DIETARY INTAKE AND IRON STATUS OF 3 AND 4 YEAR OLD HISPANIC, BLACK AND WHITE CHILDERN PARTICIPATING IN THE SPECIAL SUPPLEMENTAL FOOD PROGRAM FOR WOMEN INFANTS AND CHILDREN

BY

JENNIFER L. VAN AUKEN

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Thesis Approved:

Lee L Ebro
Thesis Advisor

B K Kapell

C M Wade

Thomas C. Collins
Dean of the Graduate College

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CHAPTER I

INTRODUCTION

There are a significant number of children who live in poverty in the United States who do not have access to an adequate diet. These children are at greater risk for growth retardation, obesity, iron-deficiency anemia, dental disease and poor academic performance. For these children, public food assistance programs are of critical importance. Studies have shown that these food assistance programs are associated with improvements in dietary intake and nutritional status. One such program is the Special Supplemental Food Program for Women, Infants, and Children (WIC) (Albertson, Tobelmann, Engstrom,and Asp, 1992). Of particular concern are Hispanic children living in poverty who are currently participating in WIC, since they are the largest growing minority population currently in the United States (Aguirre-Molina, Ramirez, and Ramirez, 1993).

There have been studies and surveys that have reported low intake of essential nutrients such as iron, calcium, vitamin B6, zinc, and magnesium in the Hispanic and American population groups. These studies include the Nationwide Food Consumption Survey, The National Health and Nutrition Examination Surveys (NHANES I, II and III and the HHANES). NHANES III is currently being conducted. Nutritional results of these studies are based on the Recommended Dietary Allowances (RDA'S) set forth by the Food and Nutrition Board (Alberston, et al., 1992). A report by the Department of Health and Human Services (DHHS), Healthy People 2000, states that iron deficiency anemia continues to be of special concern for poverty stricken children. A goal of this report is to reduce iron deficiency anemia in low income children ages three and four to less than three

percent by the year 2000. Healthy People also states that there is a need for a continuous nationwide nutritional monitoring system. Therefore, it supports the need to study children from minority groups such as Hispanics (US Department of Health and Human Services [US DHHS], 1994).

The Surgeon General's Report on Nutrition and Health states that children should consume foods that are good sources of iron such as lean meats, fish, certain beans, iron rich cereals and whole grain products. The report also states that, because of the serious consequences of iron deficiency, a continual monitoring of individuals at high risk is vital (Public Health Service (PHS), 1986). There has been little research on dietary intake and low iron levels in the blood of three and four year old Hispanic children participating in the WIC program. Since many of these children depend on the food provided by WIC as a main source of iron, it is important to identify certain trends to ensure that they are receiving the maximum benefits of this program.

Purpose and Objectives of the Study

The purpose of this study was to determine dietary intake and iron status of three and four year old Hispanic, Black and White children participating in the WIC program in Clark County, Las Vegas, NV.

Specific objectives were:

1. To determine if selected personal/health variables were associated with the iron status of children ages three and four participating in the WIC program. Personal/health variables include gender, age, ethnicity, weight, height, and vitamin and mineral supplementation.
2. To determine if selected personal/health variables were associated with the dietary intakes of children ages three and four participating in the WIC program. Personal/health variables include gender, age, ethnicity, weight, height, and hematocrit.

3. To determine if selected personal/health variables were associated with dietary intake and the Nevada Food Guide Pyramid for children ages 2 through 5 participating in the WIC program. Personal/health variables include gender, age, ethnicity, weight, height, and hematocrit.
4. To determine if there were associations between expected height, weight and actual height and weight based on gender, and expected height and weight and mean height and weight based on age.

Hypotheses

H1o - There will be no significant association between iron status of children participating in the WIC program and selected personal/health variables. Selected personal/health variables were:

1. Gender
2. Age
3. Ethnicity
4. Weight
5. Height
6. Vitamin and mineral supplementation

H2o - There will be no significant association between dietary intake of children participating in The WIC program and selected personal/health variables. Selected personal/health variables were:

1. Gender
2. Age
3. Ethnicity
4. Weight
5. Height
6. Hematocrit

H3o - There will be no significant association between dietary intake and the Nevada Food Guide Pyramid of children ages 2 through 5 participating in the WIC program and selected personal/health variables as listed in H2

H4o - There will be no significant association between expected height, and weight and actual height and weight based on gender, and mean expected height and weight and actual height and weight based on gender.

Assumptions and Limitations

The assumptions made regarding this study include:

1. The Competent Professional Authorities (CPA's) and the WIC clerks have adequate training in explaining to the participants' parent or guardian how to correctly complete the questionnaire.
2. The participant's guardian or parent will complete the questionnaire based on what is rather than what they perceive as ideal.

A limitation in this study was the fact that only data from records of 3 and 4 year old Hispanic, Black, and White children participating in WIC during the year 1994 were analyzed from one clinic out of five, which was predominately Hispanic. Results from this study can therefore only be generalized to this group of participants.

Definitions

CPA: Certified Professional Authority; physician nutritionist, registered nurse, registered dietitian, or any person who passes the examination to become a CPA.

Nevada Food Guide for Children 2 to 5 years: Outline for children ages two through five of what to eat each day and the range of servings from each food group. Taken from the United States Department of Agriculture (USDA) Food Guide Pyramid,

which Nevada has adapted to make age appropriate for serving sizes and number. (Appendix A)

Participants: Those who participate in WIC, who receive nutritional and dietary assessment, education and vouchers.

Black: Relating to a group or race characterized by dark pigmentation.

White: Relating to a group or race of people characterized by light pigmentation.

Hispanic: Relating to the people of or culture of Mexico, Puerto Rico, Cuba, and Latin America.

Healthy People 2000: Administered by the Public Health Service, a broad based initiative aimed at improving the health of the American people over the next decade.

NHANES: National Health and Nutrition Examination Survey (I, II, III, and HHANES), source of periodic information on the dietary, nutrition and health status of the US population.

National Food Consumption Survey: Conducted by the U.S. Department of Agriculture as part of the Continuing Survey of Food Intakes by Individuals. It is conducted on llow-income women and children to determine nutrient intake.

National Nutrition Monitoring System: Composed of federal and state surveys and surveillance systems and other monitoring activities. These provide information about the dietary and nutritional status of the U.S. population and certain conditions which affect the health of individuals.

Surgeon General's Report on Nutrition and Health: Reviews scientific evidence and recommends dietary changes that help improve the health of the American people.

Food Guide Pyramid: A graphical representation of what to eat each day, allowing one to chose a healthful diet that fits a particular lifestyle.

CHAPTER II

REVIEW OF LITERATURE

This chapter will include a review of the following major topics: overview of WIC, nutritional studies on children, nutritional studies on the Hispanic population, iron studies and various nutrition studies and surveys. Results of selected research will also be discussed in this chapter.

Overview of the WIC Program

The WIC program is an outgrowth of the 1969 White House Conference on Food, Nutrition and Health. During this conference, in the sections referring to pregnant and nursing women and infants it was stated:

> "Hunger and malnutrition constitute a national emergency which requires an immediacy of response fully commensurate with the scope and severity. Delays are intolerable either in initiating relief, or in developing and funding long term programs for remedy and intervention." (Strategies for Expanding, 1988, pg. 2)

Congress also created the Commodity Supplemental Food Program (CSFP) in 1969. This program purchased surplus commodities from the agriculture sector and distributes the surplus to low-income women, infants, and children under the age of six (Strategies, 1988). Consequently in 1972, Congress passed Public Law 92-433 which created the Special Supplemental Food Program for Women Infants and Children (WIC) (Child Nutrition Act of 1966, 1972). This law provided cash grants to states for the purpose of providing funds to local agencies to carry out the WIC program. This bill was originally a two year pilot program, created to provide supplemental food to pregnant or lactating women and infants up to age four who were low-income and determined to be at nutritional

risk by a competent professional (Child Nutrition Act of 1966, 1972). The program has been reauthorized five times and in 1974, Congress expanded the WIC program to include the nursing mothers up to one year, post-partum non-nursing mothers up to six months and children up to age five (Budgetary Examination of Investment Potential, 1991).

In 1975, Congress enacted a number of amendments which included income eligibility, nutrition risk criteria, and nutrition education. The income standards were to met the standards for free and reduced price meals under Section A of the National School Lunch Act. Competent Professional Authorities (CPA's) were to determine the nutritional risk of the client. These professionals were defined as physicians, nutritionists, registered nurses or dietitians. In addition to determining nutritional risk, they were to prescribe the appropriate food package (Child Nutrition Act of 1966, 1978). The Congress also required nutrition education for participants and no less than one-sixth of 1978 administration funds be used for this activity (Strategies, 1988). In 1981, the Budget Reconciliation Act lowered the maximum income eligibility level for reduced price meals from 195% of poverty to 185% of poverty, thereby reducing the eligibility level. In 1989, WIC was again reauthorized through fiscal year 1995, with a $150 increase over the current services. This increase added approximately 300,000 new participants (Child Nutrition and WIC Amendment, 1989).

Population Served

The WIC program serves pregnant women, post-partum women who are breastfeeding for up to one year, post-partum women non-breastfeeding for up to six month, infants and children up to age five. These participants must be low-income, less than 185% of poverty, and be at nutritional risk. In 1974, the program served approximately 88,000 participants at a cost of $10.4 million per year (Rush, 1988). By 1980, WIC was serving about 1.9 million participants per year with an annual cost of $736 million. In 1987, the numbers increased to 3.4 million participants and $1.7 billion per

year (Issues Affecting the WIC program, 1987). As of 1990, the authorization level had increased to 2.2 billion and at least 300,000 new participants (Reauthorization of the WIC Program, 1989). Almost half of the participants are White, while 30% are Black. The remaining 17% are Hispanic, Asians and others. Over half of those being served are children (51%) while infants and women are both one-fourth of the participants (Strategies, 1988).

Priorities and Nutritional Risk

The fact that WIC is an appropriated program means that there are limited resources for each state, thus a priority system was created. There are six priorities which help determine the eligibility criteria for those considered at highest risk.

Priority I: Prenatal and breastfeeding women demonstrating biomedical, anthropometric or physical/medical risk criteria and infants who are being breastfed by a woman who qualifies for Priority I.

Priority II: Women who are breastfeeding. Infants under six months who were born to program participants, and infants whose mothers were at biomedical, anthropometric or physical/medical risk during pregnancy but did not participate in WIC.

Priority III: Children who are at biomedical, anthropometric or physical/medical risk. Post-partum, non-breastfeeding who meet the same indicators.

Priority IV: Prenatal women who are at dietary risk. Breastfeeding women who meet dietary risk but do not meet any of the indicators in Priority I. Infants who meet dietary risk but do not meet any of the other risk factors.

Priority V: Children who are at dietary risk but do not meet any of the other risk indicators.

Priority VI: Postpartum-nonbreastfeeding women who meet dietary risk but do not meet any of the other risk factors (Special Supplemental Food, 1991).

Nutritional risk is defined in PL 95-627 as: a) detrimental or abnormal nutritional conditions detectable by biomedical or anthropometric measurements; b) other documented nutritionally related medical conditions; c) dietary deficiencies that impair or endanger health or; d) conditions that predispose persons to inadequate nutritional patterns or nutritionally related medical conditions including, but not limited to, alcoholism and drug addiction (Child Nutrition Act of 1966, 1972).

Program Benefits

Food Package

Each food package in WIC is designed to provide a nutrient rich diet. The foods allowed on WIC target five essential nutrients: vitamin A, vitamin C, iron, calcium, and protein (Rush, 1988). The average food package contains milk and/or cheese, fruit and vegetables juices, iron-fortified cereal, eggs and beans and/or peanut butter. These packages may be tailored by a health professionals at the time of certification. There are currently three methods of delivery; warehouse distribution, home delivery and vouchers, with vouchers being the most common. Vouchers are redeemable only for the food specified rather than allowing a dollar amount for foods.

Nutrition Education

Nutrition education was not mandated until 1975. It is required that no less than one-sixth of administration funds be spent on nutrition education. Each participant is required a minimum of two sessions of nutrition education during each six months certification period (Strategies, 1988). The type of education the parent or guardian or the participant receives varies depending on what type of nutritional risk the participant is at. Most often individual counseling is conducted if the participant is at high risk (biomedical, anthropometric, and/or physical/medical), and group counseling if the participant is low-risk (dietary). Written materials are often used in conjunction with counseling. Dietitians

and nutritionists are most often responsible for nutrition education, but physicians, nurses, aides and clerks may also serve as counselors (Strategies, 1988).

Nutritional Studies of Children

Childhood offers an opportunity to influence eating patterns and habits. As a result of an increasing interest in preventative health, children have become the focus in many nutrition issues. In 1986, the American Academy of Pediatrics (AAP) published recommendations for children regarding fat and cholesterol. It was found in the Bogalusa Heart study and other observations that fatty streaks are present in a large number of children by the age of 10 regardless of age, sex or environment (Prudent Life-Style for Children, 1986). The National Institute of Health, in contrast, states that there is no direct evidence that a decrease in fat and cholesterol for children during the first 20 years help in decreasing cholesterol over the life span. The NIH also stated, "If dietary intervention in the general population is to be effective, the eating habits of the entire family must by changed. Thus, the recommended diet should be available to all family members except those younger than two years." (Harper, 1978, pg.316). It has been suggested that because of children's special nutritional needs and concerns, such as iron deficiency anemia, that changes in current dietary patterns not be recommended for the first two decades of life without first assessing the effects on growth development and measures of nutritional adequacy as iron status (Prudent Life-Style,1986)

More recently, it has been recommended that the primary goal of the diet in childhood should be to achieve normal growth and development. No single food should be considered bad, in particular where food supply is limited and children are at greater risk for malnutrition. No restriction should be placed on children under two years of age and after that the change to a lower fat diet should be considered a transition time when children gradually decrease to the recommended amounts (Statement on Cholesterol, 1992).

Although these recommendations have been made, evidence suggests that overweight is more prevalent among children than underweight (National Research Council, 1989). Data, however, revealed that energy intakes have remained constant over the last decade (Albertson, et al., 1992). This is reflected in the results of the 1977-78 and the 1987-88 NFCS; children are consuming no more fat today than they were 10 years ago (Consumer Nutrition Center, 1982). The NHANES III study further reflects these trends. Mean energy intakes in NHANES III were similar to those reported in NHANES II for children under 12. Fat intake was lower in NHANES III, as well as percentage of fat from calories. It fell from 36% fat from calories to 34% (Alaimo, McDowell, Briefel, Bischof, Caughmann, Loria, and Johnson, 1994). There are a number of factors which could contribute to the lower consumption of fat including, lower fat foods available on the market, an increase in consumption of high carbohydrate foods, and methodological differences between studies (McPherson, Montgomery, and Nickman, 1995).

