%). About one-third were on a 10 meals per week plan, while more than half were on a 15 to 16 or 18-20 meal plan (Table II). Plato (1993) and Bryant (1994) reported these same findings. Between 50-60% of the students consumed breakfast, lunch and dinner 1-5 times per week. Forty-four students (17%) did not eat breakfast. This was not consistent with findings by research conducted by Khan and Lipke (1982) and Bryant (1994) who indicated that approximately one-third of students surveyed skipped breakfast.

A majority of the students (77%) consumed 0-2 snacks per day, while 23% consumed between 3-15 snacks (Table II). These findings were also consistent with findings from Ridgway (1989) who studied snack consumption behaviors. Table III showed the percentages of beverages used as a snack item. When asked if the choice of beverage in the cafeteria was a factor in beverage selection, 62% replied in the affirmative (Table II).

Beverages Consumed During Different Occasions

Types of beverages and when they were most likely to be consumed were reported in Table III. Soft drinks were most likely to be chosen with meals (29%), between meals (42%), under stress (37.7%) and as a snack (34.6%). Alcoholic beverages were the least likely to be chosen with meals (1.1%), between meals (11.9%),

Table II
MEAL PLAN AND SNACK VARIABLES
(N=319)

Variables	N*	%	Variables	N*	%
<u>Meal Plan</u>			<u>Snacks Per Day*</u>		
Yes	289	90.6	0-2	241	77.0
No	<u>30</u>	<u>9.4</u>	3-15	<u>72</u>	<u>23.0</u>
	319	100.0		313	100.0
<u>Meals Plans Per Week*</u>			<u>Choice of Beverage*</u>		
< 10	4	1.7	Yes	190	61.9
10	94	42.2	No	<u>117</u>	<u>38.1</u>
12-14	7	3.1		307	100.0
15-16	60	26.9			
18-20	<u>58</u>	<u>26.0</u>			
	223	99.9			
<u>Meals Per Week*</u>					
Breakfast					
0	44	16.9			
1-5	157	60.4			
6-7	<u>59</u>	<u>22.7</u>			
	260	100.0			
Lunch					
0	3	1.0			
1-5	157	54.8			
6-7	<u>127</u>	<u>44.2</u>			
	287	100.0			
Dinner					
0	3	1.0			
1-5	146	50.4			
6-7	<u>141</u>	<u>48.7</u>			
	290	100.1			

* Responses total less than 319 because not all respondents answered all questions.

Table III

CONSUMPTION OF BEVERAGES
(MULTIPLE ANSWERS ALLOWED)

Beverages	With Meals		Between Meals		Under Stress		As A Snack		Special Occasions	
	N*	%	N*	%	N*	%	N*	%	N*	%
Fruit Juice/Drink	197	61.8	165	51.7	65	20.4	171	53.6	70	21.9
Milk	159	49.8	58	18.2	24	7.5	78	24.5	38	11.9
Soft Drinks	233	73.0	228	71.5	157	49.2	188	58.9	135	42.3
Coffee/Tea	139	43.6	74	23.2	79	24.8	50	15.7	89	27.9
Alcoholic Beverages	9	2.8	24	7.5	54	16.9	13	4.1	178	55.8
Other	66	20.7	74	23.3	37	11.6	42	13.2	35	11.0

*Responses total less than 319 because not all respondents answered all questions.

and as a snack (2.4%) (Fig. 3,4,5,and 6). During special occasions (Fig. 7), alcoholic beverages (32.7%) were chosen first, followed by soft drinks(24.8%). Fruit juice/drinks were chosen by students after soft drinks to be consumed with meals (24.5%), between meals, (26.5%), as a snack (31.5%) under stress (15.6%) and during special occasions (12.8%). Soft drinks and fruit juice/drinks were preferred over milk, with meals, between meals, as a snack, under stress and during special occasions. Similar findings indicating that carbonated beverages were preferred over milk as a snack were reported by Khan and Lipke (1982) and Khan (1980).

Consumption of water ranged from none to more than eight glasses per day (Fig.8). Of the college students surveyed, 43% drank between 2-3 glasses of water per day. A similar number consumed either one, or four to five glasses of water per day. Even though 72% of the students knew the recommended amount of water to drink per day (Fig. 9), only 9.4% (Fig. 8) of the students followed this recommendation.

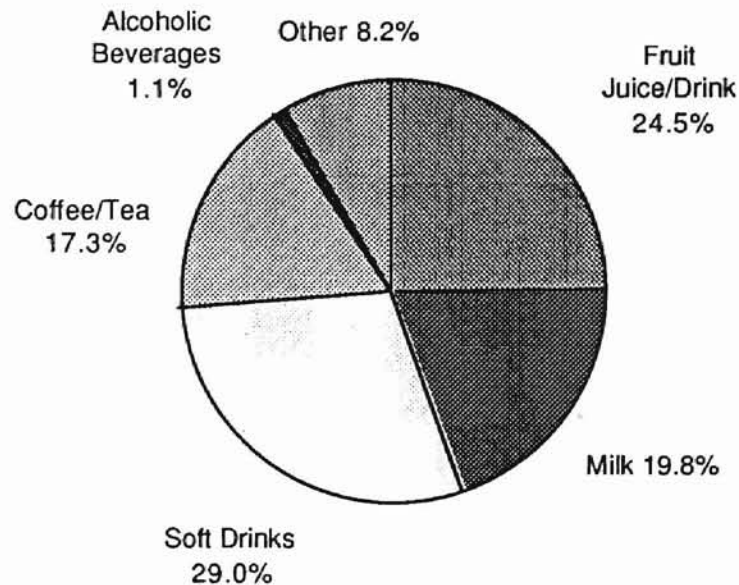


Figure 3. Percentage of selected beverages students drink with meals

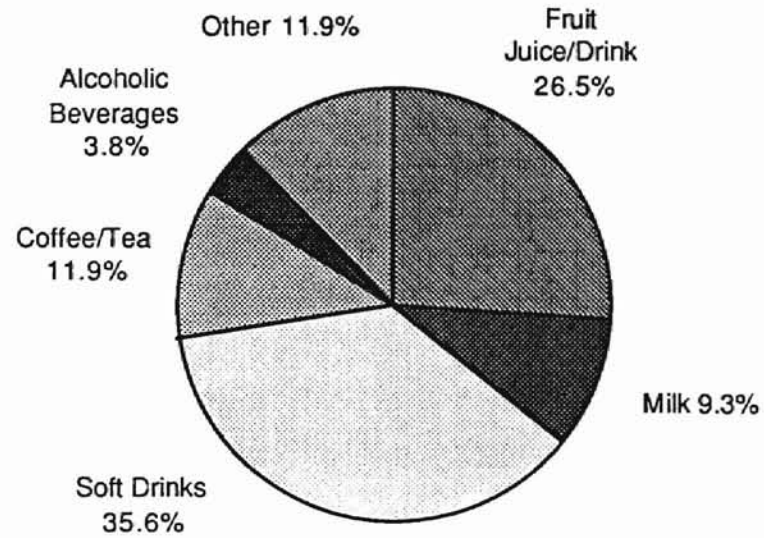


Figure 4. Percentage of students consuming selected beverages between meals

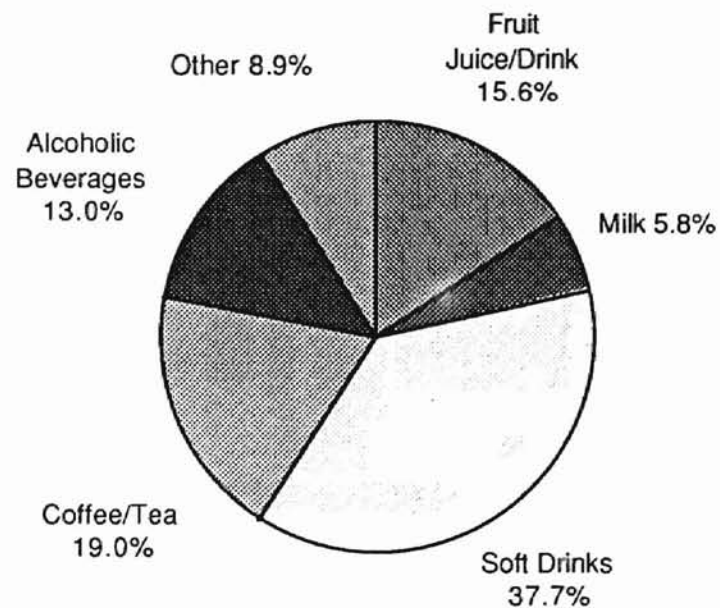


Figure 5. Percentage of students consuming selected beverages under stress

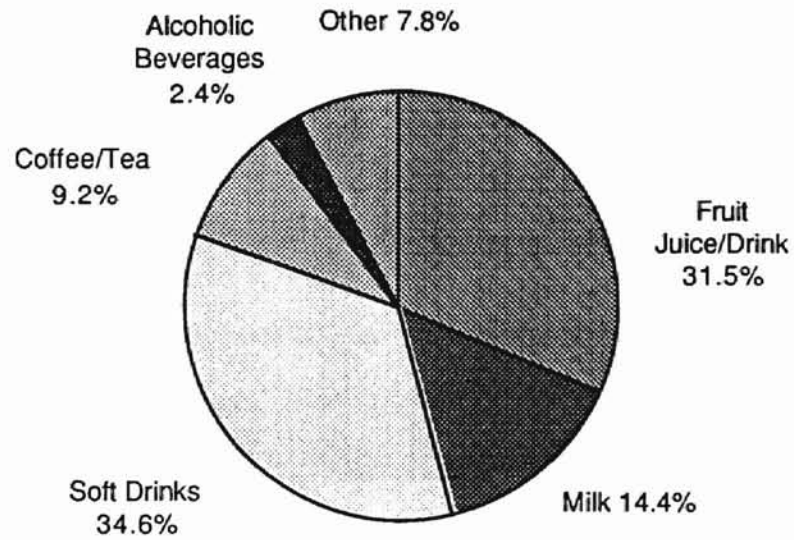


Figure 6. Percent of students consuming selected beverages as a snack

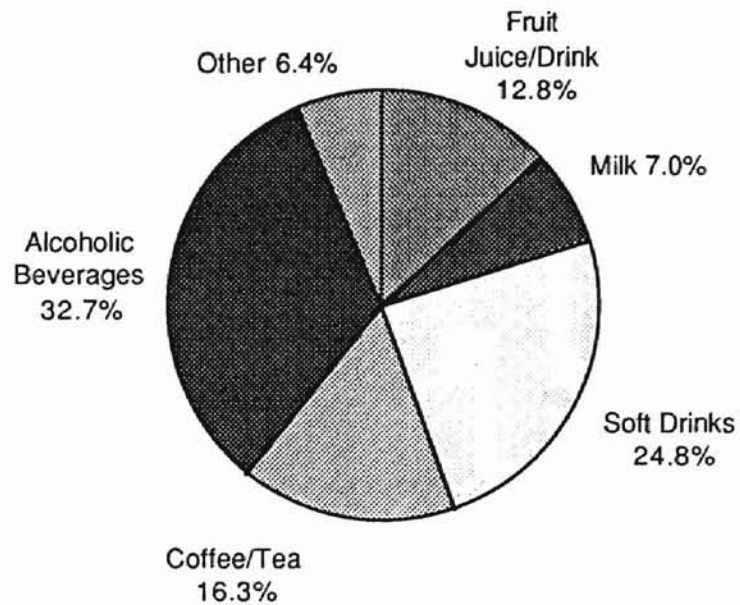


Figure 7. Percentage of students consuming selected beverages during special occasions

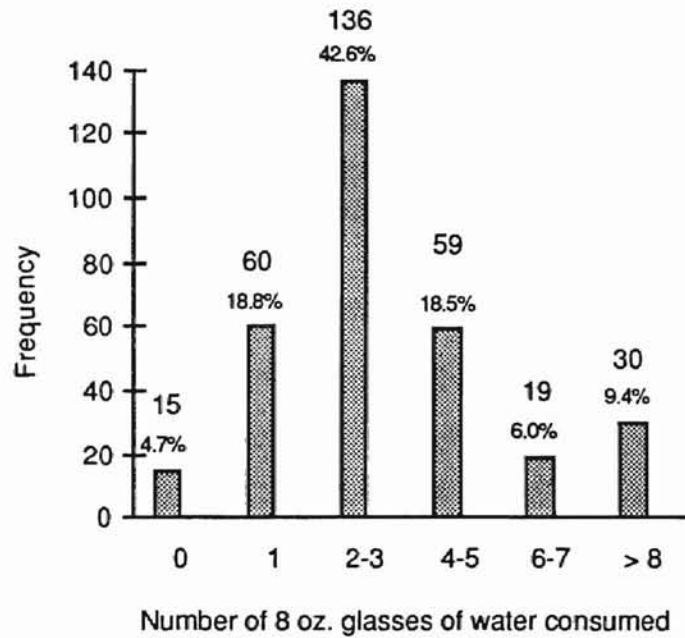


Figure 8. Number of glasses of water consumed by students per day

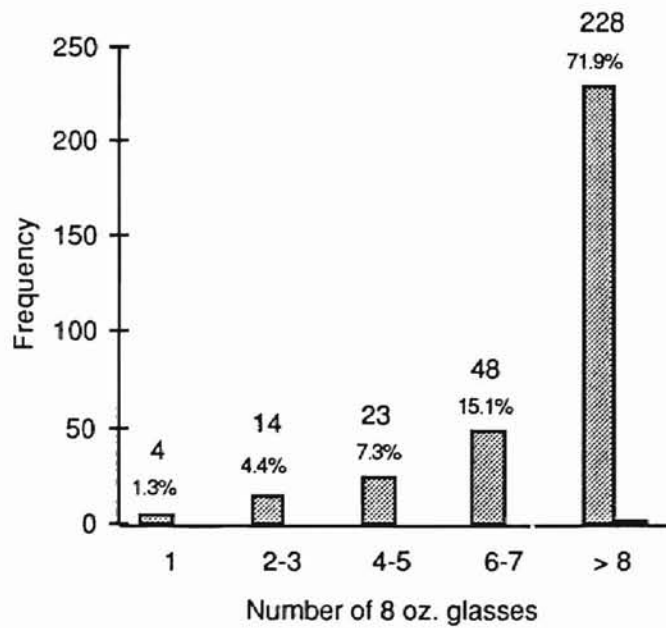


Figure 9. Number of glasses of water consumed in a healthy diet per day

These results were as expected since soft drinks are readily available to students on and off campus via vending machines, gas stations, quick-stops, retail stores and fast food establishments. Students today are perhaps more oriented towards the sweetness of many products including beverages and also the sensory aspects of carbonation.