Overnutrition may be the most prevalent health problem for children today, however, there are still a few who suffer from undernutrition. There is also a problem of underconsumption of some healthy foods such as fruit and vegetables. Energy restriction in children is most often limited to certain population groups such as low-income, minority subgroups, homeless children and children with disabilities. In 1976, a study done by Cook, Davis, Radake, and Thornbuy, showed that the dietary pattern and foods consumed varied between socioeconomic groups. The children from the lower socioeconomic groups consumed a smaller variety of foods and fewer snacks. Growth retardation in a population is defined as five percent below the fifth percentile of height for age, compared to the NCHS charts. In 1988, the prevalence for growth retardation exceeded five percent for certain population groups; low-income Hispanics, low-income Black and low-income Asian, Pacific Islanders. Data from 1992 indicates that there is a decrease in underweight children in these sub-minority groups (McPherson, et al., 1994). Iron deficiency is also a

result of undernutrition, and it has been shown to be associated with low-birth weight and retardation of growth and weight gain (Lozoff, Jimenez, and Wolf, 1991).

There has been an increased awareness of the consumption of fruit and vegetables, due to their prevention in cancer in certain populations groups. Dittus, Hillers and Beerman (1995), found that although consumption of fruit and vegetables has increased 17% since 1970, overall intake remains less than the recommended five a day. It was also shown that families from lower-income and less education tend to consume fewer fruit and vegetables. Higher cost of fruit and vegetables, as well as limited availability may hinder consumption of these foods even when the benefits are known. A study by Kirby, Baranowski, Reynolds, Taylor, and Binkley (1995), also reported that children from low-socioeconomic families had fewer fruits and vegetables available in their home. This study provided no evidence related to ethnicity. It did, however, show that children liked the taste of fruits over vegetables and that parents forced them to eat vegetables.

There are a number of factors which influence the consumption patterns of children including, parents and the education of parents, attendance at child care centers, socioeconomic status, ethnicity, locality of residence and food availability. Parents are the primary influencers of the eating behaviors of three to five year olds. Parents decide when their children will eat as well as what they eat (Schlicker, Borra, Regan, 1994). In addition, a study done in 1992 reported that children where parents consumed high amounts of saturated fat were 5.5 times as likely to also consume high amounts of fat compared to children whose parents did not consume a lot of fat. A statistical significant difference was found in all nutrients except potassium (Oliveria, Ellison, Moore, Gillman, Garrahie, and Singer, 1992). Parents working patterns also have an influence on what the child consumes. Children whose parents work and are attending child care may be lacking in some nutrients. A study done by Drake (1991), found that children in child care settings were more likely to be consuming less iron and folic acid. In addition, Pond-Smith, Richarz, and Gonzalez (1992) also found that non foodservice staff in child care centers

may lack knowledge and commitment to food service, which may affect nutritional quality of food served. Parental income and education contribute to the eating patterns of their children. Families with lower income spend more on food per dollar than those with higher incomes. Single mothers who are head of households are also more likely to buy more preprepared foods, fast foods, and convince foods (Crockett and Sims, 1995). In addition, those who are less educated have been shown to be the most confused over many dietary recommendations and felt that the expense was a barrier to making change (Cotugna, Subar, Heimendinger, and Kahle, 1992).

Ethnicity has an impact in consumption patterns of children. Hispanic and Blacks are the largest minority populations in the USA; together they make up 20% of the population. Both groups carry diverse backgrounds in consumption patterns. It has been shown that Black children have lower vitamin A intakes and higher total fat, cholesterol and sodium intakes (Johnson, Guthrie, Smicklas-Wright, and Wary, 1994). Hispanics, however, showed the lowest fat intake (McDowell, et al., 1994), but still had low fruit and vegetable consumption (Basch, Zybert, Shea, 1994). Food availability and locality of residence are an issue for many low-income families. Those children from rural areas were less compliant with the dietary guidelines than those in urban areas (Johnson, et al., 1994). Those households with low-income have decreased their consumption of fresh fruits and vegetables by 22 % between 1977-78 and 1987-88 (Crockett and Sims, 1995).

Nutritional Studies on the Hispanic Population

The Hispanic population is the fastest growing ethnic group in the United States, currently they make up 8.2% of the population. If current trends continue, in 10 years, they will represent the largest minority population. Hispanic children traditionally come from low-income families and present a number of nutritional problems associated with low-income and low education levels. It has been found that Hispanic children have an increased incidence of growth impairment, anemia, and vitamin deficiencies (Dewey,

Metallinos, Strode, All, Fitch, Holguin, Kraus, McNicholas, 1984). Although interventions have been made in all these areas for the rest of the population, Hispanics remain inadequately represented among groups which have benefited (Aguirre-Molina, et al., 1993). The Hispanics, while having a variety of significant needs, have a variety of strengths. Traditionally, the Hispanic diet consists of maize, beans, and squash (Diabetes Care and Education Dietetic Practice Group, 1989). It is when they become more acculturated that their health status worsens (Hispanic Health in the US, 1991).

A typical Hispanic meal consists of tortillas, beans and rice, meat or sausage and perhaps a vegetable. Meat consumption most often depends on the families finances. A variety of fresh vegetables are consumed, but not as separate dishes. Fresh fruits such a papaya, mango, guava, and pineapple are also popular when available and when they can afford it (Diabetes Care, 1989). The diet patterns for many Hispanics has changed in recent years. Research has shown that many Hispanics are consuming more meats, breakfast cereals, and peanut butter (Dewey, et al., 1994). Many also consume greater quantities of milk in the United States. Basch, et al. (1992), found that children's greatest source of saturated fat was from whole milk, and that as the children grow older their milk consumption decreases. With regard to fruit and vegetable intake, these children consumed fewer than the recommended five a day. Even after the serving sizes were halved, thereby doubling the number of servings, less than half of the children meet the recommendations. It was also found that on days where consumption of fruit drinks or punch was high, consumption of fruit juice was low. Murphy, Castillo, Martorell and Mendoza (1990), also found fruit and vegetable intake less than half (33%-47%) of the recommended four servings a day used in their study. They also found bread intake was approximately one serving short of the recommended four a day. Many persons in this population have adapted the habit of snacking. They consumed moderate to high amounts of candy, cookies, ice cream and soda (Dewey, et al., 1984). Although Hispanics have made their dietary patterns more closely resembling the American diet, their fat intake was lower than

non-white Hispanics or Blacks, and their percentage of fat calories was also lower (Mc,Dowell, et. al, 1994). Despite their changes to a more "American" diet, many feel that their diet and the diets of their of children have improved after coming to the United States (Dewey, et al., 1984). Their knowledge of a healthy diet is, however, lower than Anglo-Americans, and their perception of a health is very different than Anglo-American. (Haffiner, Knapp, Hazuda, and Young, 1985).

Studies on Iron

In 1978, Congress mandated an evaluation of the impact of the WIC program on the nutritional status of women infants and children. This study found discrepancies in previous studies between rates of anemia and participation in the WIC program. A study done in Maryland found no association between hematocrit or hemoglobin levels and participation in WIC, whereas a study by Vazquez-Seoane, Windam, and Pearson (1985), found a near disappearance in anemia after the implementation of WIC. The Center for Disease Control found that there was an increase in hematocrit and/or hemoglobin levels of children who had participated in WIC for six months or longer (Rush, 1988). Oski (1993), found that there has been a decline in the prevalence of anemia for low-income children in the past 15 years. He states, "The overall prevalence of anemia declined from 7.8% in 1975 to 2.9% in 1985. (pg. 192)" He attributes much of this decline to programs such as WIC, which provides iron fortified foods for infants and children. Yip, Binkin, Fleshblood and Trowbridge (1987) also found an association between low-income children who participated in public nutrition programs and a decrease in iron-deficiency anemia. They found that among children seen at the initial visits and then seen at the follow-up visits after enrollment in the program, the rate of anemia had declined more than 50 percent. In this study, Hispanic children were grouped with white children because there was no distinction between Hispanic and non-Hispanic white children in race reporting, thus, making it impossible to distinguish between the two groups.

With all the evidence that there has been a substantial decrease in the prevalence of iron deficiency, one has to wonder if enough has been done. The majority of the studies have been done on WIC participants with little distinction between population groups. In addition, Stockman (1991), points out that , "We should recognize that the specific prevalence data probable underestimate the magnitude of the problem.(pg. 1647)" In a time when we know what causes this and what the effects of it are, we are still seeing iron-deficiency anemia. Oski (1993), states that while severe iron deficiency has been virtually eradicated, mild anemia still persists. Because of the long-term consequences of anemia, it should be prevented in every child.

Other Nutrition Surveys

Healthy People 2000

Healthy People 2000, which is administered by the Public Health Service is a broad based initiative aimed at improving the health of the American people over the next decade. It provides a framework for preventing death and disease, improving quality of life, and reducing poor health status of certain at risk population groups. Three goals of Healthy People 2000 are:

1. Increase the span of healthy life for Americans.
2. Decrease health disparities among Americans.
3. Achieve access to preventive services for all Americans.

(Healthy People 2000, 1991)

It is divided into 22 priorities areas, two of which are related to nutrition and are relevant to this research. These areas are nutrition and surveillance and data systems. Sub-objectives for minorities and other population groups, such as low-income, were established to meet the needs and health problems of these unique groups. The sub-objectives for nutrition are as follows:

2.4: Decrease growth retardation among low-income children aged 5 years and younger to less than 10% (Baseline: up to 16% among low-income children in 1988, depending on age and race.

2.10: Decrease iron-deficiency to less than 3% among children ages 1 to 4 and among women of child bearing age. (Baseline: 9% for children aged 1 through 2 years and 4% for children ages 3 through 4 years, and 5% for women ages 20 through 44 years in 1976 through 1980) (US DHHS, 1994).

The sub-objectives for the surveillance and data systems are as follows:

22.2: Identify and increase where necessary, National data sources to measure progress toward each of the year 2000 National Health Objectives.

22.2a: Identify and increase where necessary, state-level data for at least two-thirds of the objectives in at least 35 states.

22.7: Achieve timely release of national surveillance and survey data needed by health professional and agencies to measure progress toward the National Health Objectives.

(US DHHS, 1994)

National Food Consumption Survey

The National Food Consumption Survey was conducted by the United States Department of Agriculture (USDA), as part of the Continuing Survey of Food Intakes by individuals (CFSII). It has been conducted since 1935 on low-income women 18 through 50 years and children ages one through five years, the most recent being April 1986 through March 1987. The data were collected over a four day, non-consecutive period using the 24-hour recall method. The first day was conducted by a personal interview, with the following days being a telephone interview (National Food Consumption Survey, 1989).

The National Nutrition Monitoring System

The National Nutrition Monitoring System is composed of federal and state surveys and surveillance systems and other monitoring activities. These systems and activities provide information about the dietary and nutritional status of the US population, and certain conditions which affect the health of individuals. They also provide information about relationships between diet and health. This program was passed in 1990 and as a result of the passage, in 1993 the National nutrition Monitoring and Related Research Act was sent to Congress. The goals of this Act are:

1. Collect quality data that are continuous, coordinated, timely, and reliable.
2. Use comparable methods for collecting data and reporting results.
3. Conduct related research.
4. Efficiently and effectively disseminate and exchange information data users.

(US DHHS, Nutrition Monitoring , 1993)

The Surgeon Generals Report on Nutrition and Health

The Surgeon Generals Report on Nutrition and Health was created in response to an increased interest of scientist, health professionals, and the American people in the role of diet and health promotion. It reviews scientific evidence and recommends dietary changes that help improve the health of the American people. In addition, it summarizes research on the diet in health promotion and disease prevention. The findings of the report indicate the importance between diet and health. "They demonstrate that changes in the present dietary practices of America could produce substantial gains in the health of the population." (PHS, 1986, pg. 12).

Food Guide Pyramid

The Food Guide Pyramid is based on the Dietary Guideline for Americans (Appendix A). The pyramid is a graphical representation, developed in 1980, which has been revised twice. The current Guidelines were issued in 1990 (Appendix B). It is a general outline of what to eat each day, which lets one chose a healthful diet that fits a particular lifestyle. The Guidelines are:

*Eat a variety of foods

*Maintain a healthy weight

*Chose a diet low in fat, saturated fat, and cholesterol

*Chose a diet with plenty of vegetables, fruits and grain products

*Use sugars only in moderation

*Use salt and sodium only in moderation, and

*If you drink alcoholic beverages, do so in moderation.

In developing the Food Guide Pyramid five steps were employed which include: 1) establishment of nutritional goals; 2) definition of food groups; 3)assignments of serving sizes; 4) determination of nutrient profiles; and 5) determination of the number of servings. The Food Guide Pyramid was first presented to consumers in 1984 through an American National Red Cross course developed by the USDA.

The Food Guide Pyramid is an outline of what to eat each day and shows a range of servings from each food group. The serving size appropriate for each person will depend on a number of factors such as age, gender, size, and activity level. Preschool children need the same variety as adults so the Food Guide Pyramid pertains to them as well. Their caloric intake will be less however, so their serving sizes will be decreased accordingly.

National Health and Nutrition Examination Survey

NHANES I, II, III, and HHANES are conducted by the National Center for Health Statistics (NCHS) and Centers for Disease Control (CDC). It is a component of the

National Nutrition Monitoring and Related Research Program. These surveys are an important source of information on dietary, nutritional, and health status of the US population. These surveys play a role in nutrition monitoring and epidemiological research, they combine personal interview with standardized health examinations. These are conducted in two 3-year nationally representative phases. These surveys are designed using the 24-hour recall method to estimate nutrient intake for persons two months of age and over, and for three ethnic groups: non-Hispanic white, nom-Hispanic black, and Mexican Americans (Alaimo, et al., 1994).

Summary

Nutrition intervention programs such as the WIC program, aimed at improving the diets and nutritional status of special population groups, depends on the knowledge of what the participants consume. There have been numerous studies which have documented a concrete link between food and health, as well as describing the impact between disease prevention and health promotion (Alaimo, et al., 1994). Several studies have concluded that low-income is a factor of poor dietary intake and those at high risk in this group are children. It has also been pointed out that studies on intervention programs often disregard an examination of dietary intake (Brown, and Tieman, 1986).

The WIC program was created in response to the 1968 "Hunger in America" and the "Hunger USA" report, both of which showed how many in the rural south were living in poverty. Several nutrition surveys completed after these reports revealed that low-income was associated with malnutrition (Graham, 1989). Nutrients which were consumed in small amounts were targeted for WIC to improve dietary intake. One of the nutrients which was found to be low in this population group was iron. Research has indicated that low-income children who did not participate in WIC were more likely to have lower iron intake than those children who were participants. This has also been found to be true of energy consumption. It has been stated that participation in WIC by young

children is associated with higher hematrocrit and hemoglobin levels (Brown and Tieman, 1986).