Knowledge of Beverage Consumption as Part of Nutrition

Several recommendations have been made to help decrease the mortality rate in the US from cardiovascular disease, stroke, and cancer; and to improve the overall health of the nation. It has been recommended that consumption of fats, sweets and oils, and alcohol be limited in the diet. When students were asked whether or not they limited the consumption of carbonated and alcoholic beverages, 72% of the respondents said they did (Table IV). To further evaluate knowledge of a healthy diet, students were asked to give the number of servings for the different groups of the food guide pyramid; as well as the number of glasses of water adults should consume per day. The majority of students knew the correct amount of servings per day for all of the food groups except for the bread, cereal, rice and pasta group (19%); 71% of students knew that 3-5 servings of vegetables and 2-3 servings of meat, poultry, dry beans, eggs, and nuts group have been

Table IV

LIMITING OF CARBONATED AND ALCOHOLIC BEVERAGES CONSUMED

Variables	N*	%
Yes	223	72.4
No	<u>85</u>	<u>27.6</u>
	308	100.0

*Responses total less than 319 because not all respondents answered all questions.

recommended. Results also showed that students knew that 2-4 servings of fruit (81%) and 2-3 servings of milk, yogurt and cheese group (59%) were needed to be consumed per day to provide a balanced diet with variety (Table V). As previously mentioned, the majority of students (72%) knew that eight or more glasses of water should be consumed each day.

Although students knew the correct number of servings from the different food groups, and water; these guidelines were not always being followed. Results showed that water consumption fell below the suggested recommendations while soft drink consumption was higher than milk consumption, suggesting that the recommended number of servings for milk was not met.

Length and Frequency of Exercise

With the health and wellness movement, the number of people exercising has been increasing. As the level of exercise increases, and depending on the type of exercise performed, beverage consumption can vary widely. For endurance sports, beverages that replace electrolytes may be more important to consume than a beverage chosen by an athlete who participates in a non-endurance sport.

Students were asked questions about the type, duration and frequency of exercise they engaged in. This was to determine whether or not exercise had a bearing on the types of beverages consumed. The majority of the students (45%) reported that they exercised 2-3 times per week for 30 minutes or more (Table VI). A similar number of students (11%) exercised either 0 to 1 times or 4-5 times per day. Only 2.8% of respondents exercised every day of the week (Table VI). The most frequent type of exercise performed by students was running (32%), followed closely by walking (30%) (Fig. 10). Only about one-fourth of the students reported that they either lifted weights, biked or participated in aerobic exercise (Fig. 10). For the other sports listed, less than 10% of the respondents reported that they performed these activities.

Table V

SERVING SIZES OF FOOD GROUPS USING FOOD GUIDE PYRAMID

Variable	N	%
<u>Bread, Cereal, Rice</u>		
<u>& Pasta Group</u>		
0-2	102	34.4
3-5	139	46.9
6-11*	<u>56</u>	<u>18.8</u>
	297	100.0
<u>Vegetable</u>		
<u>Group</u>		
1-2	78	26.2
3-5*	211	70.8
6-8	<u>9</u>	<u>2.9</u>
	298	99.9
<u>Fruit Group</u>		
1	25	8.4
2-4*	242	81.2
5-8	<u>31</u>	<u>10.4</u>
	298	100.0
<u>Milk, Yogurt</u>		
<u>& Cheese Group</u>		
0-1	48	16.1
2-3*	177	59.4
4-8	<u>73</u>	<u>24.4</u>
	298	99.9
<u>Meat, Poultry</u>		
<u>Dry Beans, Eggs</u>		
<u>& Nuts Group</u>		
1	58	19.4
2-3*	211	70.6
4-6	<u>30</u>	<u>10.0</u>
	299	100.0

* Suggested Guidelines, Food Guide Pyramid (Welsh et.al, 1992)

Responses total less than 319 because not all respondents answered all questions.

Table VI

TIMES PER WEEK STUDENTS EXERCISE THIRTY MINUTES OR MORE

Times Per Week	N*	%
0-1	77	24.4
2-3	141	44.6
4-5	70	22.1
6-7	21	6.6
≥ 9	<u>7</u>	<u>2.2</u>
	316	99.9

Responses total less than 319 because not all respondents answered all questions

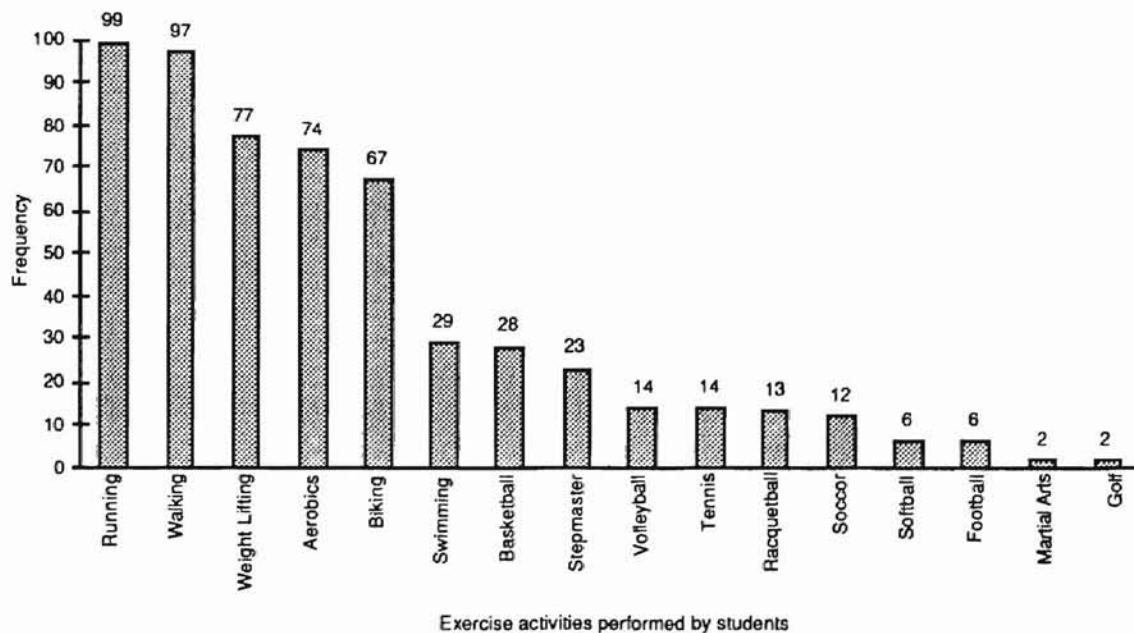


Figure 10. Activities performed by students

Beverage Consumption

The research questionnaire contained eight different beverage groups; milk, fruit juice, fruit drink/punch, vegetable juice, water, carbonated beverages, miscellaneous, and alcohol. Beverages included on the questionnaire were those provided by the cafeterias in the residence halls and other selected beverages not provided in the cafeteria. The subjects were asked to indicate the number of 8 ounce servings consumed for each beverage on a typical day and a typical weekend for each beverage. There were four columns provided for responses in this portion of the survey; never consume, consume less than once per day, number of 8 ounce glasses consume on a typical day and number of 8 ounce glasses consumed on a typical weekend. If students never consumed these beverages, and if beverages were consumed less than once per day; they were asked to respond in the appropriate columns. Reported responses for beverages consumed on a typical weekend were so low that analysis of this question was not feasible, hence they will not be reported. Most students (62%) reported that choice of beverage was a factor in their beverage selection (Table II). This may influence the respondents answers to the section on beverage consumption in the research questionnaire.

Milk

Table VII provides the report on number of servings and types of milk consumed. Only 17% of students consumed whole milk, 14% drank skim milk, while the majority (30%) consumed 2% low-fat milk. Students indicated that they generally consumed 1-2 servings per day of milk for all categories; however, a majority of the students (70-95%) responded that they consumed less than one serving of milk per day. The least likely types of milk to be consumed were the 1% and 1/2%.

Table VII
CONSUMPTION OF MILK

Number of 8 oz. servings	N*	%	Number of 8 oz. servings	N*	%
<u>Milk</u>					
<u>Whole</u>			<u>Skim</u>		
0	253	82.4	0	261	85.9
1-2	44	14.3	1-2	36	11.8
3-5	<u>9</u>	<u>2.9</u>	3-5	<u>7</u>	<u>2.3</u>
	306	99.6		304	100.0
<u>Low-fat 2%</u>			<u>Milkshakes</u>		
0	214	70.2	0	274	94.2
1-2	80	26.3	1-2	16	5.5
3-5	<u>11</u>	<u>3.6</u>	3-5	<u>1</u>	<u>0.3</u>
	305	100.0		291	100.0
<u>Low-fat 1%</u>			<u>Other</u>		
0	273	90.1	0	104	89.7
1-2	25	8.3	1-2	7	6.1
3-5	<u>5</u>	<u>1.7</u>	4-8	<u>5</u>	<u>4.4</u>
	303	100.0		116	100.0
<u>Low-fat 1/2%</u>					
0	291	95.1			
1-2	14	4.6			
3-5	<u>1</u>	<u>0.3</u>			
	306	100.0			

*Responses total less than 319 because not all respondents answered all questions.

Fruit and Vegetable Juice

Table VIII provided data on fruit and vegetable consumption. Orange juice (44%) was the most popular of all the juices consumed. The number of servings consumed for orange juice was 1-2 servings per day (39%). Almost one-fourth of the students consumed lemonade, of these, 18% drank 1-2 glasses per day. Apple juice, grape juice and the "other" category were also consumed; (19%, 13% and 12% respectively). For all categories of juice, the serving size most often consumed was 1-2 glasses per day.

Vegetable juices were not popular with college students. An overwhelming majority of the students (98%) surveyed responded that they did not drink any type of vegetable juice. Only 2% drank 1-2 glasses of tomato juice per day and 1% drank 1-2 glasses of V-8 juice per day (Table VIII).

Fruit Drinks/Punch

Types of beverages included in this category consisted of Mystic and Twister brand fruit drinks, lemonade and fruit punch, orange drinks, and Koolaid brand beverages. Fruit Punch (17%) was the most likely to be consumed followed closely by Koolaid (16.3%) (Table IX). Only 4% of the respondents consumed Mystic fruit drinks and the "other" category. Once again, the usual number of servings consumed per day was 1-2 glasses.

Water

More than three-fourths of the students drank regular tap water where as only one-fourth of the students reported they drank non-carbonated bottled water (Table X). An equal number of students (5%) consumed carbonated and sparkling water. As many as 92% of students reported that they did not drink any type of flavored water. Of the regular tap water drunk, 65% drank between 1-2 servings per day while only 12% drank 3-5 servings. This somewhat contradicts the number of servings students reported in

Table VIII
 CONSUMPTION OF FRUIT AND VEGETABLE JUICES

Number of 8 oz. servings	N*	%	Number of 8 oz. servings	N*	%
<u>Orange Juice</u>			<u>Grapefruit</u>		
0	172	56.2	0	300	95.8
1-2	119	38.9	1-2	11	2.5
3-4	<u>15</u>	<u>4.9</u>	3	<u>2</u>	<u>0.6</u>
	306	100.0		313	98.9
<u>Apple</u>			<u>Lemonade</u>		
0	250	81.4	0	242	78.3
1-2	49	15.9	1-2	55	17.8
3-6	<u>8</u>	<u>2.6</u>	3-5	<u>12</u>	<u>3.8</u>
	307	99.9		309	99.9
<u>Cranberry</u>			<u>Other</u>		
0	287	92.6	0	109	87.2
1-2	21	6.7	1-2	12	9.6
3	<u>2</u>	<u>0.6</u>	3-4	<u>4</u>	<u>3.2</u>
	310	99.9		125	100.0
<u>Cranapple</u>			<u>Tomato</u>		
0	284	91.9	0	307	98.1
1-2	20	6.5	1-2	<u>6</u>	<u>1.9</u>
3-4	<u>5</u>	<u>1.6</u>		313	100.0
	309	100.0			
<u>Pineapple</u>			<u>V8</u>		
0	303	97.7	0	309	97.8
1-3	<u>7</u>	<u>2.2</u>	1-2	<u>7</u>	<u>1.2</u>
	310	99.9		316	99.0
<u>Grape</u>					
0	267	88.1			
1-2	34	11.2			
3	<u>2</u>	<u>0.7</u>			
	303	100.0			

*Responses total less than 319 because not all respondents answered all questions.

Table IX
CONSUMPTION OF FRUIT DRINKS/PUNCH

Number of 8 oz. servings	N*	%	Number of 8 oz. servings	N*	%
<u>Mystic Fruit/ Drinks</u>			<u>Koolaid</u>		
0	299	95.8	0	259	83.8
1-2	<u>13</u>	<u>4.1</u>	1-2	40	13.0
	312	99.9	3-4	<u>10</u>	<u>3.3</u>
				309	100.0
<u>Twister Fruit Drinks</u>			<u>Other</u>		
0	288	91.7	0	129	96.3
1-2	23	7.4	1-2	3	2.2
3-4	<u>3</u>	<u>0.9</u>	6-8	<u>2</u>	<u>1.4</u>
	314	100.0		134	99.9
<u>Orange Drinks</u>					
0	279	90.0			
1-2	29	9.4			
3	<u>2</u>	<u>0.6</u>			
	310	100.0			
<u>Lemonade Punch</u>					
0	287	92.3			
1-2	20	6.5			
3	<u>4</u>	<u>1.3</u>			
	311	100.0			
<u>Fruit Punch</u>					
0	257	83.2			
1-2	46	14.9			
3-7	<u>6</u>	<u>1.9</u>			
	309	100.0			

*Responses total less than 319 because not all respondents answered all questions

Table X
CONSUMPTION OF WATER

Number of 8 oz. servings	N*	%	Number of 8 oz. servings	N*	%
<u>Water Tap</u>			<u>Flavored Water</u>		
0	69	22.5	0	287	92.9
1-5	200	65.2	1-2	<u>22</u>	<u>7.1</u>
6-10	35	11.5		309	100.0
12-24	<u>2</u>	<u>0.6</u>			
	306	99.8			
<u>Non-Carbonated Bottled Water</u>			<u>Other Water</u>		
0	224	74.7	0	116	96.7
1-3	63	21.0	1-2	2	1.6
4-12	<u>13</u>	<u>4.3</u>	3-7	<u>2</u>	<u>1.6</u>
	300	100.0		120	99.9
<u>Carbonated Bottled Water</u>					
0	295	94.9			
1-2	15	4.8			
3	<u>1</u>	<u>0.3</u>			
	311	100.0			
<u>Sparkling Water</u>					
0	296	94.9			
1-2	14	4.5			
3-8	<u>2</u>	<u>0.6</u>			
	312	100.0			

*Responses total less than 319 because not all respondents answered all questions.

Figure 8 where they reported consuming 2-3 glasses of water per day. Of those students who consumed non-carbonated bottled water, 21% responded that they drank between 1-3 servings per day. This higher serving size would be expected since many of the bottled waters come in containers containing more than 8 ounces of beverage.

Carbonated beverages

Cola type beverages were the most likely to be consumed (79%). Of this percentage, more than half the students reported that they consumed 1-2 servings per day while one-fifth reported they consumed 3-5 servings per day (Table XI). About one-fourth of the respondents (24%) consumed some type of diet cola; of this, 17% consumed 1-2 servings per day. Approximately one-fourth of the students consumed Sprite/Fresca or 7-up, while only 5% reported that they consumed both orange and strawberry soft drinks. Rootbeer was only chosen by 9% of the students.

Tea, Coffee, Chocolate and Sports drinks

Table XII provided consumption patterns of tea, coffee and other related items. Of this category, ice tea, was the most likely chosen beverage (35%). The number of servings per day for iced tea was usually between 1 to 3 8 ounce glasses per day. Coffee was chosen only by 12% of the students, while decaffeinated tea and coffee, and flavored tea were chosen by less than 3% of the students. Although 13% of the students reported that they drank some type of sports drink 12% consumed 1-2 glasses per day.

Alcohol

Between 94-99% of students responding to this questionnaire, reported that they did not drink any type of alcoholic beverage (Table XIII). Of those students who did consume some type of beverage, 5.8% of them chose beer, while only 4% chose liquor. Almost 100% of the students did not consume champagne. Students who consumed

Table XI
CONSUMPTION OF CARBONATED BEVERAGES

Number of 8 oz. servings	N*	%	Number of 8 oz. servings	N*	%
<u>Cola Type</u>			<u>Rootbeer</u>		
0	124	41.5	0	282	90.7
1-2	103	34.0	1-2	27	8.7
3-5	60	20.1	5	<u>2</u>	<u>0.6</u>
6-9	<u>12</u>	<u>3.9</u>		311	100.0
	299	99.5			
<u>Diet Cola</u>			<u>Orange</u>		
0	223	76.1	0	297	95.2
1-2	51	17.4	1-3	<u>15</u>	<u>4.9</u>
3-8	<u>19</u>	<u>6.5</u>		312	100.0
	293	100.0			
<u>Sprite/Fresca</u>			<u>Other</u>		
<u>7-Up</u>					
0	226	73.9	0	137	88.4
1-3	75	24.5	1-3	<u>18</u>	<u>11.6</u>
4-8	<u>5</u>	<u>1.6</u>		155	100.0
	306	100.0			
<u>Strawberry</u>					
0	292	95.1			
1-2	<u>15</u>	<u>4.9</u>			
	307	100.0			

Responses total less than 319 because not all respondents answered all questions.

Table XII

CONSUMPTION OF TEA, COFFEE, HOT CHOCOLATE AND SPORTS DRINKS

Number of 8 oz. servings	N*	%	Number of 8 oz. servings	N*	%
<u>Iced Tea</u>			<u>Decaf Coffee</u>	308	99.0
0	196	64.9	0	<u>3</u>	<u>0.9</u>
1-3	94	31.1	1-2	311	99.9
4-8	<u>12</u>	<u>4.0</u>			
	302	100.0			
			<u>Flavored Coffee</u>		
<u>Hot Tea</u>			0	296	95.8
0	298	96.8	1-2	12	3.9
1-3	<u>10</u>	<u>3.2</u>	5	<u>1</u>	<u>0.3</u>
	308	100.0		309	100.0
			<u>Hot Chocolate</u>		
<u>Flavored Tea</u>			0	266	86.9
0	302	97.7	1-2	39	12.7
1-2	<u>7</u>	<u>2.2</u>	4	<u>1</u>	<u>0.3</u>
	309	99.9		306	99.9
			<u>Sports Drinks</u>		
<u>Decaffeinated Tea</u>			0	261	85.3
0	301	97.4	1-2	37	12.1
1-3	<u>8</u>	<u>2.5</u>	3-8	<u>8</u>	<u>1.3</u>
	309	99.9		306	98.7
			<u>Other</u>		
<u>Coffee</u>			0-1	129	100.0
0	271	87.7			
1-2	34	11.0			
5-10	<u>4</u>	<u>1.2</u>			
	309	99.9			

*Responses total less than 319 because not all respondents answered all questions

Table XIII
CONSUMPTION OF ALCOHOL

Number of 8 oz. servings	N*	%
<u>Beer</u>		
0	265	94.3
1-2	14	5.0
3-7	<u>2</u>	<u>0.8</u>
	281	100.0
<u>Wine</u>		
0	299	98.7
1-2	<u>4</u>	<u>1.3</u>
	303	100.0
<u>Wine Coolers</u>		
0	287	97.6
1-2	<u>7</u>	<u>2.4</u>
	294	100.0
<u>Champagne</u>		
0-1	305	100.0
<u>Liquor</u>		
0	273	96.1
1-3	<u>11</u>	<u>3.9</u>
	284	100.0

*Responses total less than 319 because not all respondents answered all questions.

alcoholic beverages usually did so in moderation, consuming only 1-2 glasses per day. It is obvious that students consumed more carbonated drinks than any other type of beverage. Fruit juices were usually the second choice of beverage followed by water. Students consumed alcohol, coffee, hot chocolate, sports drinks, and vegetable juices the least. The most common serving size among all beverages was 1-2 servings per day.

Beverages Purchased by the University Food Service

The Oklahoma State University Food Service Department purchases food and beverages for each of the six residence halls. The residence hall cafeterias then purchase the food and beverage from the food service department. For this study, a comparison between the amounts of beverages purchased from 1989-1993 were analyzed to detect trends in beverage consumption by students from year to year based on invoices and other records available. The reader is reminded that for this study a year constitutes only the fall and spring semesters since during the summer the residence halls cater to conferences and camps whose clients are all ages and not just college students. The beverages analyzed included: carbonated beverages, milk, tea, coffee, and juice. For some years, purchases may be lower due to carry over of inventory from the previous year.

Carbonated Beverages

Figure 11 shows the relationship for all carbonated beverages purchased between the years of 1989-1993. Purchases of soft drinks increased between 1989 and 1990, but then fell by approximately 1,000 gallons in 1991 and 1992. This decrease could perhaps be attributed to a change in beverage companies which occurred during this period. It may also have reflected the decrease in occupancy rate for freshmen and sophomores in the residence halls during these two years. The reader is reminded that freshmen and sophomores were the predominant residents living in the residence halls. In the year

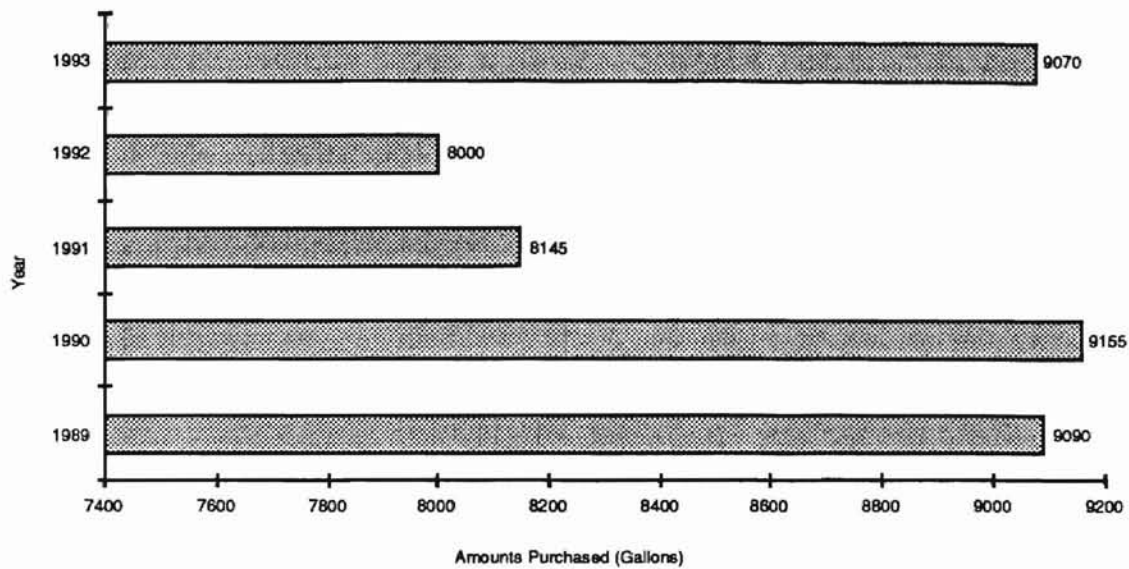


Figure 11. Amounts of carbonated beverages purchased by University Food Service

1993, carbonated beverages again rose to 9,070 gallons, which was still below the amount purchased in 1989 and 1990 along with the occupancy rate for sophomores, juniors and seniors. This does not conform to studies reported in Chapter II by Khan (1980), which indicates that carbonated beverage consumption was high among college students. Results of soft drink consumption was expected to have increased over these years.

Milk

The amount of milk purchased will be more than that which is consumed by the students because a certain percentage is used by food service workers for food production. The trend for milk was a steady decline between the years of 1989-1993 (Fig. 12). For all five years, whole milk was purchased more than any other type of milk (Fig. 13, 14, 15, 16, 17). This was probably due to its being used in gravies, mashed potatoes, cream soups, and baking. In 1990, skim milk was beginning to be purchased and used by some of the residence halls; consequently, purchase amounts of 2% milk