Due to changes in the demographics of the United States, it is important to consider the dietary intake of nutrient consumption of the Hispanic population. This is the fastest growing population group in the United States and they remain understudied. Zive, Howard, Broyles, Frank-Shohrer, and Nadar (1995), found that there were significant differences in iron intake between Hispanic children and Anglo-American children. Although their energy intakes were lower, their nutrient intake per 1000 kcal was higher. This could possibly mean that Hispanic children are either making wiser food choices or that the Hispanic diets include more protein than their counterparts.

Children have been targeted as an important target group for nutrition intervention. Johnson, Guthrie, Smicklas-Wright, and Wary (1994), point out that health professional benefit from information about the diet of diverse population groups. It has been identified by the 1987-1988 NFCS that low-income children have low nutrient intakes and that race was a factor in several nutrient intakes, however, the Hispanic group was not considered, therefore, they were not represented. It was also found that those receiving public assistance such as WIC and food stamps had higher nutrient intake. Data from NHANES I show that eight percent of White children consumed fruits and vegetables less than once a day, while the HHANES II showed that 25% of Hispanic children consumed fruit and vegetables less than once a day. Low-intakes of these foods may place Hispanic children at risk for nutrients found in these foods (Murphy, et al., 1990). In a study done by Rush (1988), on the impact of the WIC program, it was found that WIC benefits are improving the quality of nutrients, but not increasing the total energy intake. It was found also, that on a given day, a large number of children were still consuming less than 77% of the RDA for many nutrients. Thus, it can be assumed that the WIC program is having its greatest impact on those who are at greatest need, low-income children who are at nutritional risk.

CHAPTER III

METHODOLOGY

This study was designed to assess the dietary intake and iron status of Hispanic, Black, and White children enrolled in the WIC program in Clark County, Las Vegas, NV, in 1994, and was approved by the Director of the WIC program and by the Oklahoma State University Institutional Review Board (Appendix E). The population was taken from one of five WIC clinics, which was largely Hispanic, and had 5000 participants, 875 of them being children. This chapter includes the research design; population and sample; data collection, which includes instrumentation and procedures; and data analyses.

Research Design

The research method used in this study was retrospective descriptive research. The purpose of this design is to describe, analyze, and interpret conditions on trends that exist. It involves comparing and contrasting in an attempt to discover relationships between variables (Monsen, 1991).

The survey method was employed in this research. A survey is "designed to describe and quantify characteristics of a defined population." (Monsen, 1991) The purpose of a survey is to obtain a statistical profile of the population. A survey can establish associations among two or more variables and can provide clues for further study (Mosen, 1991).

Sample and Population

The population used in this study was comprised of 875 three and four year old children participating in the Special Supplemental Food Program for Women, Infants, and Children in Clark County, Las Vegas, NV in 1994. All children who participated in WIC from January 1 through December 31, 1994 were included in the study.

Data Collection

Planning and Development

The planning of this study began in the Spring of 1994. The development of the procedures evolved form a class assignment in NSCI 5123, Research Development in nutritional sciences (NSCI) at Oklahoma State University. Data analysis techniques were also selected in the Spring of 1993 as well as the fall of 1995. Data was collected by the researcher in the summer of 1995, at Economic Opportunity Board, WIC program, in Las Vegas, NV, where the researcher was employed.

The survey instrument was taken from the Nevada WIC programs children's questionnaire which is used to determine if a child has a nutritional risk. The food frequency questionnaire was also taken directly from the WIC program. The questionnaire for children was modified to make it appropriate for this study. The questionnaire for children consisted of three personal variables: date of birth, gender and ethnicity, and three health variables: height, weight, and hematocrit. Four other statements were taken from the WIC questionnaire which were used to describe the eating patterns of the population: 1. How many meals and snacks a day does the child have. 2. Who prepares the meal. 3. Is the child on a special diet. 4. Is the child taking a vitamin or mineral supplement. The food frequency questionnaire consisted of 203 foods and the number of servings of each food group per week. The questionnaire was examined by the graduate committee of the researcher for content, validity, clarity and format. The approved proposals (Appendix D)

were then sent to the Institutional Review Board, Oklahoma State University, for further approval.

Procedures

Using the aforementioned instruments, the data were collected by the researcher from clients data records from the Economic Opportunity Board Clark County WIC clinic in Las Vegas, NV. Only 1994 records were analyzed

Data Analyses

Data collected were coded and transcribed into the computer using the P.C. File Software Program. Standard Statistical Procedures were used to analyze data (SAS, 1979). Frequencies and percentages were used to describe subjects as well as dietary intake. Analyses of variances, Duncan's Multiple Range Test, t-test, and Chi-Squares were used to test the hypotheses in this study.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this study was to determine dietary intake and iron status of three and four year old Hispanic, Black, and White children participating in the WIC program in Clark County, Las Vegas, NV during 1994. Data were obtained using the research instrument described in Chapter III, "Methods and Procedures". Data from 875 questionnaires were used and analyzed.

Characteristics of Survey Participants

Age, Ethnicity, and Gender

Of the 875 children who were included in the study, 46.2% (n=403) were four years old (born in 1990), and 53.8% (n=470) were three years old (born in 1991) (Figure 1). The children who were Hispanic comprised 70.9% (n=616). The remaining were Black (n=131, 15.1%) and White (n=122, 14.0%) (Figure 2). Fifty-one percent (n=442), were female and 49% (n=433) were male (Figure 3).

Hematocrit, Height, and Weight

Over 60% (n=546, 62.5%) of the children had a hematocrit of 34.5% to 40%, while the remaining children had hematocrits under 34% (n=207, 23.7%), and hematocrits over 40% (n=121, 13.8%). A hematocrit under 34.5% is considered low nutrition risk and a hematocrit under 34% is considered high nutrition risk. in the WIC program in Nevada. Ninety-six percent (n=840) had heights between 34.75 inches and 45.38 inches. Three

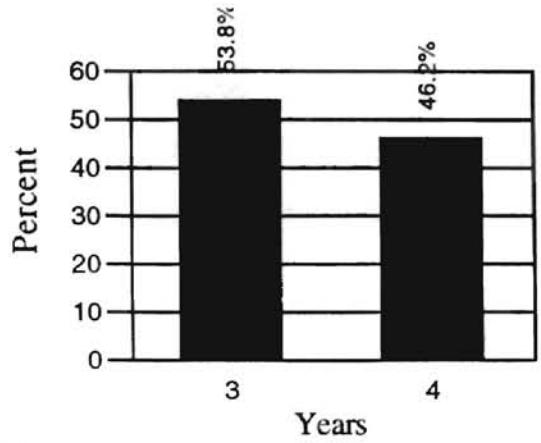


Figure 1. Age of children.

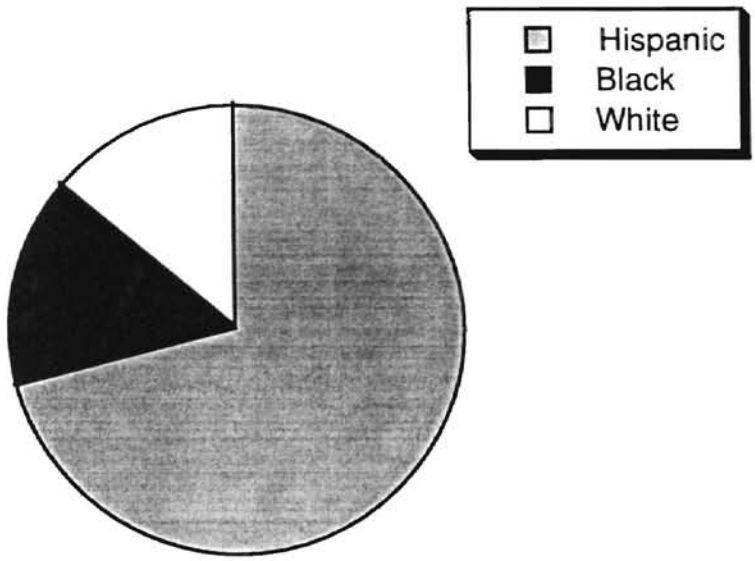


Figure 2. Ethinic composition of children in survey.

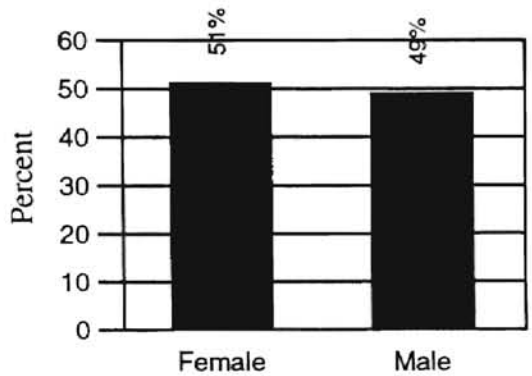


Figure 3. Gender composition of children in survey.

percent (n=28) were 34.5 inches and under, while less than one percent (n=7, .80%) were 45.5 inches and over. Ninety-seven percent (n=852) weighed between 26 pounds and 51 pounds. Of the remaining, 1.4% were under 25.75 pounds and 13% were 51.5 pounds and over (Table 1). The height and weight numbers and percents were taken from the National Center for Health Statistics (NCHS) charts using the 5th and 95th percentiles. This is in line with the study by McPherson et al. (1994), that indicated that there was a decrease in undernutrition in sub-minority groups.

TABLE 1

FREQUENCIES AND PERCENTAGE OF HEALTH VARIABLES OF WIC CHILDREN IN LAS VEGAS, NV

Health Variables	Frequency	Percentage
HEMATOCRIT		
34% and under	207	23.7
34.5% - 40%	546	62.5
40.5% and over	121	13.8
	874	
HEIGHT		
34.5 and under	28	3.2
34.75 - 42.25	840	96.0
45.5 and over	7	.8
	875	
WEIGHT		
25.75 and under	12	1.4
26 - 51	852	97.3
51.5 and over	11	13.0
	875	

Responses to Descriptive Questions

Meals and Snacks per Day, Who Prepares the Meals

Parents of the participants were asked how many meals and snacks per day the child consumes and who prepares the meals. Seventy-nine percent (n=690) consumed three meals per day and about 10% (n=87) consumed two (Figure 4). Forty-one percent

(n=356) consumed 2 snacks per day, while 20.9% (n=181) consumed 3 snacks. The remaining, consumed 4 to as many as 8 snacks per day (n=96, 11.1%) (Figure 5). Of the nine possible responses for who prepares the meals, mother was the most common food preparer (n=782, 89.4%) (Figure 6).

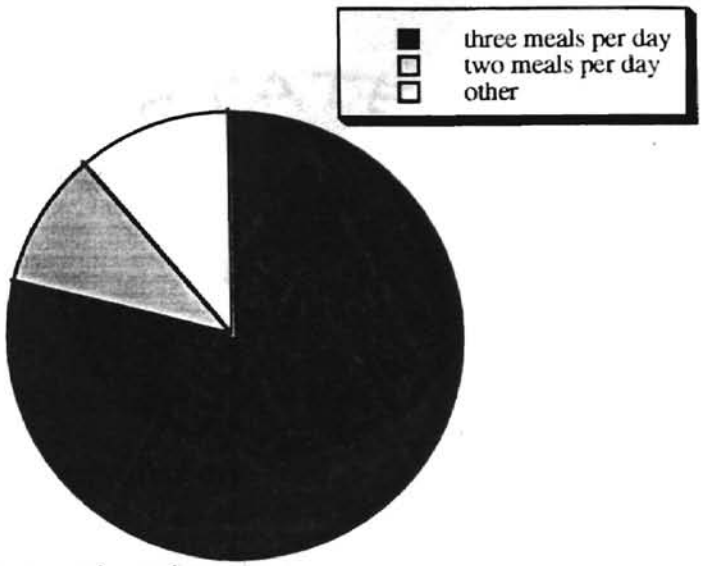


Figure 4. Meals consumed per day.

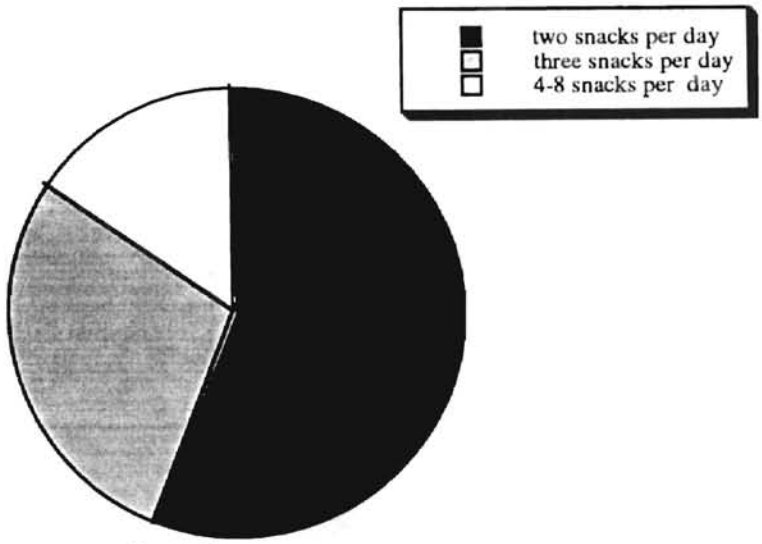


Figure 5. Snacks consumed per day.

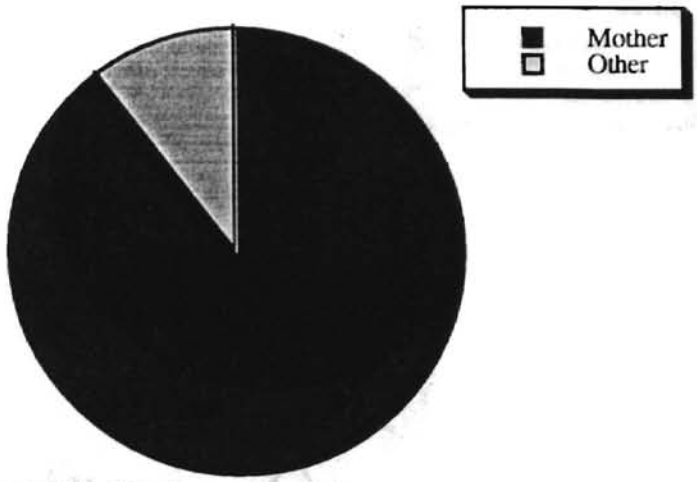


Figure 6. Who prepares the Meals.

Special Diet and Vitamin and Mineral Supplementation

Respondents were asked on the survey instrument if their child was on a special diet and if the child was taking a vitamin and/or mineral supplement. Ninety-seven percent (n=855) of the children were on no a special diet, while only 20 of the children were on a special diet (Figure 7). Seventy-two percent (n=631) of the children were taking no vitamin and/or mineral supplement, while 23.7% (n=207) were taking a multivitamin and mineral supplement, while 4.2% (n=37) were taking another type of supplement as shown in Figure 8.