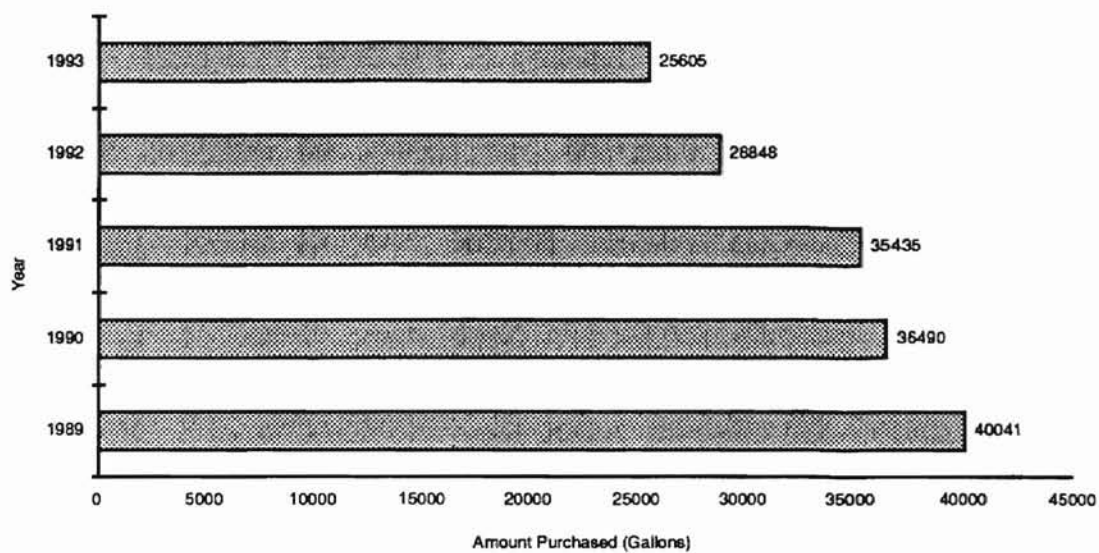


Figure 12. Amounts of milk purchased by University Food Service

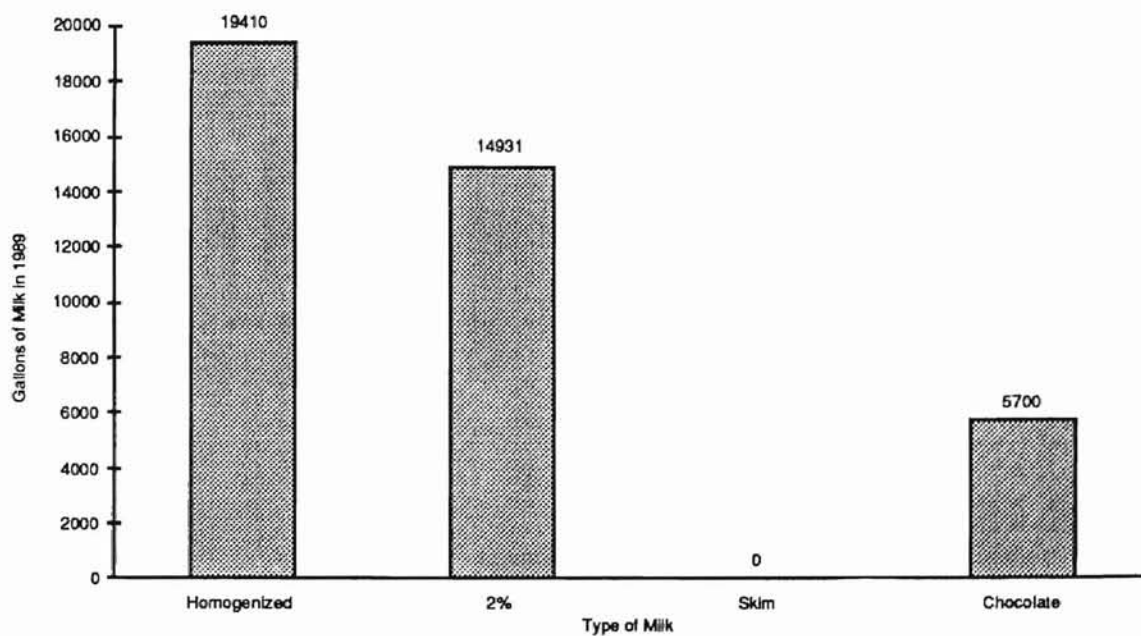


Figure 13. Amounts of milk purchased in 1989

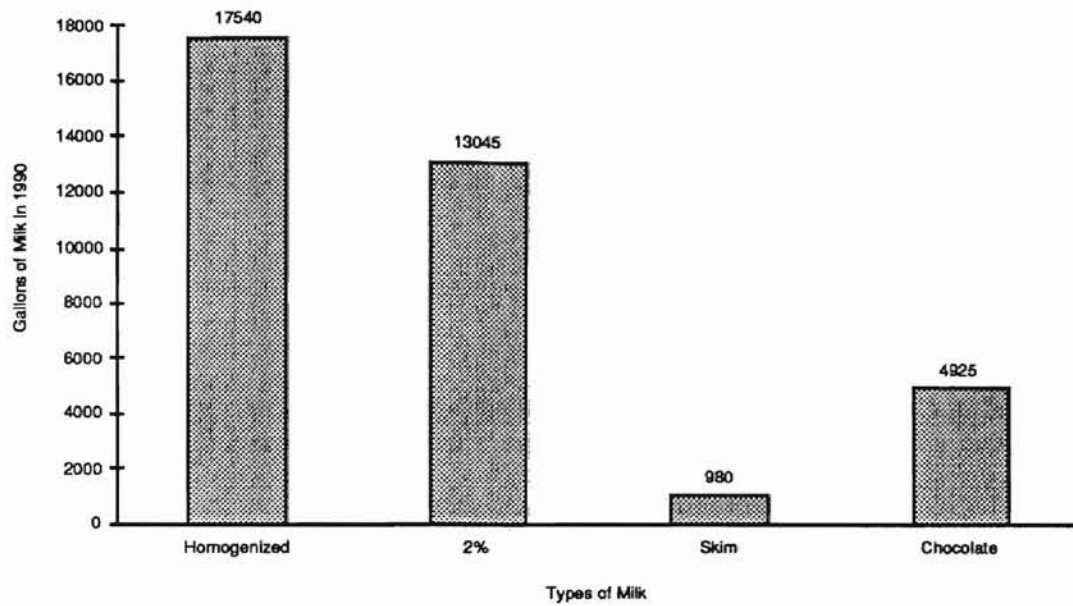


Figure 14. Amounts of milk purchased in 1990

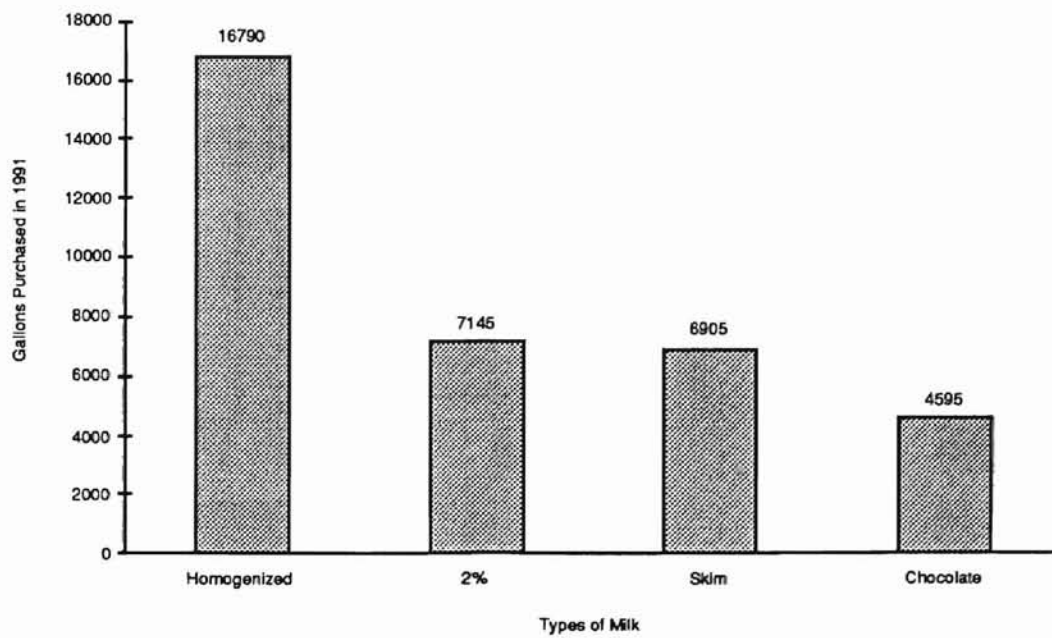


Figure 15. Amounts of milk purchased in 1991 by University Food Service

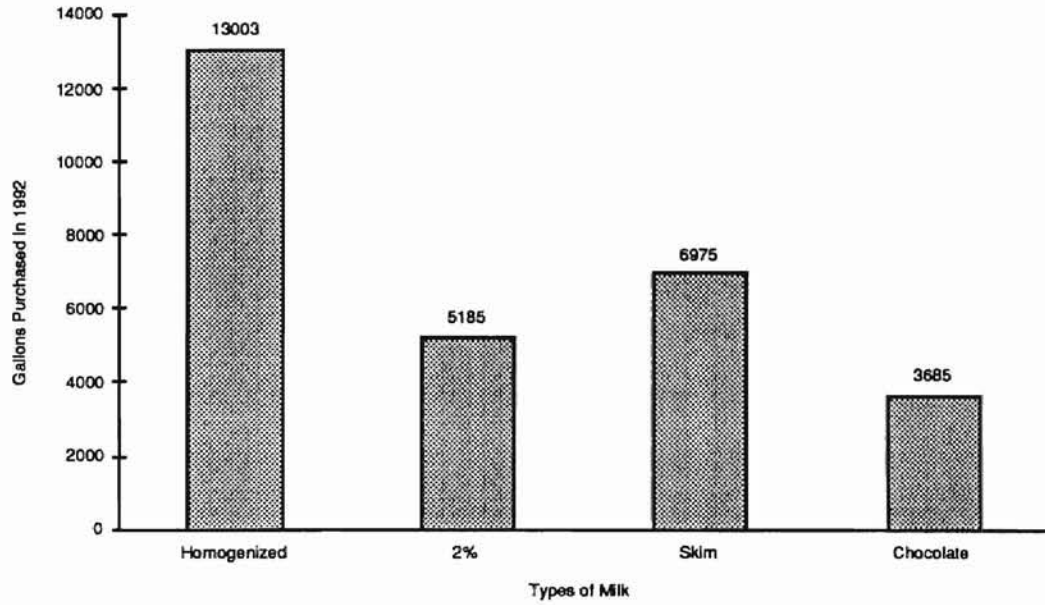


Figure 16. Amounts of milk purchased in 1992 by University Food Service

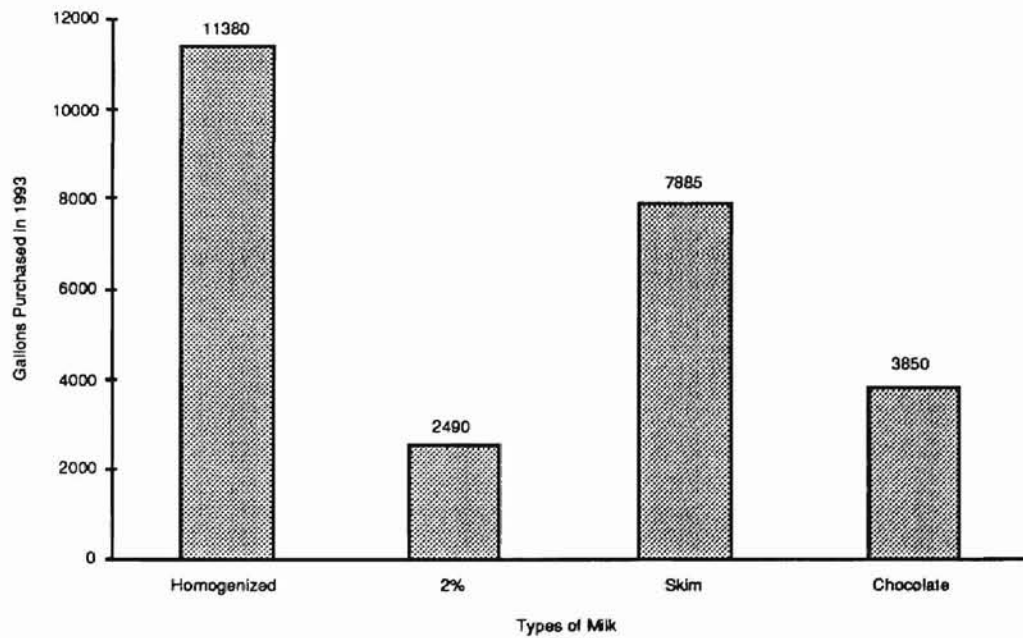


Figure 17. Amounts of milk purchased in 1993 by University Food Service

began to decline. In 1992, skim milk was purchased by almost 2,000 gallons over 2%. Up until this time 2% purchases were greater than skim milk purchases. In 1993, whole milk purchases were still declining along with 2 % milk, while skim milk purchases increased over that of 1992. For years 1989-1992 (Fig 13-17), chocolate milk purchases declined, but rose again in 1993. The decline of whole milk, and the increase in skim milk was expected because of the recent health and wellness movement with the addition of the Wellness Center to Oklahoma State University and one of the residence halls starting a health club also around 1990.

Tea and Coffee

For tea, purchases increased from 810 pounds in 1989 to 1087 pounds in 1992 (Fig. 18) They then declined to 924 pounds in 1993. For coffee, purchases decreased by approximately one-half from 768 to 312 pounds between 1990 and 1992 (Fig. 19). They once again rose to approximately 1104 pounds in 1993. Perhaps coffee consumption has increased because of the emergence of flavored coffees. Tea and coffee consumption purchases in the residence halls however, represented only a small portion of total beverages purchased.

Juice

Juice purchases varied widely during the five years that beverage consumption was analyzed. In 1990 and 1993, purchases increased by almost one-half of that purchased in 1989, 1991, and 1992 (Fig. 20). Juice purchases were expected to be higher than these figures because, in this study, students consumed more carbonated beverages and juices. Obviously, students also purchased juices from other food outlets rather than the residence halls. Students also may have interpreted the questions on juice consumption as asking which ones they consume and not which ones they consume in a typical day.

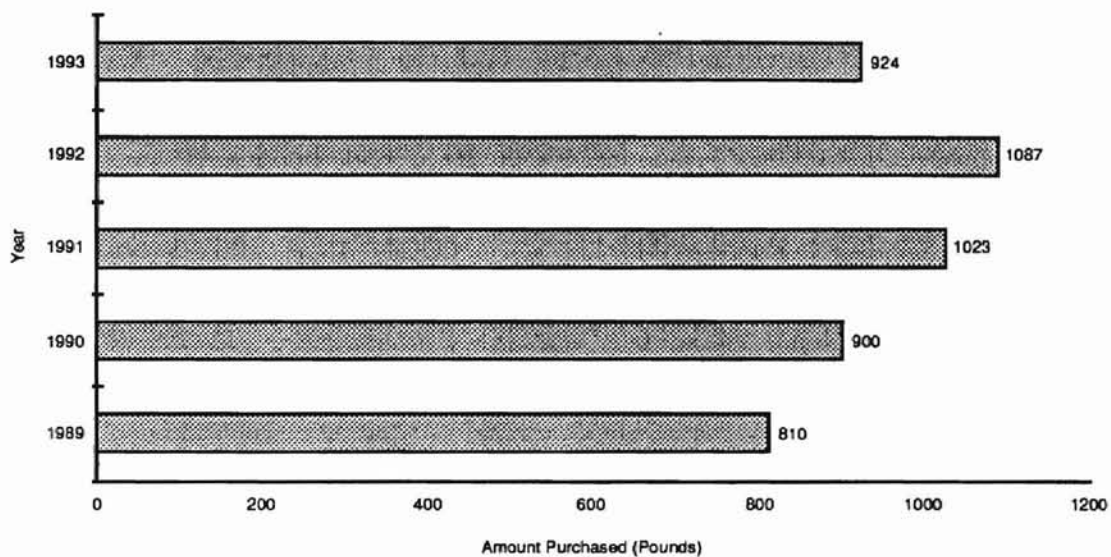


Figure 18. Amounts of Tea Purchased by University Food Service

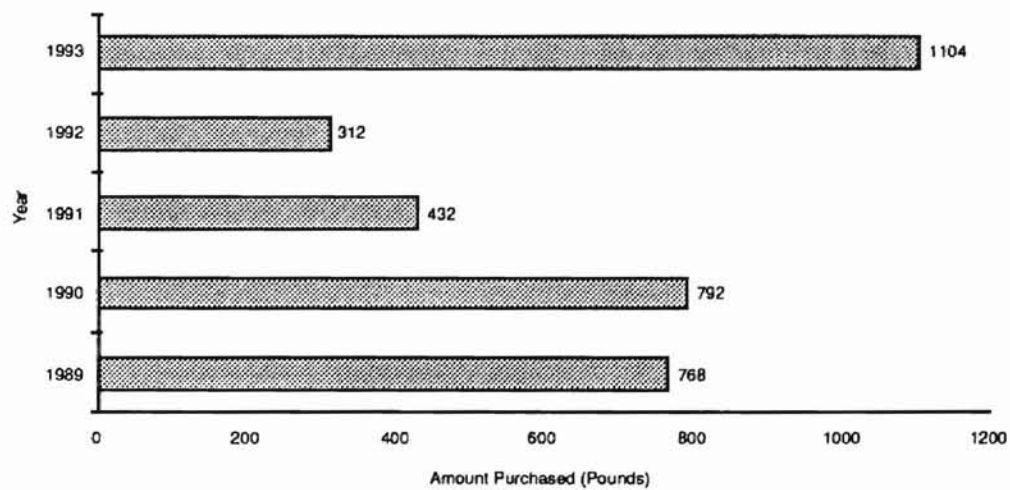


Figure 19. Amount of Coffee Purchased by University Food Service

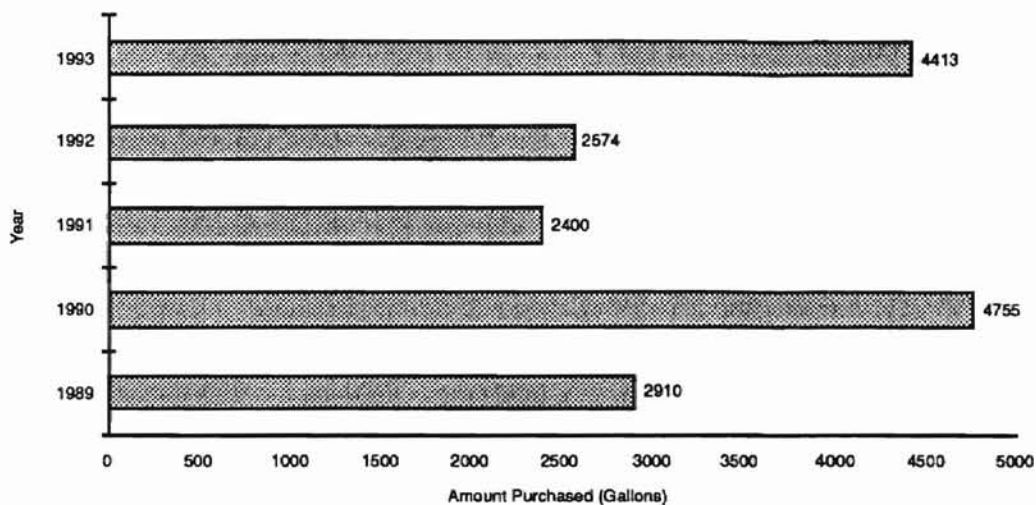


Figure 20. Amount of juice purchased by University Food Service

Summary

Overall, milk was purchased more than any other type of beverage, however, milk was also used during food preparation and other catering functions, therefore, there is no way to account for the actual consumption of this beverage by students. Soft drink consumption over five years has stayed about the same, as has juice, coffee, and tea (Fig 21). The purchased amounts of these beverages disregarding milk, support results reported by Khan (1980), which indicated that soft drinks were the beverage of choice by college students followed by juice.

Statistical Analysis

Hypothesis One

H_{01} : There will be no significant associations between beverage consumption of college students during a typical day and selected demographic variables: gender, ethnic background, number of meals per week, age, education level, college, and religion. T-

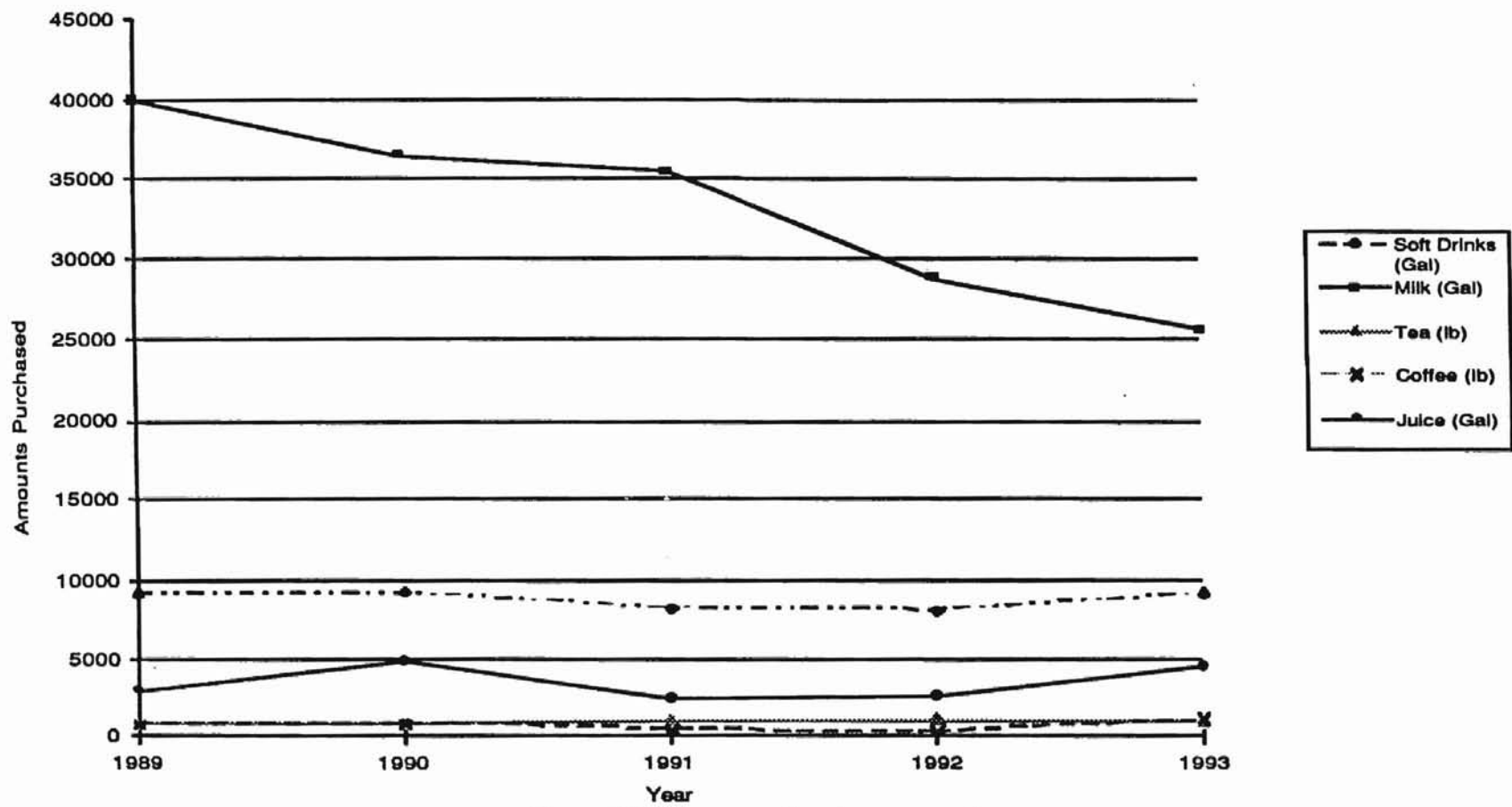


Figure 21. Beverage Purchases over 5 years

tests, analysis of variance, and Duncan's multiple range test were used to determine the relationships between the respondents' characteristics and their beverage consumption patterns.

Gender

T-tests were used to determine if gender was significantly ($p \leq 0.05$) associated with the consumption of certain beverages (Table XIV). Males were more than twice as likely to consume whole milk and cola-type beverages, than females. Males also consumed more overall carbonated beverages than females, in contrast females consumed twice as much skim milk than males. This is supported by Morgan et al. (1985); men between the ages of 19-24 were the primary consumers of regular soft drinks. They also consumed significantly more bottled type waters, hot chocolate, other types of coffee, and tea. Perhaps females consume more skim milk because they perceive this beverage as less fattening and therefore healthier and trendier than their male counterparts.

Table XIV

T-TEST DETERMINATIONS ON CONSUMPTION
OF BEVERAGES BY GENDER

Beverage	<u>Female</u>		<u>Male</u>		T	P-Value
	N	Mean	N	Mean		
Whole Milk	194	0.1649	112	0.4732	3.1628	0.0019
Skim Milk	193	0.3005	111	0.1351	-2.1928	0.0292
Non-Tap	186	1.2043	110	0.3454	-4.5687	0.0001
Cola-Type	190	1.1842	109	2.1009	4.1806	0.0001
Total Soft Drinks	175	2.5200	99	3.4343	2.5486	0.0070
Hot Chocolate	197	0.2131	109	0.0825	-2.6029	0.0097
Other Coffee	198	0.1111	110	0.0000	-3.1822	0.0017
Other Teas	196	0.1632	110	0.0545	-2.1125	0.0355

Ethnic background

Ethnic background was significantly ($p \leq 0.05$) associated with the consumption of certain beverages as shown by t-test determinations (Table XV). Caucasians drank significantly more cola-type soft drinks, beer, wines, and total alcohol than did African-Americans, Native-Americans, Hispanics, and Asians/Oriental groups combined. This may be due to these other ethnic groups preference for tea and coffee products.

Number of meals per week

T-tests determine a significant ($p \leq 0.1$) association between the number of meals per week consumed and whole milk and wine type beverages (Table XVI). Those students who consumed more whole milk, had a meal package that included less than 15 meals per week. Perhaps these students prefer drinking whole milk over others because they may have been used to consuming whole milk at home; it provides more calories, making up for meals that they do not eat; or it may help add satiety throughout the day so students do not always feel as hungry. Students who have less than 15 meals per week meal plan, consumed more wine type products. The alcoholic beverages may be taking the place of some meals.

Age

T-test determinations indicated that age was significantly ($p \leq 0.05$) associated with the consumption of diet cola, selected juices, total juices, and total alcoholic ($p \leq 0.10$) beverages (Table XVII). Students 17-20 years old consumed significantly more selected juices, and total juices, while those over age 21, consumed more diet cola, and alcoholic beverages. This was as expected, because it is not legal for students under 21 to consume alcohol. Diet cola was also consumed more by the 21 and over group who may be more concerned about calories provided by the regular carbonated beverages.

Table XV

T-TEST DETERMINATION ON CONSUMPTION
OF BEVERAGES BY ETHNIC GROUPS

Beverage	<u>Caucasian</u>		<u>Other</u>		T	P-Value
	N	Mean	N	Mean		
Cola-type	246	1.6178	53	1.0566	2.1770	0.0303
Beer	228	0.1228	53	0.0000	3.1127	0.0021
Wines	237	0.0590	54	0.0000	2.2914	0.0228
Alcohol	220	0.2222	50	0.0200	3.3043	0.0011

Table XVI

T-TEST DETERMINATION ON CONSUMPTION
OF BEVERAGES BY THE NUMBER OF MEALS
PER WEEK CONSUMED

Beverage	<u>< 15</u>		<u>> 15</u>		T	P-Value
	N	Mean	N	Mean		
Whole Milk	191	0.2251	115	0.3652	-1.6569	0.0986
Wines	181	0.0718	110	0.0090	1.8188	0.0704

*Significance level at $p \leq 0.10$

Table XVII

T-TEST DETERMINATION ON CONSUMPTION
OF BEVERAGES BY AGE

Beverage	<u>17-20</u>		<u>≥ 21</u>		T	P-Value
	N	Mean	N	Mean		
Diet Cola	224	0.4290	69	0.8410	2.5788	0.0104
Selected Juices	229	0.8780	64	0.3910	2.1471	0.0327
Total Juice	224	1.9870	61	1.0980	2.4000	0.0170
Alcohol	210	0.1430	60	0.3330	1.6673	0.0964

Education

Education level was significantly ($p \leq 0.05$) associated with the consumption of lemonade (Table XVIII). Duncan's multiple range tests (Table XIX) revealed that there were significant associations between graduate level and sophomore-senior education levels and lemonade consumption. Graduate students consumed more lemonade than did sophomore-senior level students. This would not seem likely because as shown in the previous section, undergraduate students drank significantly more juices than the older students. Since graduate students tend to be over 21 the fact that they drink more lemonade was not expected.

College

ANOVA determinations (XX and XXII) also showed a significant ($p \leq 0.05$) association between the consumption of non-tap water, and total water and college. Duncan's multiple range tests (Table XXI) indicated that students in the College of Human Environmental Sciences consumed significantly more than two times the amount of non-tap water than did the students from the Colleges of Business, Arts & Sciences, Agriculture, Engineering, Special and Graduate. Students from the colleges of Veterinary Medicine and Education also consumed significantly more non-tap water than did the Graduate College students. Table XXIII showed that students in the College of Human Environmental Sciences and Veterinary Medicine consumed more than three times the amount of total water than did students in the Colleges of Business, Engineering, Special and Graduate. The College of education students also consumed significantly more total water than did the Graduate College students.

Table XVIII

ANALYSIS OF VARIANCE RESULTS FOR THE CONSUMPTION
OF LEMONADE AND EDUCATION

Source	df	Mean Square	F	P
Education level	2	2.3357	3.71	0.0255
Error	306	0.6289		
Total	308			

Table XIX

DUNCAN'S MULTIPLE RANGE TEST FOR THE CONSUMPTION
OF LEMONADE AND EDUCATION

Education Level	N	Mean	Grouping*
Graduate/Special	15	0.600	A
Sophomore-Senior	116	0.438	B
Freshmen	178	0.207	AB

* Means with the same letter are not significantly different at the 0.05 level

Table XX

ANALYSIS OF VARIANCE RESULTS FOR THE CONSUMPTION
OF NON-TAP WATER AND COLLEGE

Source	df	Mean Square	F	P
College	8	14.5847	4.32	0.0001
Error	285	3.3786		
Total	293			

Table XXI

DUNCAN'S MULTIPLE RANGE TEST FOR CONSUMPTION
OF NON-TAP WATER AND COLLEGE

College	N	Mean	Grouping*
HES	13	3.000	A
Veterinary Medicine	4	2.250	AB
Education	19	2.105	AB
Business	44	0.841	BC
Arts & Sciences	115	0.774	BC
Agriculture	33	0.636	BC
Engineering	58	0.362	BC
Special	6	0.333	BC
Graduate	2	0.000	C

* Means with the same letter are not significantly different at the 0.05 level.

Table XXII

ANALYSIS OF VARIANCE RESULTS FOR THE CONSUMPTION
OF TOTAL WATER AND COLLEGE

Source	df	Mean Square	F	P
College	8	40.9655	3.79	0.0003
Error	280	10.7989		
Total	288			

Table XXIII
DUNCAN'S MULTIPLE RANGE TEST FOR CONSUMPTION OF
TOTAL OF WATER AND COLLEGE

College	N	Mean	Grouping*
HES	13	7.154	A
Veterinary Medicine	4	6.500	A
Education	19	4.895	AB
Agriculture	32	3.656	ABC
Arts & Sciences	114	3.579	ABC
Business	42	2.857	BC
Engineering	57	2.754	BC
Special	6	2.000	BC
Graduate	8	0.500	C

* Means with the same letter are not significantly different at the 0.05 level.

Religion

Religion was significantly associated with coffee consumption ($p \leq 0.05$), as determined by ANOVA (Table and XXIV,). Protestants, drank the least amount of coffee than the other religions (Table XXV). Protestants consuming the least amount of coffee was as expected since most of the respondents were between the ages of 17-20, and coffee is a more popular beverage among older individuals. Because the Catholic, Jewish and Mormon religions were grouped together for analysis, expected results would be higher.

Based on the results reported in Tables XIV-XXV indicating associations between whole and skim milk, lemonade, selected juices, total juices, non-tap and total water, cola-type diet cola-type and total soft drinks, coffee, hot chocolate, other types of coffee and tea, and beer, wines and total alcohol consumption and the personal variable gender,

Table XXIV
ANALYSIS OF VARIANCE FOR COFFEE
CONSUMPTION AND RELIGION

Source	df	Mean Square	F	P
Religion	2	2.6816	3.37	0.0358
Error	286	0.7966		
Total	288			

Table XXV
DUNCAN'S MULTIPLE RANGE TEST FOR
COFFEE CONSUMPTION AND RELIGION

Religion	N	Mean	Grouping*
Catholic/Jewish Mormon	36	0.556	A
Other	127	0.260	AB
Protestant	140	0.129	B

* Means with the same letter are not significantly different at the 0.05 level.

ethnic background, meals per week, age, education level, college and religion, the researcher rejected H_{o1} . If the other beverages, Milkshakes, other types of milk, low-fat milk, and total milk, orange juice, and vegetable juice, tap water, uncola-type soft drinks, sports drinks, total coffee and liquor were considered, then the researcher failed to reject H_{o1} .

Hypothesis Two

H_{o2} : There will be no significant associations between nutrition knowledge and beverage consumption patterns of college student's. Analysis of Variance (ANOVA) and Duncan's Multiple Range Test were used to determine the relationships between the respondents nutrition knowledge as suggested by the food guide pyramid and water needs and its effects on consumption of beverages. For convenience, respondents nutrition knowledge about servings for foods was limited to the number of servings as suggested by the food guide pyramid.