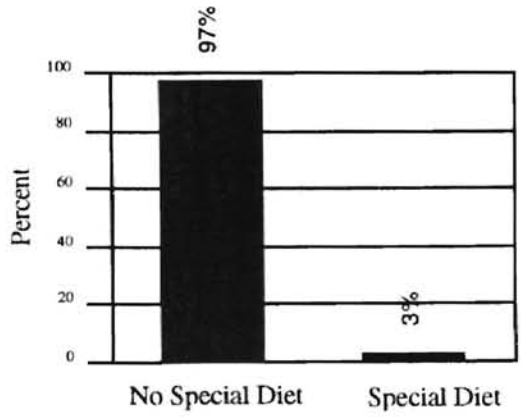


Figure 7. Special Diet.

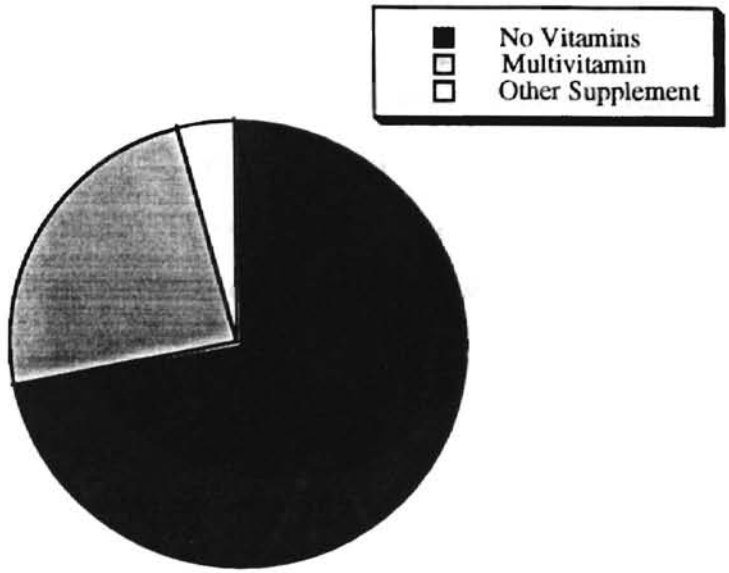


Figure 8. Vitamin and Mineral Supplement.

Responses to Food Frequency Checklist and
Servings per day of the food groups

The food Freqency checklist consisted of 203 different types of foods clustered under nine sections with sub groupings. When filling out the checklist, the parent/ guardian of the child was told to circle each type of food the child consumed. This section will describe the foods typically eaten by this population group. The percentages for each particular food eaten was based on the total sample of 875.

Frequency of Intake for Dairy

Milk Products

The majority of the participants checked that their children consumed whole milk (n=702, 80.2%), followed by chocolate milk and yogurt. A small number consumed other milk products such as Mexican chocolate which is common in the Hispanic culture. Table 2 shows the frequencies of these foods. These results are in line with the study by Basch, et al. (1994) which found that Hispanics greatest source of saturated fat was from whole milk.

Cheese

Over half of the children consumed hard cheese along with American cheese (n=493, 56.3%; n=487. 55.7%), while only 96 (11.0%), consumed cottage cheese (Table 2). The most likely explanation for over one half consuming both hard cheese and American cheese is that these food items are both allowed on the WIC program.

Other Milk Products

Almost two-thirds of the children (n=528, 60.3%) consumed ice cream, while about 20% consumed frozen yogurt, pudding, and/or ice milk (n=204, 23.3%; n=182,20.8%; n=171, 19.5%). Only a few consumed flan or custard, which are typically Hispanic desserts. (Table 2)

TABLE 2

FREQUENCY OF INTAKE FOR DAIRY PRODUCTS

Variable	Frequency	Percentages
MILK PRODUCTS		
Whole Milk	702	80.2
Chocolate Milk	146	16.7
Yogurt	143	16.3
2% Milk	82	9.4
Cottage Cheese	38	4.3
Mexican Chocolate	34	3.9
Cream Soup	34	3.9
Milk Shakes	24	2.7
1% Milk	12	1.4
Non-Fat Milk	8	0.9
Goats Milk	7	0.8
CHEESE		
Hard Cheese	493	56.3
American Cheese	487	55.7
Cottage Cheese	96	11.0
OTHER DAIRY		
Ice cream	528	60.3
Frozen Yogurt	204	23.3
Pudding	182	20.8
Ice Milk	171	19.5
Flan	57	6.6
Custard	13	1.5

Dairy Product Cosnumption by Number of Servings

The dairy products were divided into three categories. These categories were milk products, cheese and other dairy products.

Total Dairy Products

The recommended amount of dairy products, according to the Food Guide for 2 to 5 year olds in the Nevada WIC program, for a child age three to four is four to six servings per day. Only 36% met this requirement. In contrast, about half of the children consumed less than four servings a day (n=476, 54.4%) as shown in Table 3. From these results one can assume that milk products are the majority of the total dairy products.

Milk Products

Almost half of the children consumed between one and two servings a day and over two servings a day (n=406, 46.4%; n=428, 48.9%). The remaining milk products are listed on Table 3, with the maximum being 12.

Cheese

Over 60% (n=548, 62.2%) consumed less than one serving a day of cheese, while 31.8% (n=278) consumed between one and two servings a day. The highest number of servings per day was five (Table 3).

Other dairy Products

As shown in Table 3, 68.2% (n=597) of the children consumed less than one serving a day of other milk products. About 15% consumed either zero serving a day or between one and two servings a day (n=139, 15.9%; n=133, 15.2%). Less than one percent consumed over two servings per day with the maximum being five.

TABLE 3

FREQUENCY OF DAIRY PRODUCTS CONSUMPTION

Servings per day	Frequency*	Percentage
TOTAL DAIRY PRODUCTS		
less than 4	476	54.4
4 - 6	316	36.1
over 6	83	9.5
MILK PRODUCTS		
0	4	.5
less than 1	37	4.2
1 - 2	406	46.4
greater than 2	428	48.9
CHEESE		
0	20	2.3
less than 1	548	62.6
1 - 2	278	31.8
greater than 2	29	3.3
OTHER DAIRY PRODUCTS		
0	139	15.9
less than 1	597	68.2
1 - 2	133	15.2
greater than 2	6	.7

*n=875 for each group

Frequency of intake for Protein

Eggs and Other Protein Foods

Almost all of the children consumed eggs (n=796, 91.0%), while over half consumed both peanut butter and beans, (n=591, 67.5%; n=543, 62.1%). Less than one-fourth consumed the remaining protein foods listed on Table 4. Eggs may be consumed by such a large majority due to the fact that the allowance for them on The WIC program is four dozen a month per child or participant.

Meat

Over three-fourths (n=689, 78.7%), of the participants checked that their children consumed chicken, while 70% (n=619) consumed hamburger. Nearly half consumed both ham and beef (n=426, 48.7%; n=378. 43.2%), followed by fish, tuna and pork being consumed by at least 30% of the children. The remaining consumed less than one fourth of the other meats as listed in Table 4. Parents of the participants receive no vouchers for any type of meat..

Processed Meats

Fifty-one percent (n=446) of the participants consumed hot dogs, while close to 40% (n=384, 43.9) consumed bologna. Just over one-fourth consumed bacon (n=253, 28.9%) with the remaining foods being consumed by less than 20% of the children (Table 4).

TABLE 4

FREQUENCY OF INTAKE FOR PROTEIN PRODUCTS

Variable	Frequency	Percentages
OTHER PROTEINS		
Eggs	796	91.0
Peanut Butter	591	67.5
Beans	543	62.1
Lentils	116	13.3
Nuts	74	8.5
Seeds	45	5.1
Tofu	6	.7
MEATS		
Chicken	689	78.7
Hamburger	619	70.7
Ham	426	48.7
Beef	378	43.2
Fish	315	36.0
Tuna	312	35.7
Pork	266	30.4
Turkey	159	18.2
Liver	93	10.6
Lamb	8	.9
Game	7	.8
PROCESSED MEATS		
Hot Dogs	446	51.0
Bologna	384	43.9
Bacon	253	28.9
Lunch Meat	171	19.5
Fried Fish	155	17.8
Cold Meat	145	16.6
Cold Cuts	73	8.4

Protein Products Consumed by Number of Servings

Protein was divided into four categories. Protien in the form of eggs, protein type foods, meats and processed meats will be discussed in this section.

Total Protein

About 30% of the children (n=315, 36.1%) consumed the recommended two to three servings per day, while 54% (n=476) consumed less than two servings. Only 83 children (9.5%) consumed more than three servings per day (Table 5)

Eggs

Almost three-fourths (n=631, 72.1%) of the children consumed less than one egg per day, followed by 24.8% (n=217) consuming one to two servings per day, with the remaining listed on Table 5. The largest number of eggs reported to be consumed by any child was five per day.

Other Protein

Over 60% (n=530, 60.6%) consumed less than one serving per day of other protein foods, while about 30% (n=319, 36.4%) consumed between one and two servings. The remaining are listed in Table 5, with the maximum being 5.

Meats

Over one half (n=488, 55.8%) of the children consumed less than one serving of meat per day, while 41.2% (n=361) consumed between one and two servings per day. Thirteen of the children consumed either no meat or more than two servings per day as shown in Table 5. Five was the maximum servings of meat consumed per day.

Processed Meats

Sixty-nine percent of the children (n=604) consumed less than one serving per day of processed meats, while about 15% consumed either no processed meats or over two servings per day (n=123, 14.4%; n-145, 16.6%). The maximum servings consumed per day were five. (Table 5)

TABLE 5

PROTEIN PRODUCTS CONSUMPTION
BY NUMBER OF SERVINGS

Servings per day	Frequency*	Percentage
TOTAL PROTEIN		
less than 2	476	54.4
2 - 3	316	36.1
over 3	83	9.5
EGGS		
0	18	2.1
less than 1	631	72.1
1 - 2	217	24.8
greater than 2	9	1.0
OTHER PROTEIN		
0	13	1.5
less than 1	530	60.6
1 - 2	319	36.4
greater than 2	13	1.5
MEATS		
0	13	1.5
less than 1	488	55.8
1 - 2	361	41.2
greater than 2	13	1.5
PROCESSED MEATS		
0	123	14.4
less than 1	604	69.0
1 - 2	145	16.6
greater than 2	3	.3

*n=875 for each group

Frequency of Intake for Fruits

Vitamin C Juices and Fruit

As shown in Table 6, nearly three-fourths of the children consumed orange juice (n=613, 70.1%). Over 60% consumed both oranges and WIC juices, the approved WIC juices consist of orange, grape, apple, grapefruit, and pineapple (n=607, 69.4%; n=549,62.7%). Thirty-one percent consumed strawberries (n=272), while 29% (n=257)

consumed pineapple juice. Oranges are available year round and are economical, which could account for the high number of children consuming oranges. Consumption is high because the WIC program offers a substantial amount of juice hence, over 60% consume it. These results are similar to the findings of Dittus, Hillers and Beerman (1995), which stated that the high cost and limited availability of fruits and vegetables may hinder the consumption of these foods even when the benefits are known.

Vitamin A Fruit

Less than one-fourth of the children consumed any vitamin A fruits as shown in Table 6. A possible explanation for this could be that the vitamin A fruits listed on the food frequency are more expensive and less accessible than the other types of fruits. In addition the vitamin A fruits listed are not a voucher food.

Other Fruits

Nearly three-fourths of the participants consumed apples and bananas (n=676, 77.3; n=647, 73.9%), while almost 50% consumed grapes and raisins (n=404, 46.2%; n=385, 44.0%). Thirty-four percent (n=296) consumed melons. The type of melon was not specified on the Food Frequency checklist form. Peaches, pears and watermelon were consumed by about one-fourth of the children (n=260, 29.7%; n=201, 23.0%; n=184, 21.0%). The remaining were consumed by less than 20% of the children as shown in Table 6. Apples and bananas can be bought in large quantities and at a low price at both the farmers market and the grocery store which could account for the large number consumed. The fruits that were chosen less often are more tropical, more difficult to find, and also more expensive, which could account for their low consumption.

Other Juices

Over half of the participants consumed apple juice (n=560, 64.0%), followed by grape juice which was consumed by about 36% of the children (n=317, 36.2%). Pineapple juice was consumed by one-fourth of the participant (n=223, 25.5%). The remaining juices were consumed by less than five percent as indicated on Table 6. The other juices are juices which are not good sources of vitamin C. Apple and grape juice are easy to find and are cheaper than the other juices such as pear and cherry juice. This could be the reason these juices were chosen more often.

TABLE 6

FREQUENCY OF INTAKE FOR FRUITS

Variable	Frequency	Percentages
VITAMIN C FRUITS AND JUICE		
Orange Juice	613	70.1
Orange	607	69.4
WIC Juice	549	62.7
Strawberry	272	31.1
Pineapple Juice	257	29.4
Mango	198	22.6
Tangerine	158	18.1
Cantaloupe	111	12.7
Kiwi	77	8.8
Papaya	76	8.7
Grapefruit Juice	60	6.9
Grapefruit	50	5.7
VITAMIN A FRUIT		
Peach Nectar	189	21.6
Apricots	55	6.3
Apricot Nectar	4	1.3

TABLE 6 Continued

Variable	Frequency	Percentages
OTHER FRUIT		
Apples	676	77.3
Banana	647	73.9
Grapes	404	46.2
Raisins	385	44.0
Melon	296	33.8
Peaches	260	29.7
Pears	201	23.0
Watermelon	184	21.0
Applesauce	174	19.9
Pineapple	149	17.0
Combination Fruit	133	15.3
Plum	80	9.1
Nectarines	75	8.6
Cherries	66	7.5
Berries	63	7.2
Pomegranate	38	4.3
Figs	19	2.2
Persimmons	13	1.5
Dates	7	.8
Loquates	5	.6
OTHER JUICE		
Apple Juice	560	64.0
Grape Juice	317	36.2
Pineapple Juice	223	25.5
Cranberry Juice	39	4.5
Pear Juice	39	4.5
Cherry Juice	29	3.3
Other Juice Without Vitamin C	28	3.2

Fruit Consumed by Number of Servings

Fruit was divided into five categories. The first two being vitamin C juice and vitamin C fruit. The third was vitamin A fruit and the last two were other fruit and other juice without vitamin C.

Total Fruit

The total fruit intake frequencies and percentages are shown in Table 7. Almost 60% n=497, 56.8%) of the children consumed two to four servings a day, which is the recommended amount for children, three to four years old. Thirty percent (n=264) consumed four to six servings a day with the maximum being 13. The study by Dittus, et al. (1995), found similar results, that the over all intake of fruit and vegetables remains below the recommended amount. The majority of the intake was vitamin C sources and other juice.