Recommended servings of milk

ANOVA determinations indicated that low-fat milk, total milk, uncola soft drinks, total soft drinks, hot chocolate, and beer consumption were significantly associated with the nutrition knowledge of number of servings of milk suggested by the food guide pyramid (Table XXVI, XXVIII, XXX, XXXII, XXXIV and XXXVI). Duncan multiple range tests showed that for low-fat milk and total milk, those students who thought the recommended servings of milk were 4-8 per day, drank significantly ($p \leq 0.0115$, $p \leq 0.0433$ respectively) more beverages from the milk group than did those students who correctly thought that individuals should consume 2-3 servings of milk per day (Table XXVII, and XXIX). Duncan multiple range test for uncola consumption (Table XXXI) indicated that students who thought they should drink 4-8 servings per day of milk, were drinking the most uncolas, students who knew to drink 2-3 servings of

milk per day were drinking less uncolas. Hopefully those who were drinking less uncolas, may also be drinking the recommended servings for milk, rather than other carbonated beverages. For total soft drink consumption (Table XXXIII), students who thought the correct serving was 0-1, drank significantly more soft drinks than did those who knew the correct servings of milk. Results of the Duncan multiple range tests for hot chocolate consumption and beer consumption (Table XXXV and XXXVII), showed that students who indicated that 4-8 servings of milk were needed per day, were drinking significantly more hot chocolate and more beer than did the other students. Those who knew that 2-3 servings of milk was the appropriate amount for daily intake, consumed significantly less beer (Table XXXVII). These results indicated that students who knew that 2-3 servings of milk per day was correct were drinking less of all the following beverages: beer, hot chocolate, total soft drinks, uncola-type soft drinks, and total milk and low-fat milk. These students may be drinking less total milk and low-fat milk because they know that they do not need more than 2-3 servings per day, where as those students who thought they needed 4-8 servings may be trying to consume that much.

Table XXVI

ANALYSIS OF VARIANCE RESULTS FOR LOW-FAT MILK CONSUMPTION
AND NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF MILK

Source	df	Mean Square	F	P
Servings	2	6.5662	4.54	0.0115
Error	273	1.4478		
Total	275			

Table XXVII

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF MILK AND LOW-FAT
MILK CONSUMPTION

Servings of milk	N	Mean	Grouping*
4-6	70	1.043	A
0-1	46	0.826	AB
2-3	160	0.537	B

* Means with the same letter are not significantly different at the 0.05 level.

Table XXVIII

ANALYSIS OF VARIANCE RESULTS FOR TOTAL MILK CONSUMPTION AND
NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF MILK

Source	df	Mean Square	F	P
Servings	2	7.3084	3.18	0.0433
Error	253	2.2995		
Total	255			

Table XXIX

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF MILK AND
ALL TYPES OF MILK CONSUMPTION

Servings of milk	N	Mean	Grouping*
0-1	43	1.256	AB
2-3	149	1.101	B
4-6	64	1.672	A

* Means with the same letter are not significantly different at the 0.05 level.

Table XXX

ANALYSIS OF VARIANCE RESULTS FOR UNCOLA CONSUMPTION AND
NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF MILK

Source	df	Mean Square	F	P
Servings	2	9.6239	4.73	0.0096
Error	279	2.0351		
Total	281			

Table XXXI

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF MILK AND
UNCOLA CONSUMPTION

Servings of Milk	N	Mean	Grouping*
0-1	43	0.860	AB
2-3	169	0.533	B
4-8	70	1.143	A

* Means with the same letter are not significantly different at the 0.05 level.

Table XXXII

ANALYSIS OF VARIANCE RESULTS FOR TOTAL SOFT DRINK CONSUMPTION
AND NUTRITION KNOWLEDGE: RECOMMENDED
SERVINGS OF MILK

Source	df	Mean Square	F	P
Servings	2	6.5662	4.54	0.0115
Error	273	1.4478		
Total	275			

Table XXXIII

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF MILK AND TOTAL SOFT
DRINKS CONSUMPTION

Servings of milk	N	Mean	Grouping*
0-1	43	0.860	AB
2-3	169	0.533	B
4-8	70	1.143	A

* Means with the same letter are not significantly different at the 0.05 level.

Table XXXIV

ANALYSIS OF VARIANCE RESULTS FOR HOT CHOCOLATE CONSUMPTION
AND NUTRITION KNOWLEDGE: RECOMMENDED
SERVINGS OF MILK

Source	df	Mean Square	F	P
Servings	2	2.0888	9.33	0.0001
Error	285	0.2239		
Total	287			

Table XXXV

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF MILK AND
HOT CHOCOLATE CONSUMPTION

Servings of milk	N	Mean	Grouping*
0-1	45	0.1111	B
2-3	171	0.0936	B
4-6	72	0.3750	A

* Means with the same letter are not significantly different at the 0.05 level.

Table XXXVI

ANALYSIS OF VARIANCE RESULTS FOR BEER CONSUMPTION AND NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF MILK

Source	df	Mean Square	F	P
Servings	2	0.9912	3.52	0.0311
Error	262	0.2818		
Total	264			

Table XXXVII

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF MILK AND BEER CONSUMPTION

Servings of milk	N	Mean	Grouping*
0-1	40	0.0250	B
2-3	158	0.0443	B
4-6	67	0.2388	A

* Means with the same letter are not significantly different at the 0.05 level.

Recommended servings of meat

Tables XXXVIII, XL, XLII, XLIV, XLVI and XLVIII, showed the results of the ANOVA determinations for knowledge of the recommended amount of meat consumption and beverages were significant at a $p \leq 0.05$ level. Low-fat milk, total milk, hot chocolate, sports drinks, beer, and total alcoholic consumption were all significantly related to the recommended servings of meat suggested by the food guide pyramid. Duncan's multiple range test for low-fat milk and sports drinks, indicated that for those students who correctly knew that 2-3 servings of meat per day was recommended, drank less low-fat milk and sports drinks than those students who thought you should consume 4-6 servings of meat per day (Table XXXIX and XLV). Table XLI for total milk

consumption indicated that there was a significant ($p = 0.0233$) association between students who thought that 4-6 servings of meat per day was recommended and those who thought 0-1 and 2-3 were recommended. These students who thought 4-6 servings per day were recommended were drinking twice as much total milk than the other students. For hot chocolate, beer and total alcohol, Duncan's multiple range test (Table XLIII, XLVII, and XLIX) showed that students who knew the correct servings of meat to eat per day drank significantly less of these products. Students who believed that 0-1 servings of meat per day were suggested servings by the food guide pyramid also drank significantly less of these products than did students who thought between 4-6 servings of meat were recommended.

Table XXXVIII

ANALYSIS OF VARIANCE RESULTS FOR LOW-FAT MILK CONSUMPTION
AND NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF MEAT

Source	df	Mean Square	F	P
Servings	2	6.5803	4.56	0.0113
Error	274	1.4442		
Total	276			

Table XXXIX

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF MEAT AND LOW-FAT MILK

Servings of meat	N	Mean	Grouping*
0-1	50	0.900	AB
2-3	197	0.584	B
4-6	30	1.233	A

* Means with the same letter are not significantly different at the 0.05 level.

Table XL

ANALYSIS OF VARIANCE RESULTS FOR TOTAL MILK CONSUMPTION AND
NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF MEAT

Source	df	Mean Square	F	P
Servings	2	8.7219	3.82	0.0233
Error	254	2.2856		
Total	256			

Table XLI

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF MEAT AND TOTAL
OF MILK CONSUMPTION

Servings of meat	N	Mean	Grouping*
0-1	48	1.354	B
2-3	183	1.137	B
4-6	26	2.000	A

* Means with the same letter are not significantly different at the 0.05 level.

Table XLII

ANALYSIS OF VARIANCE RESULTS FOR HOT CHOCOLATE CONSUMPTION
AND NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF MEAT

Source	df	Mean Square	F	P
Servings	2	0.9379	4.06	0.0183
Error	286	0.2313		
Total	288			

Table XLIII

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION KNOWLEDGE:
RECOMMENDED SERVINGS OF MEAT AND HOT CHOCOLATE CONSUMPTION

Servings of meat	N	Mean	Grouping*
0-1	53	0.1132	B
2-3	206	0.1456	B
4-6	30	0.4000	A

* Means with the same letter are not significantly different at the 0.05 level.

Table XLIV

ANALYSIS OF VARIANCE RESULTS FOR SPORTS DRINK CONSUMPTION
AND NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF MEAT

Source	df	Mean Square	F	P
Servings	2	2.2675	3.26	0.0400
Error	285	0.6963		
Total	287			

Table XLV

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION KNOWLEDGE:
RECOMMENDED SERVINGS OF MEAT AND
SPORTS DRINK CONSUMPTION

Servings of Meat	N	Mean	Grouping*
0-1	51	0.314	AB
2-3	207	0.193	B
4-6	30	0.600	A

* Means with the same letter are not significantly different at the 0.05 level.

Table XLVI

ANALYSIS OF VARIANCE RESULTS FOR BEER CONSUMPTION AND
NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF MEAT

Source	df	Mean Square	F	P
Servings	2	2.8949	10.87	0.0001
Error	263	0.2663		
Total	265			

Table XLVII

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF MEAT AND BEER CONSUMPTION

Servings of meat	N	Mean	Grouping*
0-1	50	0.040	B
2-3	190	0.042	B
4-6	26	0.538	A

* Means with the same letter are not significantly different at the 0.05 level

Table XLVIII

ANALYSIS OF VARIANCE RESULTS FOR TOTAL ALCOHOL CONSUMPTION
AND NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF MEAT

Source	df	Mean Square	F	P
Servings	2	2.6761	5.44	0.0048
Error	253	0.4916		
Total	255			

Table XLIX

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF MEAT AND
TOTAL ALCOHOL CONSUMPTION

Servings of meat	N	Mean	Grouping*
0-1	49	0.020	B
2-3	183	0.137	B
4-6	24	0.583	A

* Means with the same letter are not significantly different at the 0.05 level.

Recommended servings of vegetables

ANOVA determinations (Table L, LII and LIV) for beverages and vegetables indicated that low-fat milk, regular coffee, and total coffee were significantly ($p \leq 0.05$) related to nutrition knowledge on the suggested servings of vegetables by the food guide pyramid. There was a significant association ($p = 0.0238, 0.0005$) between students who thought the recommended servings were between 6-8 per day and those who thought they were 1-2 and 3-5 for low-fat milk and regular coffee consumption (Table LI and LIII). Low-fat milk and coffee consumption were less consumed by students who thought that the correct servings of vegetables were 1-2 and 3-5. There were significant associations between the students who believe that vegetables should be consumed 6-8 servings per day, and those who believed that the number of servings were 3-5 and 1-2 servings per day for total coffee. No significant association were found however, between those who chose 3-5 or 1-2 servings per day as the requirement for consumption and total coffee consumption. Total coffee was consumed in greater amounts by those students who believed that 6-8 servings of vegetables were recommended (Table LV).

Table L

ANALYSIS OF VARIANCE RESULTS FOR LOW-FAT MILK CONSUMPTION
AND NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF
VEGETABLES

Source	df	Mean Square	F	P
Serving	2	5.5153	3.79	0.0238
Error	273	1.4555		
Total	275			

Table LI

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF VEGETABLES AND LOW-FAT MILK
CONSUMPTION

Servings of Vegetables	N	Mean	Grouping*
1-2	71	0.845	B
3-5	196	0.622	B
6-8	9	1.667	A

* Means with the same letter are not significantly different at the 0.05 level.

Table LII

ANALYSIS OF VARIANCE RESULTS FOR REGULAR COFFEE CONSUMPTION
AND NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF
VEGETABLES

Source	df	Mean Square	F	P
Servings	2	5.7097	7.81	0.0005
Error	286	0.7306		
Total	288			

Table LIII

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION KNOWLEDGE:
RECOMMENDED SERVINGS OF VEGETABLE AND
REGULAR COFFEE CONSUMPTION

Servings of Vegetables	N	Mean	Grouping*
1-2	76	0.197	B
3-5	204	0.186	B
6-8	9	1.333	A

* Means with the same letter are not significantly different at the 0.05 level.

Table LIV

ANALYSIS OF VARIANCE RESULTS FOR TOTAL COFFEE CONSUMPTION AND
NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF VEGETABLES

Source	df	Mean Square	F	P
Serving	2	5.2642	6.01	0.0028
Error	283	0.8754		
Total	285			

Table LV

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF VEGETABLES AND TOTAL COFFEE
CONSUMPTION

Servings of Vegetables	N	Mean	Grouping*
1-2	75	0.227	B
3-5	202	0.238	B
6-8	9	1.333	A

* Means with the same letter are not significantly different at the 0.05 level.

Recommended servings of fruit

Suggested servings of fruit were significantly ($p \leq 0.05$) associated with orange juice consumption, cola-type soft drinks, and total soft drink consumption as shown by ANOVA determinations (Table LVI, LVIII, and LX). Duncan's multiple range tests (Table LVII) showed that students who correctly knew that the number of servings for the fruit group was 2-4, drank significantly more orange juice than did the students who thought the servings for the fruit group were 5-8 and 0-1. This indicated perhaps that students were drinking orange juice to meet the recommended number of servings of fruit per day. There was a significant ($p = 0.0172$) association between students who thought the number of servings for fruits were between 0-1 and 2-4 (Table LVIII). These students were found to be drinking almost twice as much cola-type products than those who knew the recommended servings (Table LIX). Duncan's multiple range tests (Table LXI) for the consumption of total soft drinks also indicated that students who did not know the recommended servings of fruits were consuming twice as many total soft drinks as those who knew the recommended number of servings. Students who knew the recommended servings of fruit according to the food guide pyramid, consumed significantly less cola-type beverages and total soft drinks, and more fruit juice to comply with the pyramid guidelines.

Recommended servings of the bread, cereal, rice and pasta

There were no significant associations between any beverages and this food group. This implied that the consumption of breads and cereals did not have any bearing on the type of beverages consumed.

Table LVI

ANALYSIS OF VARIANCE RESULTS FOR ORANGE JUICE CONSUMPTION
AND NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF FRUITS

Source	df	Mean Square	F	P
Serving	2	6.0817	3.73	0.0253
Error	284	0.8162		
Total	286			

Table LVII

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF FRUIT AND ORANGE JUICE CONSUMPTION

Servings of fruit	N	Mean Square	Grouping*
0-1	25	0.200	B
2-4	231	0.719	A
5-8	31	0.645	B

* Means with the same letter are not significantly different at the 0.05 level.

Table LVIII

ANALYSIS OF VARIANCE RESULTS FOR COLA-TYPE SOFT DRINK
CONSUMPTION AND NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS
OF FRUIT

Source	df	Mean Square	F	P
Serving	2	11.1567	4.12	0.0172
Error	278	2.7048		
Total	280			

Table LIX

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF FRUIT
AND COLA-TYPE CONSUMPTION

Servings of fruit	N	Mean	Grouping*
0-1	25	2.360	A
2-4	226	1.385	B
5-8	30	1.667	AB

* Means with the same letter are not significantly different at the 0.05 level.

Table LX

ANALYSIS OF VARIANCE RESULTS FOR TOTAL SOFT DRINK CONSUMPTION
AND NUTRITION KNOWLEDGE: RECOMMENDED SERVINGS OF FRUIT

Source	df	Mean Square	F	P
Serving	2	22.5999	3.18	0.0433
Error	256	7.1119		
Total	258			

Table LXI

DUNCAN'S MULTIPLE RANGE TEST FOR NUTRITION AWARENESS:
RECOMMENDED SERVINGS OF FRUIT AND TOTAL
SOFT DRINK CONSUMPTION

Servings of fruit	N	Mean	Grouping*
0-1	22	4.182	A
2-4	210	2.686	B
5-8	27	2.667	B

* Means with the same letter are not significantly different at the 0.05 level.

Recommended servings of water

Although the amount of water needed is not included in the food guide pyramid, the body needs a certain amount of water to function. Health professionals generally recommend 8 or more glasses of water per day. There was a significant ($p \leq 0.05$) association between the consumption of tap, non-tap, and total water as determined by T-tests (Table LXII). For all three categories of water students who drank more tap, non-tap and total water knew the recommended servings of water per day. Those who thought the recommended servings for water was less than 8 glasses per day consumed less than those who knew the recommended amount.

Based on the results reported in tables XXVI-LXII indicating association between beverage consumption and knowledge of the recommended servings of all of the food groups except the bread, cereal, rice and pasta group in the food guide pyramid and water the researcher rejected H_0 . If the bread, cereal, rice and pasta food group knowledge question is considered, then the researcher failed to reject H_0 .

Table LXII

T-TEST DETERMINATION OF NUTRITION KNOWLEDGE AND RECOMMENDED SERVINGS OF WATER NEEDED BY THE BODY PER DAY

Beverages	<u>> 8</u>		<u>≤ 8</u>		T	P-Value
	N	Mean	N	Mean		
Tap water	219	2.9360	87	2.1610	2.2181	0.0273
Non-tap water	210	1.0290	86	0.5350	2.0174	0.0447
Total water	206	3.9080	85	2.6710	2.8513	0.0047

Hypothesis Three

H₀₃: There will be no significant association between amount and type of exercise and beverage consumption patterns. T-tests were used to determine the relationship between the respondents exercise patterns and beverage consumption.

Number of times per week students exercised 30 minutes or more

T-tests were used to determine if the number of times students exercised 30 minutes or more per week was significantly associated with the consumption of beverages. Table LXIII showed that students who exercised 3 or more times per week consumed significantly more ($p \leq 0.05$) orange juice, lemonade, total juices and non-tap water by almost twice as much over other beverages. Perhaps these drinks were perceived as healthier by student athletes, hence, their consumption was expected to be more than that of non-athletic students.

Aerobic exercise

Table LXIV showed the results of aerobic exercise and beverage consumption. Beverages which were consumed in great amounts by students who exercised more than 3 times per week versus students who exercised less than 2 times per week were: lemonade, vegetable juices, diet cola, other coffee's especially, non-tap water, fruit juices and alcohol. Students who participated in the sports designated as aerobics for more than 3 times per week, drank significantly ($p \leq 0.05$) less whole milk, and more skim and low-fat milk than students who exercised less than 3 times per week. Overall, students who participated in aerobic exercise, consumed more beverages than those who exercised infrequently. This is as expected because beverage consumption rises to replenish body fluids lost during aerobic exercise.

Table LXIII

T-TEST DETERMINATION ON CONSUMPTION OF BEVERAGES BY THE
NUMBER OF TIMES PER WEEK STUDENTS EXERCISED
30 MINUTES OR MORE

Beverages	<u>0-2 times per week</u>		<u>3-9 times per week</u>		T	P-value
	N	Mean	N	Mean		
Orange juice	128	0.4921	178	0.7696	-2.8003	0.0054
Lemonade	131	0.2137	178	0.4662	-2.9910	0.0030
Total juices	121	1.2231	164	2.2195	-3.4815	0.0006
Non-tap	127	0.5669	169	1.1242	-2.6969	0.0074

Table LXIV

T-TEST DETERMINATIONS ON CONSUMPTION OF
BEVERAGES BY AEROBIC EXERCISE

BEVERAGES	≥ 3		≤ 2		T	P-Value
	N	Mean	N	Mean		
Whole milk	238	0.2184	68	0.4852	2.1202	0.0370
Skim milk	236	0.2796	68	0.1029	-2.1861	0.0305
Low-fat milk	228	0.7850	65	0.4615	-2.4218	0.0166
Lemonade	240	0.4000	69	0.2173	-1.9874	0.0487
All juices	220	1.9636	65	1.2307	-2.4125	0.0171
Vegetable juice	243	0.0658	70	0.0000	-2.7818	0.0058
Non-tap water	233	1.0300	63	0.3492	-3.8244	0.0020
Diet cola	231	0.5844	62	0.3064	-1.9877	0.0490
Other coffee	240	0.0875	68	0.0147	-2.2589	0.0246
Alcohol	212	0.2216	58	0.0517	-2.4013	0.0170

Intramural-type sports

T-test determinations indicated a significant association ($p \leq 0.05$) between total milk consumption and students participating in intramural sports labeled as intramural (Table LXV). Students who participated in these exercises more than 3 times per week drank more milk than those who did not. Based on the results in Tables LXIII-LXV indicating associations between beverage consumption and exercise, the researcher rejected H_0 .

Discussion/Summary

Most of the respondents in this study were between the ages of 17-20, Caucasian, female, from the College of Arts and Sciences and Protestant. As the researcher expected, that students consumed more carbonated drinks than other types of beverages. Fruit juices were usually the second choice of beverage followed by water. Students consumed alcohol, coffee, hot chocolate, sports drinks, and vegetable juices the least. The most common servings per day among all beverages was 1-2 8 oz glasses. Significant associations were found between beverages and all demographic variables. There were significant associations found between nutrition knowledge and the types of beverages consumed. Also, associations were found between exercise and beverage consumption. Students who included in their schedules a regimen of exercising 3 or more times per week significantly consumed more beverages than those who had limited exercise.

Table LXV

T-TEST DETERMINATION ON CONSUMPTION OF BEVERAGES BY INTRAMURAL TYPE SPORTS

Beverages	N	≥ 3	N	≤ 2	T	P-Value
		Mean		Mean		
Total Milk	102	1.5196	171	1.1169	-2.0345	0.0433

CHAPTER V

SUMMARY, RECOMMENDATIONS AND IMPLICATIONS

Summary

Beverages are such an important part of our lives, that research need to be undertaken to determine the impact of beverage consumption on healthy lifestyles or wellness of all individuals. The purpose of this research was to determine the beverage consumption preferences of Oklahoma State University students. Three hypotheses were postulated to determine if college students' consumption of beverages were associated with demographic variables, nutrition knowledge and exercise.

The results of the data collected from the questionnaires completed by students were presented in chapter IV. The sample population was randomly selected from students living in residence halls at Oklahoma State University during the fall semester of 1994. Data obtained from the 317 questionnaires were analyzed using frequencies, percentages, t-test, ANOVA and Duncan's Multiple Range Tests.

The majority of the respondents were freshmen, white females, aged 17-20 and in the College of Arts and Sciences (Table I, Fig.1). Almost 91% of the students had a meal plan, with most students reporting a 15-20 meals per week plan (Table II). A majority of the students consumed 0-2 snacks per day and expressed that their selection of beverages was dependent on the choice provided in the cafeteria.

Soft drinks were the most likely beverages chosen in almost any social setting except on special occasions when alcohol was chosen first (Table III). Between 2-3 glasses of water per day was consumed by a majority of the students. Usually soft

drinks were chosen by students followed by fruit juice and water. Males consumed more whole milk and cola-type beverages, while females consumed more skim and bottled type water. Students between 17-20 years of age consumed more juices, while older students selected more diet cola and alcoholic beverages. Nutrition knowledge was shown to affect beverage consumption. Students who were concerned about nutrition, health and wellness selected beverages that tended to reflect these concerns. For all students participating in exercise 3 or more times per week, beverages were consumed in greater quantity than by students with limited exercise activities.

Recommendations

The research questionnaire covered a wide area and included many different types of beverages, as listed in the inventory files of the University Food Service. For future research, the instruments might limit the number of beverages or combine them into broader groups. Many of the respondents indicated all kinds of beverages that they generally consume rather than providing the researcher with the beverages they consumed in a typical day in the residence halls. If students had been allowed to write in beverages they consumed, a more realistic picture might have been drawn, than by providing them with a long list. Also, the question on types of beverages consumed for different occasions should include more specific social situations and the beverage, water. Respondents only answered the question regarding beverage consumption over a typical day and not over the typical weekend as requested. Focusing in on only a typical day or a typical weekend might have produced a better response. Beverage consumption needs to be monitored during the different seasons of the year to ascertain seasonal changes.

A second mailing of the questionnaire or a reminder may have increased the response rate among students. Future researchers might also wish to survey colleges state wide, all the mid-western states, or nation wide to get a broader picture of trends in beverage consumption.

Implications

Technological advances in the food industry will continue to yield new food products including beverages. The emergence of these new products is accompanied by relentless advertising and marketing campaigns which will entice consumers to purchase these beverages, perhaps replacing consumption of milk and water. These newer beverages are generally carbonated or highly sweetened to please the consumers palate. Many are also expensive and provide no nutrients except some simple sugars. Dietitians and other health educators need to monitor these trends and the impact of these products on health and wellness of all consumers. With a decline in the consumption of milk, incidence of osteoporosis may increase in future years. The increased consumption of sweetened beverages which may accompany a less than nutritionally optimal diet also bring about weight gain, which may then lead to higher incidence of non-insulin dependent diabetes mellitus and heart disease.

Results of this study could perhaps enhance the forecasting accuracy of the purchasing agent for Oklahoma State University Food Service in projecting the appropriate types and amounts of beverages to procure. In addition, Oklahoma State University is developing a "Pyramid of Choices" program for selected residence halls in conjunction with the OSU Wellness Center and the Dietetic Internship Program, Nutritional Sciences Department, which will be implemented Spring semester 1996. It will be imperative for the dietitian and dietetic interns developing and teaching this program to emphasize the appropriate teaching choice of beverages (i.e. skim milk, and 100% fruit/vegetable juices) in conjunction with the proper selection of healthy entrees.

Dietitians and other health care educators need to identify barriers contributing to a low intake of milk and increasing intakes of soft drinks. Programs that promote the benefits of good nutrition need to emphasize that variety, moderation and balance in the diet (including beverages) are the key to healthy living.

BIBLIOGRAPHY

- Axelsson, M. L., Brinberg D. (1987). A social-psychological perspective on food-related behavior. New York: Springer-Verlag.
- Bryant, K. R. (1994). Nutrition Awareness and Meat Consumption of College Students. (Unpub. M.S. thesis, Oklahoma State University.)
- Cook, C. B., Eiler, D. A., Forker, O. D. (1975). Beverage consumption patterns in new york state. Journal of the American Dietetic Association, 67, 222-227.
- Department of Health and Human Services. The Surgeon General's Report on Nutrition and Health. Washington, DC: U. S. Department of Health and Human Services; 1988. DHHS (PHS) Publication 88-50210.
- Department of Health and Human Services, Office of Disease Prevention and Health Promotion Report. Promoting Health/Preventing Disease, Year 2000 Objectives for the Nation. Washington, DC: Public Health Service; 1991; 112-127.
- Giese, J. H. (1992). Hitting the spot: beverages and beverage technology. Food Technology, July; 70-80.
- Gordon, B. M. (1983). Why we choose the foods we do. Nutrition Today, March/April; 17-24.
- Green, T. (1984). The booming bottled water market. Smithsonian, 15(10), 105.
- Guenther, P. M. (1986). Beverages in the diets of American teenagers. Journal of the American Dietetic Association, 86(4); 493-499.
- Hernon, J. F., Skinner, J. D., Andrews, F. E., Penfield, M. P. (1986). Nutrient intakes and foods selected by college students: comparisons among subgroups divided by energy intake. Journal of the American Dietetic Association, 86(2); 217-221.
- Helwig, T. G., Council, J. D. SAS User's Guide. Raleigh, NC: SAS Institute; 1979.
- Interagency Board for Nutrition Monitoring and Related Research. Ervin B. and Reed D., eds. Nutrition Monitoring in the United States. Chartbook I: Selected Findings From the National Nutrition Monitoring and Related Research Program. Hyattsville, Maryland: Public Health Service, 1993.
- Khan, M. A. (1980). Observations on beverage preferences of college students at specific times. Journal of the American Dietetic Association, 77, July; 56-57.

- Khan, M. A., Lipke, L. K. (1982). Snacking and its contribution to food and nutrient intake of college students. Journal of the American Dietetic Association, 81, November; 583-587.
- Kidorf, M., Lang, A. R., Pelham, W. E. (1990). Beverages preference, beverage type and subject gender as determinants of alcohol consumption in the laboratory. Journal of Studies on Alcohol. 51(4); 331-335.
- Liebman, B. (1992). Nutrition Annual Editions 92/93. Connecticut: Dushkin Publishing Group, Inc.; 1992.
- Monsen, E. R., (1992). Research: successful approaches. Mexico: The American Dietetic Association; 1992.
- Morgan, K. J., Stults, V. J., Stampley, M. S. (1985). Soft drink consumption patterns of the U. S. population. Journal of the American Dietetic Association, 85(3); 352-354.
- Murphy, S. P., Everett, D. F., Dresser, C. M. (1989). Food group consumption reported by the elderly during the NHANES I epidemiologic followup study. Journal of Nutrition Education. 21(5); 214-219.
- Nelson, M. B., King, P. C. (1982). Snack and beverage preferences of university students. Journal of the American Dietetic Association, 81, July; 65-66.
- Nutrition Monitoring Division, Human Nutrition Information Service. CSF II. Nationwide Food Consumption Survey. (1987) Continuing Survey of Food Intake by Individuals, Women 19-50 and Their Children 1-5 Years, 1 Day 1986. Nutrition Today. September/October; 36-39.
- Pao, E. M. & Mickle, S. J. (1980). Nutrients from meals and snacks. Paper presented at the Agricultural Outlook Conference, Washington, D.C.
- Plato, R. S. (1993). Attitudes, Knowledge, and Consumption of Fruits and Vegetables by College Students. (Unpub. M.S. thesis, Oklahoma State University.)
- Ridgeway, A. D. B. (1989). College Student's Snack Food Consumption Behaviors and Nutritional Awareness. (Unpub. M.S. thesis, Oklahoma State University.)
- Scarpa, J. (1993). Premium iced drinks. Restaurant Business, May; 149-150.
- Stasch, A. R., Johnson, M. M., Spangler, G. J. (1970). Food practices and preferences of some college students. Journal of the American Dietetic Association, 57, December; 523-527.
- Stillings, B. R. (1994). Trend in foods. Nutrition Today, 29(5); 6-13.
- U.S. Department of Agriculture. Human Nutrition Information Service. Dietary Guidelines for Americans. Washington, DC: U. S. Government Printing Office; 1990. Home and Garden Bulletin No. 232.
- Welsh, S., Davis, C., Shaw, A. (1992). Development of the food guide pyramid. Nutrition Today, 27(6); 12-22.