Total Vitamin C

Half of the children in the study consumed between one and two servings of vitamin C rich foods per day (n=441, 50.4%), which is the recommended amount for this vitamin. Close to 40% (n=348, 39.8%) consumed more than two servings a day, with the maximum being five. (Table 7)

Vitamin C Juice

Over half of the children (n=518, 59.2%) consumed between one and two servings a day of vitamin C juice, followed by 24.4% (n=214) consuming less than one serving per day. The remaining 15% consumed more than 2 servings as shown in Table 7, with the maximum being five.

Vitamin C Fruit

Over 60% (n=535, 61.2%) of the participants consumed less than one serving per day. Almost one-fourth (n=193, 22.0%) consumed between one and two servings per day. The most number of servings of vitamin C fruit consumed per day was four (Table 7).

Vitamin A Fruit

About three-fourth (n=657, 75.1%) of the children consumed no vitamin A fruit, while 22.8% (n=200) consumed less than one serving per day. The remaining are listed in Table 7 with the large number of servings per day being three.

Other Fruit

The range of other fruit consumption was zero to four servings per day. Almost half of the participants (n=533, 60.9%) consumed less than one serving per day, while 33.8% (n=296) consumed between one and two per day. The remaining are listed on Table 7.

Other Juice Without Vitamin C

Almost half of the children (n=381, 43.5%) consumed less than one serving per day of other juices, which are not good sources of vitamin C. About one-fourth consumed no other juice (n=200, 22.9%) or consumed between one and two servings per pay (n=260, 29.7%). The maximum servings per day was six. (Table 7)

TABLE 7

FRUIT CONSUMPTION BY NUMBER OF SERVINGS

Servings per day	Frequency*	Percentage
TOTAL FRUIT		
less than 2	114	13.0
2 - 4	497	56.8
greater than 4	264	30.2
TOTAL VITAMIN C FRUIT		
0	5	.6
less than 1	81	9.2
1 - 2	441	50.4
greater than 2	348	39.8
VITAMIN C JUICE		
0	12	1.4
less than 1	214	24.4
1 - 2	518	59.2
greater than 2	131	15.0
VITAMIN C FRUIT		
0	120	13.7
less than 1	535	61.2
1 - 2	193	22.0
greater than 2	27	3.1
VITAMIN A FRUIT		
0	657	75.1
less than 1	200	22.8
1 - 2	16	1.9
greater than 2	2	.2
OTHER FRUIT		
0	20	2.3
less than 1	533	60.9
1 - 2	296	33.8
greater than 2	26	3.0
OTHER JUICE		
0	200	22.9
less than 1	381	43.5
1 - 2	260	29.7
greater than 2	34	3.9

*n=875 for each group

Frequency of Intake for Vegetables

Vitamin C Vegetables

Less than one-half of the participants consumed any type of vitamin C vegetables, with tomatoes and broccoli being the most common (n=414, 43.7%; n=356, 40.7%). The frequency of consumption of the remaining vitamin C vegetables are listed on Table 8. Many of the Hispanics eat raw tomatoes as well as cooking with them and using them in sauces, these could account for the higher consumption of tomatoes than the other vitamin C vegetables.

Vitamin A Vegetables

Contrary to the vitamin C vegetables almost three-fourths of the children consumed carrots (n=636, 72.7%), followed by 32.8% (n=287) consuming yams. Less than one-fourth indicated that their children consumed the other vitamin A vegetable shown in Table 8. Carrots can be bought in many forms such as frozen, canned, and fresh. They can also be bought year round and are easy to prepare hence, were consumed more often than other vitamin A vegetables.

Other Vegetables

The frequencies and percentages of consumption of other vegetables are shown in Table 8. Green beans were consumed by just over three-fourths of the children (n=663, 75.9%), followed by potatoes (n=607, 69.5%) and corn (n=525, 60.1%). About 33% consumed both lettuce and chickpeas (n=293, 33.5%; n=288, 33.0%). Cucumbers were consumed by 26% (n=227) of the children, while the remaining vegetables were consumed by less than 25% of the children. Green beans and corn are commonly bought canned, fresh, or frozen, which makes them cheaper to buy and available year round which could be why they are two of the more commonly eaten vegetables. Potatoes, which is also on

the more frequently consumed vegetables, are also available year round and at an affordable price. This could account for the large number of potatoes consumed by children.

TABLE 8

FREQUENCY OF INTAKE FOR VEGETABLES

Variable	Frequency	Percentages
VITAMIN C VEGETABLES		
Tomato	414	47.3
Broccoli	356	40.7
Cabbage	260	29.7
Cauliflower	243	27.8
Green Pepper	110	12.6
Peas	100	11.4
Tomato Juice	74	8.5
Brussel Sprouts	51	5.8
Vegetable Juice	49	5.6
Salsa	49	5.6
Green Chilies	17	1.9
Chilies	15	1.7
VITAMIN A VEGETABLES		
Carrots	636	72.7
Yams	287	32.8
Winter Squash	209	23.9
Spinach	187	21.4
Green Onion	149	17.0
Greens	120	13.7
Turnip greens	58	6.6
Mustard Greens	40	4.6
Bok Choy	15	1.7
Beet Greens	11	1.3
Nabos Greens	11	1.3
Cabbage	9	1.0
Dandelion Greens	5	.6
Escarole	5	.6
Red Greens	2	.2
OTHER VEGETABLES		
Green Beans	663	75.9
Potato	607	69.5
Corn	525	60.1
Lettuce	293	33.5
Chick Peas	288	33.0
Cucumber	227	26.0
Avocado	189	21.6
Combination Vegetable	161	18.4
Onion	129	14.8
Celery	124	14.2

Table 8 Continued

FEQUENCY OF INTAKE FOR VEGETABLES

Variable	Frequency	Percentages
OTHER VEGETABLES continued		
Zucchini	114	13.0
Chayote	94	10.8
Radish	92	10.6
Summer Squash	81	9.3
Mushroom	79	9.0
Turnip	29	3.3
Okra	25	2.9
Eggplant	24	2.7
Artichoke	24	2.7
Beets	21	2.4
Asparagus	18	2.1
Parsnips	7	.8

Vegetables Consumed by Number of Servings

Vegetables in the survey instrument consisted of three sections. There were vitamin C vegetables, vitamin A vegetables and other vegetables discussed in this section.

Total Vegetables

Only 32.8% (n=287) consumed the recommended two to four servings a day of total vegetables. In contrast more than half (n=546, 62.4%) of the children consumed less than two servings of total vegetables a day. The most number of servings a day was nine (Table 9). These results are in line with the results of total fruit consumption, which was below the recommended amount.

Vitamin C Vegetables

About 60% (n=576, 65.8%) of the children consumed less than one serving per day, followed by 19.1% (n=167) consuming between one and two servings of vitamin C

vegetables per day. The maximum number of servings per day was four as shown (Table 9).

Vitamin A Vegetables

Over 60% (n=583, 66.6%) of the children in this study consumed less than one serving of vitamin A vegetables a day, while 21.9% (n=192) consumed between one and two servings per day. The maximum number of servings per day was three. (Table 9

Other Vegetables

Over 60% of the children (n=587, 67.1%) consumed less than one serving per day of other vegetables, while 25.9% (n=227) consumed between one and two servings a day with the maximum being five (Table 9).

TABLE 9

VEGETABLE CONSUMPTION BY NUMBER OF SERVINGS

Servings per day	Frequency*	Percentage
TOTAL VEGETABLE		
less than 2	546	62.4
2 - 4	287	32.8
greater than 4	42	4.8
VITAMIN C VEGETABLE		
0	116	13.3
less than 1	576	65.8
1 - 2	167	19.1
greater than 2	16	1.8
VITAMIN A VEGETABLE		
0	88	10.1
less than 1	583	66.6
1 - 2	192	21.9
greater than 2	12	1.4
OTHER VEGETABLE		
0	40	4.6
less than 1	587	67.1
1 - 2	227	25.9
greater than 2	21	2.4

*n=875 for each group

Frequency of Intake for Grains and Starch

The majority of the children consumed rice (n=696, 79.5%), followed by bread (n=646, 73.8%). Crackers, tortillas and dry oats were all consumed by about 60% of the participants (n=562, 64.2%; n=539, 61.6%; n=528, 60.3%). Fifty-six percent (n=487) of the children consumed pancakes, while cooked oats and macaroni were consumed by more than 40% of the children (n=381, 43.5%; n=374, 42.7%). The remaining of the grains were consumed by less than 40% of the children as shown in Table 10. Rice is a common staple in the Hispanic culture, which may be why the consumption of rice was high, along with tortillas. Many of the participants in WIC in this region of the country may not be familiar with bagels and pita, hence their consumption was extremely low.

TABLE 10

FREQUENCY OF INTAKE FOR GRAINS AND STARCHES

Variable	Frequency	Percentages
Rice	696	79.5
Bread	646	73.8
Crackers	562	64.2
Tortilla	539	61.6
Dry Oats	528	60.3
Pancake	487	56.6
Cooked Oats	381	43.5
Macaroni	374	42.7
Cereal	307	35.1
Pasta	256	29.3
Noodles	216	24.7
Ramen Noodles	207	23.7
Waffles	181	20.7
Cornbread	161	18.4
Biscuits	131	15.0
Roll	101	11.5
Muffins	73	8.3
Bagel	31	3.5
Pita	5	.6

Grains and Starches Consumed by Number of Servings

The grains are divided into four different groups. The first being oatmeal's, which consists of dry oats and liquid cereal form, followed by other grains and starches, bread and bread and bread products, and pancakes and waffles.

Total Grains and Starches

The total number of grains, and the frequencies and percentages are shown in Table 11. Only 18.5% (n=162) consumed the recommended four to six servings a day of carbohydrates (grains and starches). In contrast 61.3%, (n=536) consumed between two and four servings of grains per day, while only 16.9% consumed less than two servings a day. The maximum was 13.

Oatmeal's

Almost half of the children (n=377, 43.0%) consumed between one and two servings per day of oatmeal, followed by 39.6% (n=346) consuming less than one serving per day. The range was zero to seven (Table 11).

Other Grains and Starches

Close to one-half of the participants consumed either less than one serving a day (n=425, 48.6%) or between one and two servings a day of other grains and starches (n=400, 45.7%). The maximum number of servings per day was three. (Table 11)

Bread and Bread Products

Half of the children (n=437, 50.0) consumed between one and two servings of breads and bread products per day, followed by 37.8% (n=331) consuming less than one serving per day. As shown in Table 11 less than 10% consumed zero servings a day or more than two, with the maximum being six.

Pancakes and Waffles

About half (n=505, 57.8%) of the children consumed less than one servings per day of either pancakes or waffles, while 32.3% (n=283) consumed no pancakes or waffles. Less than 10% consumed more than one serving per day, with a maximum of six (Table 11).

TABLE 11

GRAINS AND STARCHES CONSUMPTION BY NUMBER OF SERVINGS

Servings per day	Frequency*	Percentage
TOTAL GRAINS		
less than 2	148	16.9
2 - 4	536	61.3
4.25 - 6	162	18.5
greater than 6	29	3.3
OATMEAL		
0	141	16.1
less than 1	346	39.6
1 - 2	377	43.0
greater than 2	11	4.8
OTHER GRAINS AND STARCHES		
0	24	2.7
less than 1	425	48.6
1 - 2	400	45.7
greater than 2	26	3.0
BREADS AND BREAD PRODUCTS		
0	27	3.1
less than 1	331	37.8
1 - 2	437	50.0
greater than 2	80	9.1
PANCAKES AND WAFFLES		
0	283	32.3
less than 1	505	57.8
1 - 2	81	9.2
greater than 2	6	.7

*n=875 for each group

Frequency of Intake for Sweetened Beverages and Other foods

Fewer than 50% of the participants indicated that their children consumed any type of sweetened any type of sweetened beverages. Koolaid was the most common (n=389, 44.5%), followed by Sunny Delight (n=271, 31.0%) (Table 12). As with sweetened beverages, fewer than 50% of the participants indicated that their children consumed the different types of other foods. Cookies, popsicles and gelatin were consumed by about 40% of the children (n=408, 46.6%; n=346, 39.5%; n=337, 38.5%). The remaining of the other foods were consumed by less than one-fourth of the children as shown in Table 13. The foods listed under other foods are foods which are considered "bad", and many of the parents or guardians filling the questionnaire out may have underreported the number servings of these foods consumed by their children.

TABLE 12

FREQUENCY OF INTAKE FOR SWEETENED BEVERAGES

Variable	Frequency	Percentages
Koolaid	389	44.5
Sunny Delight	271	31.0
Fruit Juice	240	27.4
Soda	206	23.5
Gatorade	125	14.3
Hi-C	74	8.5
Tang	72	8.2
Cranberry Cocktail	62	7.1
Orange Drink	50	5.7
Rice Milk	42	4.8

TABLE 13

FREQUENCY OF INTAKE FOR OTHER FOODS

Variable	Frequency	Percentages
Cookies	408	46.6
Popsicles	346	39.5
Gelatin	337	38.5
French Fries	296	33.8
Chips	206	23.5
Pie	153	17.5
Candy	144	16.5
Snack Crackers	122	13.9
Chocolate	118	13.5
Pastries	64	7.3
Granola Bar	61	7.0
Cracker Jacks	45	5.1
Sugar Candy	33	3.8
Cornuts	19	2.2
Caramel	10	1.1

Sweetened Beverages and Other Foods Consumed by Number of Servings

Sweetened beverages and other foods were in two separate categories. Both categories contain food with little nutrient value.

Total Sweetened Beverages and Other Food

The frequencies and percentages of total sweetened beverages and other foods are listed in Table 14. The recommended amount for this category is to use in moderation thus, about half of the children met this by consuming less than one serving a day of combined sweetened beverages and other foods (n=413, 47.2%). Thirty-seven percent (n=324) consumed between one and two servings a day, while 11.7% (n=102) consumed greater than two servings a day. The range was between zero and six. These results were similar to the results of a study by Cook, et al (1976).

Sweetened Beverages

About 60% (n=526, 60.1%) of the participants consumed less than one serving per day of sweetened beverages, while 21.8% (n=191) consumed between one and two servings a day. The remaining are listed in Table 14, with the maximum being five.

Other Foods

A large percentage of the children (n=620, 70.9%) consumed less than one serving a day of other food, followed by 16.1% (n=141) consuming between one and two servings a day as shown in Table 14. The most number of servings per day was four.