- Welsh, S., Marston, R. M., (1982). Review of trends in food use in the United States, 1909 to 1980. Journal of the American Dietetic Association, 81(8); 120-125.
- Whitney, E. N., Hamilton, E.N., Rolfes, S. R. (1990). Understanding Nutrition. St. Paul, MN: West Publishing Company.
- Wyant, K. W., Meiselman, H. L. (1984). Sex and race differences in food preferences of military personnel. Journal of the American Dietetic Association, 84(2); 169-175.
- Zeman, F. J. (1991). Clinical Nutrition and Dietetics. New York, NY: Macmillan Publishing Company.

APPENDIXES

APPENDIX A
FOOD GUIDE PYRAMID

What's the Best Nutrition Advice?

It's following the Dietary Guidelines for Americans. These are seven guidelines for a healthful diet—*tips* for healthy Americans 2 years of age or more. By following the Dietary Guidelines, you can enjoy better health and reduce your chances of getting certain diseases—such as heart disease, high blood pressure, stroke, certain cancers, and the most common type of diabetes. These Guidelines are the best, most up-to-date advice from nutrition experts.

- Eat a variety of foods.
- Maintain healthy weight.
- Choose a diet low in fat, saturated fat, and cholesterol.
- Choose a diet with plenty of vegetables, fruits, and grain products.
- Use sugars only in moderation.
- Use salt and sodium only in moderation.
- If you drink alcoholic beverages, do so in moderation.

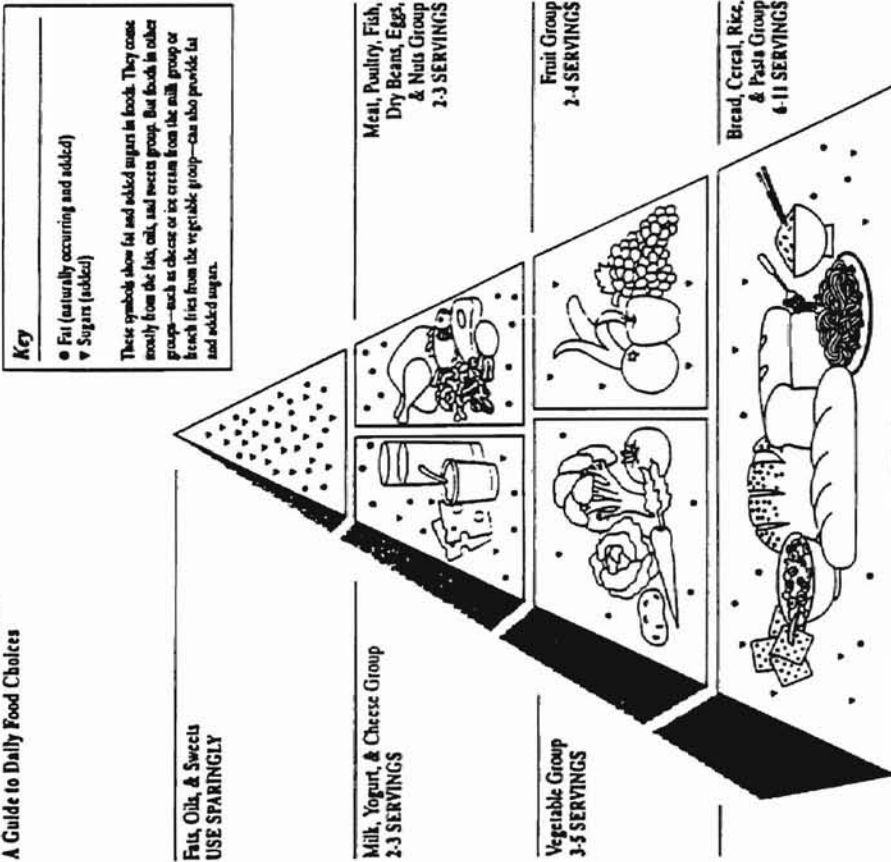
What is the Food Guide Pyramid?

The Food Guide Pyramid is an outline of what to eat each day based on the Dietary Guidelines. It's not a rigid prescription but a general guide that lets you choose a healthful diet that's right for you.

The Pyramid calls for eating a variety of foods to get the nutrients you need and at the same time the right amount of calories to maintain healthy weight.

Use the Pyramid to help you eat better every day... the Dietary Guidelines way. Start with plenty of breads, cereals, rice, pasta, vegetables, and fruits. Add 2-3 servings from the milk group and 2-3 servings from the meat group. Remember to go easy on fats, oils, and sweets; the foods in the small top of the Pyramid.

The Food Guide Pyramid A Guide to Daily Food Choices



Key

- Fat (naturally occurring and added)
- Sugar (added)

These symbols show fat and added sugars in foods. They come mostly from the fats, oils, and sweets group. But foods in other groups—such as cheese or ice cream from the milk group or french fries from the vegetable group—can also provide fat and added sugars.

What Counts as 1 Serving?

The amount of food that counts as 1 serving is listed below. If you eat a larger portion, count it as more than 1 serving. For example, a dinner portion of spaghetti would count as 2 or 3 servings of pasta.

Be sure to eat at least the lowest number of servings from the five major food groups listed below. You need them for the vitamins, minerals, carbohydrates, and proteins they provide. Just try to pick the lowest fat choices from the food groups. No specific serving size is given for the fats, oils, and sweets group because the message is USE SPARINGLY.

Food Groups

Milk, Yogurt, and Cheese	
1 cup of milk or yogurt	1½ ounces of natural cheese 2 ounces of process cheese
Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts	
2-3 ounces of cooked lean meat, poultry, or fish	1½ cup of cooked dry beans, 1 egg, or 2 tablespoons of peanut butter (count as 1 ounce of lean meat)
Vegetable	
1 cup of raw leafy vegetables	1/2 cup of other vegetables, cooked or chopped raw
Fruit	
1 medium apple, banana, orange	1/2 cup of chopped, cooked, or canned fruit 3/4 cup of fruit juice
Bread, Cereal, Rice, and Pasta	
1 slice of bread	1 ounce of ready-to-eat cereal 1/2 cup of cooked cereal, rice, or pasta

Looking at the Pieces of the Pyramid

The Food Guide Pyramid emphasizes foods from the five major food groups shown in the three lower sections of the Pyramid. Each of these food groups provides some, but not all, of the nutrients you need. Foods in one group can't replace those in another. No one of these major food groups is more important than another—for good health, you need them all.

APPENDIX B
DIETARY GUIDELINES

Nutrition and Your Health:
**Dietary Guidelines
for Americans**



**Eat a variety
of foods** page 5



**Maintain healthy
weight** page 8



**Choose a diet
low in fat, saturated
fat, and cholesterol**
page 13



**Choose a diet
with plenty of
vegetables, fruits,
and grain products**
page 18



**Use sugars only
in moderation**
page 21



**Use salt and sodium
only in moderation**
page 23



**If you drink alcoholic
beverages, do so in
moderation** page 25

Third Edition, 1990
U.S. Department of Agriculture
U.S. Department of Health and Human Services

APPENDIX C
COVER LETTER AND QUESTIONNAIRE



Oklahoma State University

DEPARTMENT OF NUTRITIONAL SCIENCES
COLLEGE OF HUMAN ENVIRONMENTAL SCIENCES

STILLWATER, OKLAHOMA 74078-0337
425 HUMAN ENVIRONMENTAL SCIENCES
(405)-744-5040

September 6, 1994

Dear OSU Student:

Congratulations! You have been chosen to participate in a study entitled "Beverage Consumption Patterns of Oklahoma State University Residence Hall Students". Carbonated and alcoholic beverages make up a big portion of food consumption among college students, however, data about the types and amounts of beverages consumed are limited. Participation is voluntary and you will not be penalized if you choose not to participate.

We would appreciate it very much, however, if you would take ten minutes of your time to fill out and return this questionnaire. Only composite data will be reported without mention of name or residence hall. A summary of results will be made available to the Department of Residential Life in Iba Hall.

For taking part in this study, **there will be something special for you at the front desk.** To receive this, turn in a completed questionnaire in the box provided near the Residential Life front desk on or before September 16, 1994. If you have any questions about this study call us at 744-8294. Thank you for your cooperation and participation in this project.

Sincerely,

A handwritten signature in cursive script that reads "Audrey L. Dennis".

Audrey L. Dennis
Graduate Student

A handwritten signature in cursive script that reads "Lea L. Ebro".

Lea L. Ebro, Ph.D., RD/LD
Major Advisor

Beverage Consumption Patterns of College Students

General Information

Please check or fill in the appropriate information concerning yourself.

1. Gender Male Female
2. Age 17-20 21-25 26-30 over 30
3. Education Level Freshman Sophomore Junior
 Senior Graduate Special
4. College Arts & Sciences Business Human Environmental Sciences
 Agriculture Engineering Veterinary Medicine
 Education Graduate Special
5. Ethnic Background Caucasian African American Native American
 Hispanic Asian/Oriental Other
6. Religion Protestant Catholic Jewish
 Mormon Muslim Other
7. Do you have a meal plan? Yes No
 If yes, state the number of meals per week _____
8. How many times per week do you eat? Breakfast ___ Lunch ___ Dinner ___
9. How many times per day do you snack? _____
10. Is the choice of beverage in your cafeteria a factor in your beverage selection?
 Yes No
11. Which of the following do you consume? (check all that apply)

	Fruit Juice/Drink	Milk	Soft Drinks	Coffee/ Tea	Alcoholic Beverages	Other
a. with meals						
b. between meals						
c. under stress						
d. as a snack						
e. during special occasions						

Turn over →

12. Approximately how many glasses of water do you consume per day
 none 1 glass 2-3 glasses
 4-5 glasses 6-7 glasses 8 or more glasses
13. A healthy diet should include how many glasses of water per day.
 1 glass 2-3 glasses 4-5 glasses
 6-7 glasses 8 or more glasses
14. If you consume carbonated and alcoholic beverages, do you try to limit the amounts in your diet?
 Yes No
15. A healthy diet should include how many servings of the following per day?
 _____ Meat, poultry, fish, dry beans, eggs, and nuts group
 _____ Milk, yogurt, and cheese group
 _____ Vegetable group
 _____ Fruit group
 _____ Bread, cereal, rice, and pasta group
16. On the average, how many times per week do you exercise thirty minutes or more? _____
17. If yes, which of the following comprise your exercise activities?
 Aerobics Bicycling Swimming
 Weight Running Other (list) _____

Consumption

For the following beverages, please check in the first two column which ones you never consume, and which ones you consume less than once per day. Please provide the appropriate amounts consumed in a typical day and weekend in columns three and four.

	Never Consume (please check all that apply)	Consume less than once per day (please check all that apply)	Number of 8 oz glasses consumed in a typical day	Number of 8 oz glasses consumed in a typical weekend
Milk				
Whole Milk				
2% Milk				
1% Milk				
1/2% Milk				
Skim Milk				
Milk Shakes				
Other				

	Never Consume (please check all that apply)	Consume less than once per day (please check all that apply)	Number of 8 oz glasses consumed in a typical day	Number of 8 oz glasses consumed in a typical weekend
Juice				
Orange				
Apple				
Cranberry				
Cranapple				
Pineapple				
Grape				
Grapefruit				
Lemonade				
Other				
Vegetable Juice				
Tomato				
V-8				
Other				
Fruit Drinks/Punch				
Mystic fruit drinks				
Twister fruit drinks				
Orange Drink				
Lemonade Punch				
Fruit Punch				
Koolaid				
Other				
Water				
Tap water				
Non-carbonated bottled water				
Carbonated bottled water				
Sparkling water				
Flavored water				
Other				
Soft Drinks				
Cola type				
Diet cola type				

Turn over →

Soft Drinks Cont'd	Never Consume (please check all that apply)	Consume less than once per day (please check all that apply)	Number of 8 oz glasses consumed in a typical day	Number of 8 oz glasses consumed in a typical weekend
Sprite/Fresca/7-up				
Strawberry				
Rootbeer				
Orange				
Other				
Miscellaneous				
Iced Tea				
Hot Tea				
Flavored Tea				
Decaffeinated Tea				
Coffee				
Decaf coffee				
Flavored Coffee				
Hot Chocolate				
Sport Drinks (Gatorade, etc.)				
Other				
Alcohol				
Beer				
Wine				
Wine Coolers				
Champagne				
Liquor				

Thank you for your cooperation.

Now, turn this into the front desk to receive your special gift!

VITA

Audrey Lynn Dennis

Candidate for the Degree of
Master of Science

Thesis: BEVERAGE PREFERENCES AND CONSUMPTION PATTERNS OF
COLLEGE STUDENTS

Major Field: Nutritional Sciences

Biographical:

Personal Data: Born in Pawnee, Oklahoma, October 22, 1970, the daughter of Robert W. and Betty N. (Kelley) Dennis.

Education: Graduated from Pawnee High School, Pawnee, Oklahoma, in May, 1988; received Bachelor of Science Degree in Nutritional Sciences from Oklahoma State University, Stillwater, Oklahoma in December 1993; completed Approved Pre-Professional Practice Program at Oklahoma State University, May 1995; completed requirements for the Master of Science Degree at Oklahoma State University in July 1995.

Professional Experience: Graduate Research Assistant, School of Hotel and Restaurant Administration, Oklahoma State University, January 1994-June 1994; Foodservice Operations Assistant Manager, Stripes Catering, Stillwater, Oklahoma, April 1993-August 1994.

Professional Memberships: American Dietetic Association, Oklahoma Dietetic Association, and Kappa Omicron Nu.

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 07-29-94

IRB#: HE-95-002

Proposal Title: BEVERAGE PREFERENCES AND CONSUMPTION PATTERNS
OF COLLEGE STUDENTS

Principal Investigator(s): Lea L. Ebro, Audry L. Dennis

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved


APPROVAL STATUS SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT
NEXT MEETING.

APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A
CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD
APPROVAL.

ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR
APPROVAL.

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

Signature:


Chair of Institutional Review Board

Date: August 26, 1995