TABLE 14

SWEETENED BEVERAGES AND
OTHER FOODS CONSUMPTION BY NUMBER OF SERVINGS

Servings per day	Frequency*	Percentage
TOTAL SWEETENED BEVERAGES AND OTHER FOODS		
0	36	4.1
less than 1	413	47.2
1 - 2	324	37.0
greater than 2	102	11.7
SWEETENED BEVERAGES		
0	126	14.4
less than 1	526	60.1
1 - 2	191	21.8
greater than 2	32	3.7
OTHER FOODS		
0	100	11.4
less than 1	620	70.9
1 - 2	141	16.1
greater than 2	14	1.6

*n=875 for each group

Frequency of Intake for Combination Foods

More than 40% of the children consumed spaghetti (n=378, 43.2%), followed by tacos being consumed by 39% (n=342), Pizza and macaroni and cheese were consumed by about 35% of the children (n=311, 35.5%; n=297, 33.9%). Less than one-fourth of the participants indicated that their children consumed the remaining combination foods listed in Table 15. The combination foods chosen most often are easy for children ages three to four to eat as well as more popular for that age, contrary to the foods chosen less often.

TABLE 15

FREQUENCY OF INTAKE FOR COMBINATION FOODS

Variable	Frequency	Percentages
Spaghetti	378	43.2
Taco	342	39.1
Pizza	311	35.5
Macaroni and Cheese	297	33.9
Enchiladas	213	24.4
Lasagna	123	14.1
Stew	71	8.1
Pot Pie	69	7.9
Spaghetti O's	40	4.6
Mince Meat	26	3.0

Combination Foods Consumed by Number of Servings

There was only one category for combination foods. The frequencies and percentages for these foods are shown in Table 16. Over three-fourths of the children (n=664, 75.9%) consumed less than one serving a day, followed by 13.8% (n=121) consuming no combination foods with the maximum being four.

TABLE 16

COMBINATION FOODS CONSUMPTION BY NUMBER OF SERVINGS

Servings per day	Frequency*	Percentage
0	121	13.8
less than 1	664	75.9
1 - 2	81	9.3
greater than 2	9	1.0

*n=875 for each group

Frequency of Intake for Drinks

Almost all of the children consumed some amount of water (n=780, 89.9%), while tea and diet soda were consumed by about 10% (n=94, 10.7%; n=91, 10.4%). Coffee was consumed by only 19 (2.2%) children Table 17. Tea is commonly used as a remedy for colds in the Hispanic culture which could be why it is consumed by some children. Children may also take sips of their parents coffee, which could account for the few who marked coffee.

TABLE 17

FREQUENCY OF INTAKE FOR DRINKS

Variable	Frequency	Percentages
Water	780	89.9
Tea	94	10.7
Diet Soda	91	10.4
Coffee	19	2.2

Drinks Consumed by Number of Servings

The drinks were divided into two categories, caffeine drinks and water. Participants were however, not asked to indicate a combined amount consumed.

Caffeine Drinks

The majority of the children consumed no caffeine drinks (n=676, 77.3%) followed by 18.8% (n=165) consuming less than one serving a day. Only 34 of the children consumed one or more caffeine drink a day with a maximum of two servings a day (Table 18).

Water

Almost half of the children consumed one to two servings per day (n=371, 42.2%) of water, while 35.4% (n=310) consumed more than two servings a day. The remaining consumed less than one serving per day, with a range of none to 10 (Table 18).

TABLE 18

DRINKS CONSUMPTION BY NUMBER OF SERVINGS

Servings per day	Frequency*	Percentage
CAFFEINE DRINKS		
0	676	77.3
less than 1	165	18.8
1 - 2	34	3.9
greater than 2	0	00.0
WATER		
0	44	5.0
less than 1	150	17.2
1 - 2	371	42.4
greater than 2	310	35.4

*n=875 for each grouop

Frequency of Intake for Fats

Cooking oil was the most common type of fat consumed, however, fewer than half of the children in this study consumed this product (n=402, 45.9%). About 30% of the participants consumed butter and/or margarine (n=342, 39.1%; n=296, 33.8%). Fewer than 15% consumed any other type of fat. The type of fats consumption may be

underestimated due to the inability or misunderstanding of the consumption of fats in foods and what is used in cooking and preparation of food. (Table19)

TABLE 19

FREQUENCY OF INTAKE FOR FAT

Variable	Frequency	Percentages
Cooking Oil	402	45.9
Butter	342	39.1
Margarine	296	33.8
Salad Dressing	124	14.2
Sour Cream	101	11.6
Homemade Gravy	81	9.3
Lard	44	5.0
Whipping Cream	42	4.8

Fats Consumed by Number of Servings

There was only one group for fats. About 60% of the children consumed less than one-half serving of fat a day (n=529, 60.5%), followed by about 18% consuming none fat a day or between one and two servings (n=157, 17.9%; n=164, 18.7%). Twenty-five (2.9%) of the children consumed more than two servings a day as shown in Table 20. The serving amounts for fats may be underreported due to many hidden fats in foods and cooking practices. These findings are contrary to the results of NHANES III, which showed that children are consuming more than the recommended amount of fat which is 30% of kcals (Alaimo, et al. 1994).

TABLE 20

FATS CONSUMPTION BY NUMBER OF SERVINGS

Servings per day	Frequency*	Percentage
0	157	17.9
less than 1	529	60.5
1 - 2	164	18.7
greater than 2	25	2.9

*n=875 for each group

Statistical Analyses

Testing of Hypothesis One

Ho1: There will be no significance association between iron status of children participating in the WIC program in Clark County Las Vegas, NV and selected personal/health variables: gender, age, ethnicity, weight, height, and hematocrit. The researcher found no significant associations between iron status and children's personal/health variables. Based on these results the researcher failed to reject Ho1.

Testing of Hypothesis Two

There will be no significant association between dietary intake of children participating in the WIC program n Clark County Las Vegas, NV and selected personal/health variables: gender, age, ethnicity, weight, height, and hematocrit. Children's analysis of variance (ANOVA), Duncan's Multiple Range Test and t-test were used to determine the relationship between the children's characteristics and their dietary intake.

Consumption Patterns by Ethnicity

There was a significant association between ethnicity and milk product consumption (Tables 21 and 22). Black children consumed significantly ($P \leq 0.0001$) less milk products than White or Hispanic children. Perhaps Black children are lactose intolerant, which could lead to them drinking less milk and milk products.

TABLE 21

ANALYSIS OF VARIANCE (ANOVA) FOR MILK PRODUCTS AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	947.58	10.31	0.0001
Error	866	91.92		
Total	868			

*Significant level at $p \leq .05$

TABLE 22

DUNCAN'S MULTIPLE RANGE TEST FOR MILK PRODUCTS AND ETHNICITY

Race	N	Mean	Grouping*
White	122	19.36	A
Hispanic	616	19.32	A
Black	131	15.20	B

*Significant level at $p \leq .05$

Analysis of variance (ANOVA) procedures were used to determine significant associations between ethnicity and cheese consumption. Hispanic children consumed significantly less ($P=0.0040$) cheese than White or Black children (Tables 23 and 24). Hispanics may be more likely to consume "queso fresco", a Mexican type cheese, which was not listed on the food frequency questionnaire. This could be why Hispanics seem to eat less cheese.

TABLE 23

ANALYSIS OF VARIANCE (ANOVA) FOR CHEESE AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	115.78	5.56	0.0040
Error	866	20.84		
Total	868			

*Significant level at p≤.05

TABLE 24

DUNCAN'S MULTIPLE RANGE TEST FOR CHEESE AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	6.58	A
White	122	6.39	A
Hispanic	616	5.36	B

*Significant level at p≤.05

Significant associations (P≤ 0.0422) existed between the Black, Hispanic and White children with regard to other dairy products. Black and Hispanic children consumed more other dairy products than White children (Tables 25 and 26).

TABLE 25

ANALYSIS OF VARIANCE (ANOVA) FOR OTHER DAIRY PRODUCTS AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	34.94	3.18	0.0422
Error	866	11.00		
Total	868			

*Significant level at p≤.05

TABLE 26

DUNCAN'S MULTIPLE RANGE TEST FOR
OTHER DAIRY PRODUCTS AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	6.58	A
Hispanic	616	6.69	A
White	122	2.69	B

*Significant level at p≤.05

There was a significant association between ethnicity and total dairy products (P≤ 0.0514) (Tables 27 and 28). Black children consumed significantly less total milk products than White or Hispanic children. Although Whites and Hispanics consumed different amounts of total milk products, the amount was not significant. Lactose intolerance is more common in the Black population which could account for fewer Blacks consuming total dairy products.

TABLE 27

ANALYSIS OF VARIANCE (ANOVA) FOR TOTAL MILK PRODUCTS AND
ETHNICITY

Source	df	Mean Square	F	P*
Race	2	403.13	2.98	0.0514
Error	866	135.34		
Total	868			

*Significant level at p≤.05

TABLE 28

DUNCAN'S MULTIPLE RANGE TEST FOR TOTAL MILK PRODUCTS AND ETHNICITY

Race	N	Mean	Grouping*
White	122	28.45	A
Hispanic	616	28.10	A
Black	131	25.48	B

*Significant level at p≤.05

Analysis of variance (ANOVA) procedures were used to determine associations between ethnicity and meat consumption. Blacks and Whites consumed significantly (P≤ 0.0001) more meats than Hispanics (Tables 29 and 30). Meat consumption is not as common in Mexico, which is where the majority of this Hispanic population is from, which may be why this group consumes less meat. Meat is also more costly and for many it could be unaffordable.

TABLE 29

ANALYSIS OF VARIANCE (ANOVA) FOR MEATS AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	120.87	10.21	0.0001
Error	866	11.83		
Total	868			

*Significant level at p≤.05

TABLE 30

DUNCAN'S MULTIPLE RANGE TEST FOR MEATS AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	6.79	A
White	122	6.32	A
Hispanic	616	5.42	B

*Significant level at p≤.05

Significant association (P≤ 0.0001) existed between Blacks, Whites, and Hispanics with regard to processed meats. Black children consumed more processed meats than Whites and Hispanics, while more Whites consumed significantly more processed meats than Hispanics (Tables 31 and 32).

TABLE 31

ANALYSIS OF VARIANCE (ANOVA) FOR PROCESSED MEATS AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	322.41	36.35	0.0001
Error	866	8.87		
Total	868			

*Significant level at p≤.05

TABLE 32

DUNCAN'S MULTIPLE RANGE TEST FOR PROCESSED MEATS AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	5.20	A
White	122	4.03	B
Hispanic	616	2.88	C

*Significant level at p≤.05

There was a significant association between race and total protein consumption (Tables 33 and 34). Black children consumed significantly (P≤ 0.0001) more total protein than Whites or Hispanics. Blacks may consider meat and protein products the most important part of a meal or they may have a stronger liking for these types of foods.

TABLE 33

ANALYSIS OF VARIANCE (ANOVA) FOR TOTAL PROTEIN AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	902.00	10.38	0.0001
Error	866	86.92		
Total	868			

*Significant level at p≤.05

TABLE 34

DUNCAN'S MULTIPLE RANGE TEST FOR TOTAL PROTEIN AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	22.64	A
White	122	19.79	B
Hispanic	616	18.58	B

*Significant level at p≤.05

Analysis of variance (ANOVA) procedures were used to determine significant associations between ethnicity and vitamin C fruit consumption. Black children consumed significantly (P≤ 0.0225) more vitamin C fruits than Whites. Although Hispanics consumed different amounts of vitamin C, their fruit consumption was not significantly different from the amount consumed by Blacks and Whites. (Tables 35 and 36)

TABLE 35

ANALYSIS OF VARIANCE (ANOVA) FOR VITAMIN C FRUIT AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	63.24	3.81	0.0225
Error	866	16.59		
Total	868			

*Significant level at p≤.05

TABLE 36

DUNCAN'S MULTIPLE RANGE TEST FOR VITAMIN C FRUIT AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	5.24	A
Hispanic	616	4.40	AB
White	122	3.86	B

*Significant level at p≤.05

Significant association (P≤ 0.0068) existed between the Blacks and Hispanics with regard to other fruits consumption (Tables 37 and 38). Blacks consumed significantly more of the other fruits than Hispanics. Although Whites consumed different amounts of other fruits than Blacks or Hispanics, the difference was not statistically significantly.

TABLE 37

ANALYSIS OF VARIANCE (ANOVA) FOR OTHER FRUIT AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	72.65	5.02	0.0068
Error	866	14.46		
Total	868			

*Significant level at p≤.05

TABLE 38

DUNCAN'S MULTIPLE RANGE TEST FOR OTHER FRUIT AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	6.56	A
White	122	6.04	AB
Hispanic	616	5.46	B

*Significant level at p≤.05

There was a significant association between race and other juice (Tables 39 and 40). Black participants consumed significantly (P≤ 0.0021) more other juice than Hispanics or Whites.

TABLE 39

ANALYSIS OF VARIANCE (ANOVA) FOR OTHER JUICE AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	154.34	6.20	0.0021
Error	866	24.87		
Total	868			

*Significant level at p≤.05

TABLE 40

DUNCAN'S MULTIPLE RANGE TEST FOR OTHER JUICE AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	6.31	A
Hispanic	616	4.73	B
White	122	4.40	B

*Significant level at p≤.05

Analysis of variance (ANOVA) procedures were used to determine significant associations between ethnicityvitamin C fruit consumption. Black children consumed significantly (P≤.0991) more total vitamin C fruit than White children. Although Hispanics consumed different amounts than Blacks or Whites, the difference was not statistically significant (Tables 41 and 42).

TABLE 41

ANALYSIS OF VARIANCE (ANOVA) FOR TOTAL VITAMIN C FRUIT AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	162.13	2.40	0.0911
Error	866	67.49		
Total	868			

*Significant level at p≤.05

TABLE 42

DUNCAN'S MULTIPLE RANGE TEST FOR TOTAL VITAMIN C FRUIT AND ETHINCITY

Race	N	Mean	Grouping*
Black	131	15.26	A
Hispanic	616	14.70	AB
White	122	13.13	B

*Significant level at p≤.05

The variable ethnicity was significantly associated with the total consumption of fruit (P≤ 0.0194) (Table 43). Black children's consumption of total fruit was significantly different than that of Hispanics or Whites. The Black children consumed more total fruit than did the other two groups (Table 44). In the desert, fresh fruit was more expensive to

buy and harder to find year round. Perhaps the Blacks prefer more canned fruit thus making their consumption greater than the other groups.

TABLE 43

ANALYSIS OF VARIANCE (ANOVA) FOR TOTAL FRUIT AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	750.88	3.96	0.0194
Error	866	89.50		
Total	868			

*Significant level at p≤.05

TABLE 44

DUNCAN'S MULTIPLE RANGE TEST FOR TOTAL FRUIT AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	28.74	A
Hispanic	616	25.68	B
White	122	24.06	B

*Significant level at p≤.05

Significant associations (P≤ 0.0013) existed between ethnicity and vitamin C vegetable consumption (Table 45). The Duncan's Multiple Range Test indicated that Black children consumed significantly more vitamin C vegetables than White or Hispanic children (Table 46). The reason could be that blacks tend to consume more greens.

TABLE 45

ANALYSIS OF VARIANCE (ANOVA) FOR VITAMIN C VEGETABLE AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	86.84	6.71	0.0013
Error	866	12.95		
Total	868			

*Significant level at p≤.05

TABLE 46

DUNCAN'S MULTIPLE RANGE TEST FOR VITAMIN C VEGETABLE AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	5.06	A
White	122	3.96	B
Hispanic	616	3.80	B

*Significant level at p≤.05

Analysis of variance (ANOVA) procedures were used to determine significant associations between ethnicity and other vegetable consumption. Hispanic children consumed significantly (P≤ 0.0001) less other vegetables than Black or White children (Tables 47 and 48). Hispanics are traditionally used to buying fresh vegetables and adding them to their foods. The expense to obtain them elsewhere since there is a lack of availability of some vegetables in the dessert may lead to fewer consumption. These findings go along with the findings of Basch et al. (1994) that Hispanics had low intakes of fruits and vegetables.

TABLE 47

ANALYSIS OF VARIANCE (ANOVA) FOR OTHER VEGETABLE AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	142.90	12.81	0.0001
Error	866	11.15		
Total	868			

*Significant level at p≤.05

TABLE 48

DUNCAN'S MULTIPLE RANGE TEST FOR OTHER VEGETABLE AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	6.02	A
White	122	5.66	A
Hispanic	616	4.60	B

*Significant level at p≤.05

The variable ethnicity was significantly associated with the total consumption of total vegetables (P≤ 0.0014) (Tables 49 and 50). Black children's consumption of total vegetables was significantly higher than that of Hispanics. As with fruits, Blacks may prefer more canned vegetables to fresh, which are cheaper and easier to obtain them fresh, which may be prefered by Hispanics.

TABLE 49

ANALYSIS OF VARIANCE (ANOVA) FOR TOTAL VEGETABLE AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	472.26	6.62	0.0014
Error	866	71.28		
Total 868				

*Significant level at p≤.05

TABLE 50

DUNCAN'S MULTIPLE RANGE TEST FOR TOTAL VEGETABLE AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	15.53	A
White	122	13.94	AB
Hispanic	616	12.67	B

*Significant level at p≤.05

The Analysis of Variance (ANOVA) on the variable ethnicity and the consumption of carbohydrates (grains and starches) is as follows: oatmeal (P≤ 0.0001), other grains (P≤ 0.0001), bread and bread products (P≤ 0.0001) and pancakes and waffles (P≤ 0.0001) (Tables 51, 53, 55, 59). For oatmeal, Hispanics consumed significantly less than Blacks or Whites (Table 52). White children consumed significantly less other grains than did Hispanics or Blacks (Table 54). There was a significant difference between the consumption of breads and bread products for Hispanics (Table 56). They consumed more than Whites or Blacks. Pancakes and waffles were consumed significantly more by Blacks than by Whites or Hispanics (Table 58).

Oatmeal is not traditionally consumed in large amounts by Hispanics as it is by Blacks and Whites, whereas tortillas are much more common in the Hispanic community. This could be why they consumed significantly less oatmeal and significantly more breads.

Rice and rice dishes are much more common in the Hispanic and Black community, which may be why Whites consumed significantly less other grains.

TABLE 51

ANALYSIS OF VARIANCE (ANOVA) FOR OATMEAL'S AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	324.86	21.52	0.0001
Error	866	15.09		
Total	868			

*Significant level at p≤.05

TABLE 52

DUNCAN'S MULTIPLE RANGE TEST FOR OATMEAL'S AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	6.79	A
White	122	6.13	A
Hispanic	616	4.61	B

*Significant level at p≤.05

TABLE 53

ANALYSIS OF VARIANCE (ANOVA) FOR OTHER GRAINS AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	185.29	10.84	0.0001
Error	866	17.09		
Total	868			

*Significant level at p≤.05

TABLE 54

DUNCAN'S MULTIPLE RANGE TEST FOR OTHER GRAINS AND ETHNICITY

Race	N	Mean	Grouping*
Hispanic	616	6.95	A
Black	131	6.16	A
White	122	5.11	B

*Significant level at p≤.05

TABLE 55

ANALYSIS OF VARIANCE (ANOVA) FOR BREADS AND BREAD PRODUCTS AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	446.88	13.20	0.0001
Error	866	34.31		
Total	868			

*Significant level at p≤.05

TABLE 56

DUNCAN'S MULTIPLE RANGE TEST FOR BREAD AND BREAD PRODUCTS AND ETHNICITY

Race	N	Mean	Grouping*
Hispanic	616	8.91	A
White	122	6.87	B
Black	131	6.51	B

*Significant level at p≤.05

TABLE 57

ANALYSIS OF VARIANCE (ANOVA) FOR PANCAKE AND WAFFLES AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	122.48	14.39	0.0001
Error	866	8.51		
Total	868			

*Significant level at p≤.05

TABLE 58

DUNCAN'S MULTIPLE RANGE TEST FOR PANCAKES AND WAFFLES AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	3.51	A
White	122	2.50	B
Hispanic	616	2.02	B

*Significant level at p≤.05

There was a significant associations between ethnicity and consumption of sweetened beverages (P≤ 0.0001), junk food (P≤ 0.0001) and total sweetened beverages and other foods (P≤ 0.0001) (Tables 59, 61, 63). For sweetened beverages, Black children consumed significantly more than White or Hispanic children (Table 60). Black children consumed significantly more other foods than Whites or Hispanics, however, Whites consumed significantly more other food than Hispanics (Table 62). Total sweetened beverages and other foods were consumed significantly more by Blacks than by White or Hispanics. Whites, consumed significantly more total sweetened beverages and other foods than Hispanics (Table 64).

Hispanics may not be as familiar with sweetened drinks and other foods may not be as easy to find in the United States. The wording of some of the foods on the questionnaire may have been confused by some of the non-English speaking population.

TABLE 59

ANALYSIS OF VARIANCE (ANOVA) FOR SWEETENED BEVERAGES AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	497.14	21.80	0.0001
Error	866	22.79		
Total	868			

*Significant level at p≤.05

TABLE 60

DUNCAN'S MULTIPLE RANGE TEST FOR SWEETENED BEVERAGES AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	6.93	A
White	122	4.89	B
Hispanic	616	3.93	B

*Significant level at p≤.05

TABLE 61

ANALYSIS OF VARIANCE (ANOVA) FOR OTHER FOODS AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	145.72	12.98	0.0001
Error	866	11.22		
Total	868			

*Significant level at p≤.05

TABLE 62

DUNCAN'S MULTIPLE RANGE TEST FOR OTHER FOODS AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	4.88	A
White	122	4.09	B
Hispanic	616	3.32	C

*Significant level at p≤.05

TABLE 63

ANALYSIS OF VARIANCE (ANOVA) FOR TOTAL SWEETENED BEVERAGES AND OTHER FOODS AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	1173.74	24.52	0.0001
Error	866	47.86		
Total	868			

*Significant level at p≤.05

TABLE 64

DUNCAN'S MULTIPLE RANGE TEST FOR TOTAL SWEETENED BEVERAGES AND OTHER FOODS AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	11.82	A
White	122	8.99	B
Hispanic	616	7.25	C

*Significant level at p≤.05

The Analysis of variance (ANOVA) procedures was used to determine significant associations between ethnicity and combination foods. Black children consumed significantly (P=0.0026) more combination foods than Whites or Hispanics (Tables 65, 66). Many of the foods listed were traditional Hispanic foods, however, the most common

type of food chose was spaghetti, which could account for the results of these findings. Spaghetti type products are available canned and are favorite foods by most children

TABLE 65

ANALYSIS OF VARIANCE (ANOVA) FOR COMBINATION FOODS AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	48.73	6.01	0.0026
Error	866	8.10		
Total	868			

*Significant level at p≤.05

TABLE 66

DUNCAN'S MULTIPLE RANGE TEST FOR COMBINATION FOODS AND ETHNICITY

Race	N	Mean	Grouping*
Black	131	3.56	A
White	122	2.80	B
Hispanic	616	2.61	B

*Significant level at p≤.05

There was a significant association between the variable ethnicity and fat consumption (Table 67). Hispanic children consumed significantly (P≤ 0.0003) less fat than Black or White children (Table 68). This section of the questionnaire may have been misinterpreted, thus the fat consumption may have been underestimated. Some of the fats listed may be used in cooking, therefore not counted as a serving. The fats which were most likely counted as a serving, whipping cream, salad dressing, sour cream and homemade gravy, are consumed less by Hispanics which may account for the difference in

consumption. These findings are in line with the findings by McDowell, et al. (1994), that Hispanics showed the lowest fat intake.

TABLE 67

ANALYSIS OF VARIANCE (ANOVA) FOR FAT AND ETHNICITY

Source	df	Mean Square	F	P*
Race	2	143.18	8.30	0.0003
Error	866	17.25		
Total	868			

*Significant level at p≤.05

TABLE 68

DUNCAN'S MULTIPLE RANGE TEST FOR FAT AND ETHNICITY

Race	N	Mean	Grouping*
White	122	4.94	A
Black	131	4.58	A
Hispanic	616	3.51	B

*Significant level at p≤.05

Consumption of Foods by Gender

The female participants were most likely to consume vitamin A and fat, while males were most likely to consume oatmeal (Table 69). Females may have a taste preference for the vitamin A foods, apricots, apricot nectar, and peach nectar. The parents or guardians of the children may fix oatmeal for the males more often because it is believed to be filling. Females may consume more fats that are gravy, salad dressing, and sour cream, which are added as extras to foods.

TABLE 69

T-TEST DETERMINATION OF FOOD CONSUMPTION BY GENDER

Food Group	Male Mean	(N=433) SD	Female Mean	N=442) SD	P-Value*
Vitamin A	0.5837	1.4718	0.8630	2.012	0.0349
Oatmeal's	5.4480	4.3373	4.8959	3.569	0.0403
Fats	3.5288	3.6138	4.2126	4.650	0.0152

*Significant level at p≤.05

Consumption of Foods by Age

Those children born in 1991 (three year olds), were most likely to consume vitamin A fruit, other fruit, other juices and total fruit. Those children born in 1990 (four year olds) were most likely to consume caffeine drinks (Table 70). It is possible that parents or guardians think that fruits, no matter what form it is in, is better for younger children, or perhaps the children's tastes change as they get older and they enjoy a wider variety of foods. As children's age increases, parents or guardian may become more lenient about their children consuming caffeinated drink.

TABLE 70

T-TEST DETERMINATION OF FOOD CONSUMPTION BY AGE

Food Group	Male Mean	(N=433) SD	Female Mean	N=442) SD	P-Value*
Vitamin A	0.5558	1.2473	0.8319	2.0945	0.0165
Other Fruit	5.4392	3.6384	5.9297	3.9573	0.0568
Other Juice	4.4044	4.9195	5.3914	5.1369	0.0039
Total Fruit	24.4813	12.7107	27.2446	14.6401	0.0029
Caffeine Drinks	1.0024	2.3120	0.5893	1.5159	0.0023

*Significant level at p≤.05

Based on the results reported in Tables 22-70 indicating associations between dietary intake and the personal variables ethnicity, gender, and age, the researcher rejected Ho2. If health variables are considered; weight, height, and hematocrit the researcher failed to reject Ho2.

Testing of Hypothesis Three

Ho3: There will be no significant association between dietary intake and the food guide pyramid of children participating in the WIC program in Clark County Las Vegas, NV on selected personal/health variables: gender, age, ethnicity, weight, height, and hematocrit. Chi-Square values were used to determine the association between dietary intake and the food guide pyramid.

Consumption and Ethnicity

Ethnic differences are significant ($P \leq 0.0001$) for vitamin C servings (Table 71). More Blacks and Whites consumed less than one serving a day of vitamin C. These findings agree with McDowell, et al. (1994), that Hispanics consumed more fruits than other population groups. A likely explanation for this is that the two population have fewer opportunities to consume vitamin C fruit which is in line with the study by Kirby, et al. (1995) that states, children from low-economic families had fewer fruits and vegetables in their home. Blacks were the only significant group in the consumption of dairy products. Significantly ($P=0.0001$) fewer blacks met the recommended four to six servings per day of dairy products than expected. In addition, more Blacks than expected consumed less than four servings per day (Table 73). This was also found earlier in the study, which showed that Blacks consumed significantly less total diary products than Whites and Hispanics. Again a likely explanation for this would be that more Blacks are lactose intolerant than the other population groups.

TABLE 71

CHI-SQUARE DETERMINATIONS INDICATING ASSOCIATIONS BETWEEN CONSUMPTION AND ETHNICITY

Food Consumption	Ethnicity
Vitamin C Fruit	
x2	14.088
df	2
P	.0001
Dairy Product	
x2	12.348
df	4
P	.0015

Based on the results in Table 71 indicating an association between consumption patterns and ethnicity, the researcher rejected Ho3. If other personal/health variables such as gender, age, height, weight, and hematocrit are considered, then the researcher failed to reject Ho3.

Testing of Hypothesis Four

Ho4: There will be no significant association between expected height and weight and actual height and weight based on gender, and on the means of heights and weights and actual heights and weights based on gender. Scatterplots were used to determine the associations between expected heights and weights and actual heights and weights and gender Appendix F.

EXPECTED WEIGHT AND HEIGHT VS. ACTUAL WEIGHT AND HEIGHT IN FEMALES

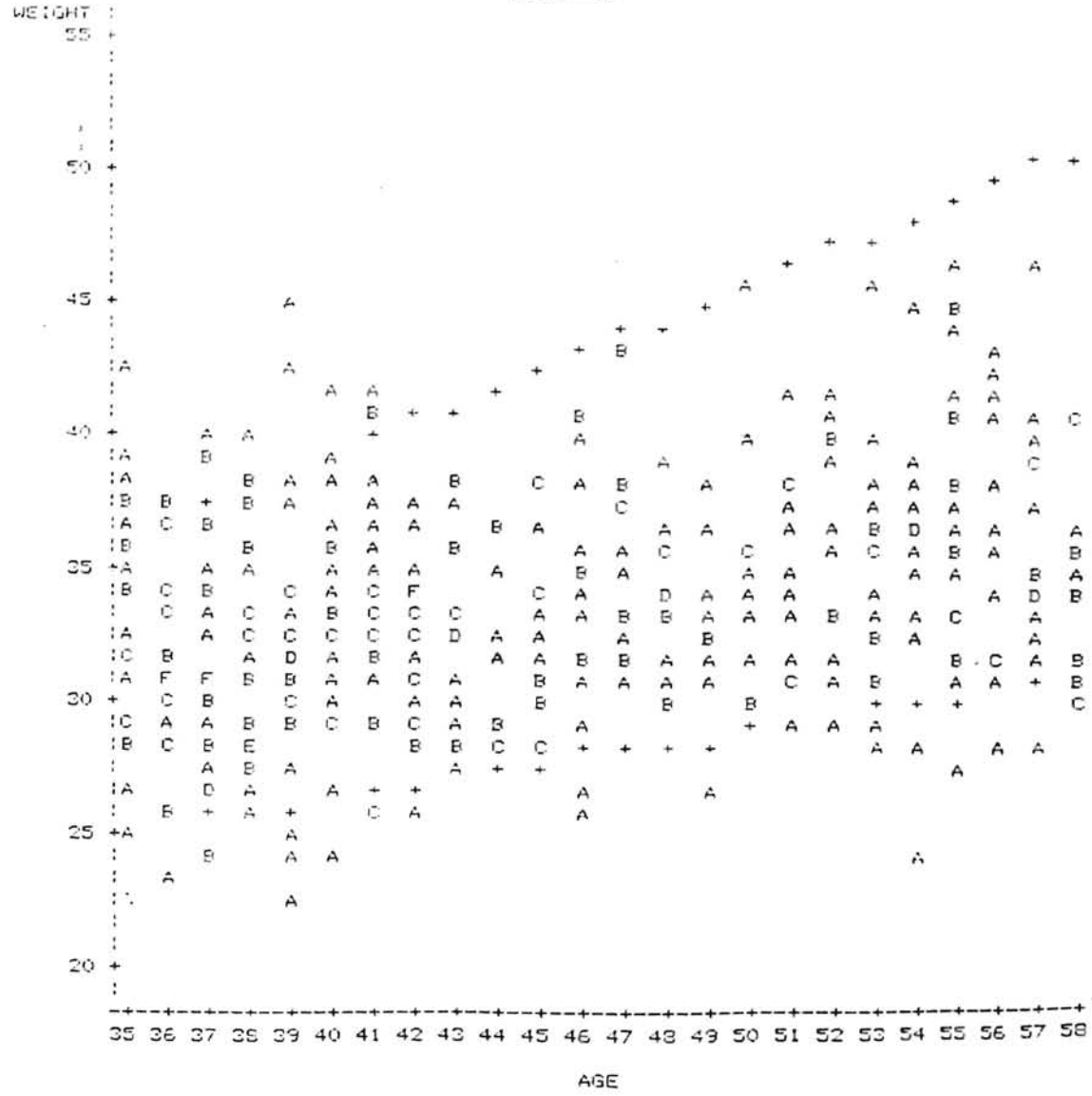
The expected heights and weights of females were based on the NCHS growth chart for females ages 2 to 18 years. The majority of the females fell in between the 5th and the 95th percentiles of the NCHS charts for weight and age. Those below the 5th

seemed to stay consistently below the 5th. The majority of the female children in this study were also between the 5th and the 95th percentile for height. After 46.5 months those above the 95th seemed to eventually fall within normal range with a few exceptions. Those below the 5th seemed to stay consistently below the percentile even with time (Figures 9, and 10).

EXPECTED WEIGHT AND HEIGHT VS.ACTUAL WEIGHT AND HEIGHT IN MALES

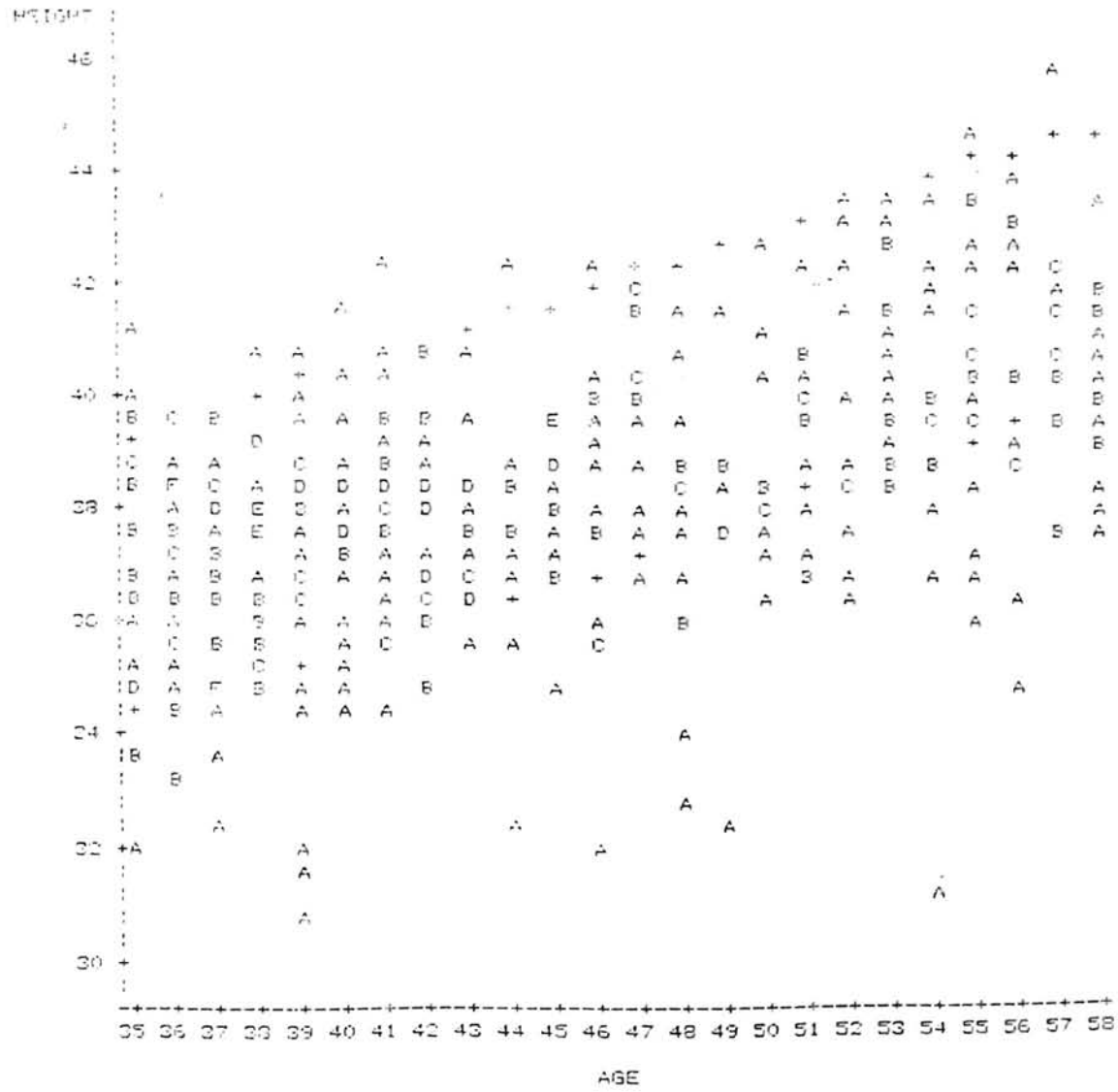
The majority of the male children fell within normal range of the NCHS chart for height (Figures 11 and 12). There were more males above the 95th percentile than females, with fewer below the 5th than females. Males both above and below the expected weights stayed consistent as they aged. Their height for age was also more consistent with increasing age. The majority were within normal range, and, as they grew older they seemed to continue the same pattern.

FIGURE 9



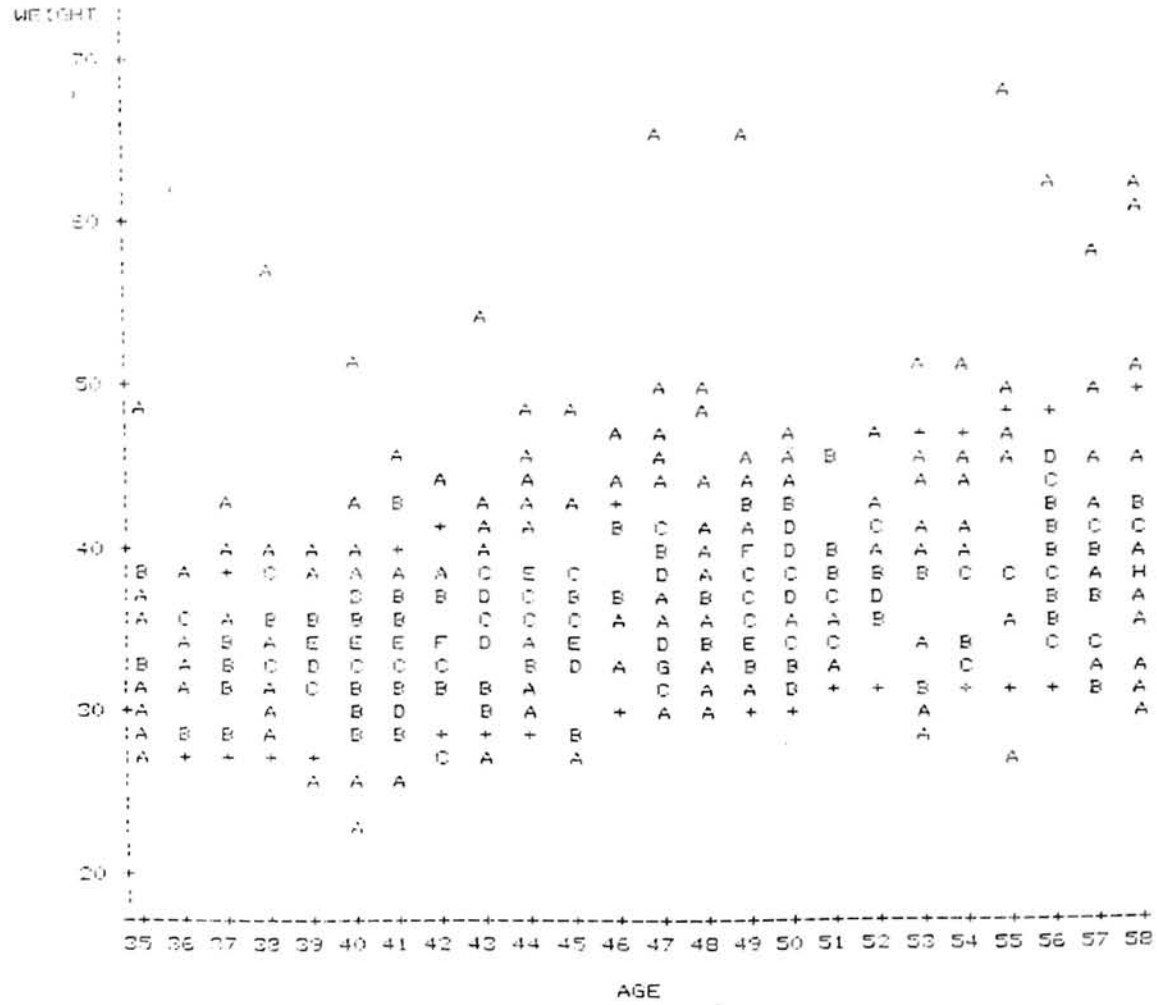
EXPCETED WEIGHT vs. ACTUAL WEIGHT IN FEMALES

FIGURE 10



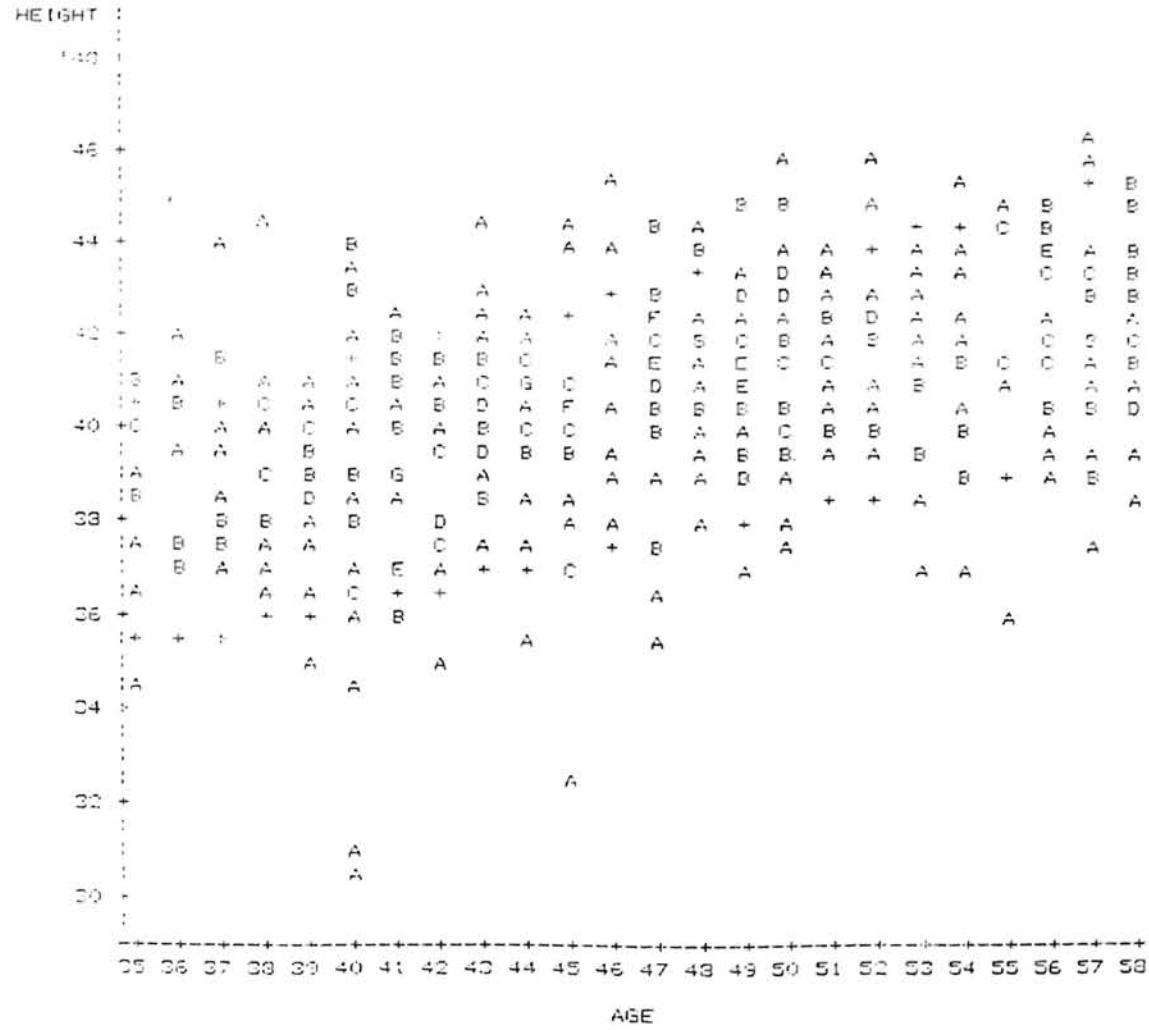
EXPECTED HEIGHT vs. ACTUAL HEIGHT IN FEMALES

FIGURE 11



EXPECTED WEIGHT vs. ACTUAL WEIGHT MALES

FIGURE 12



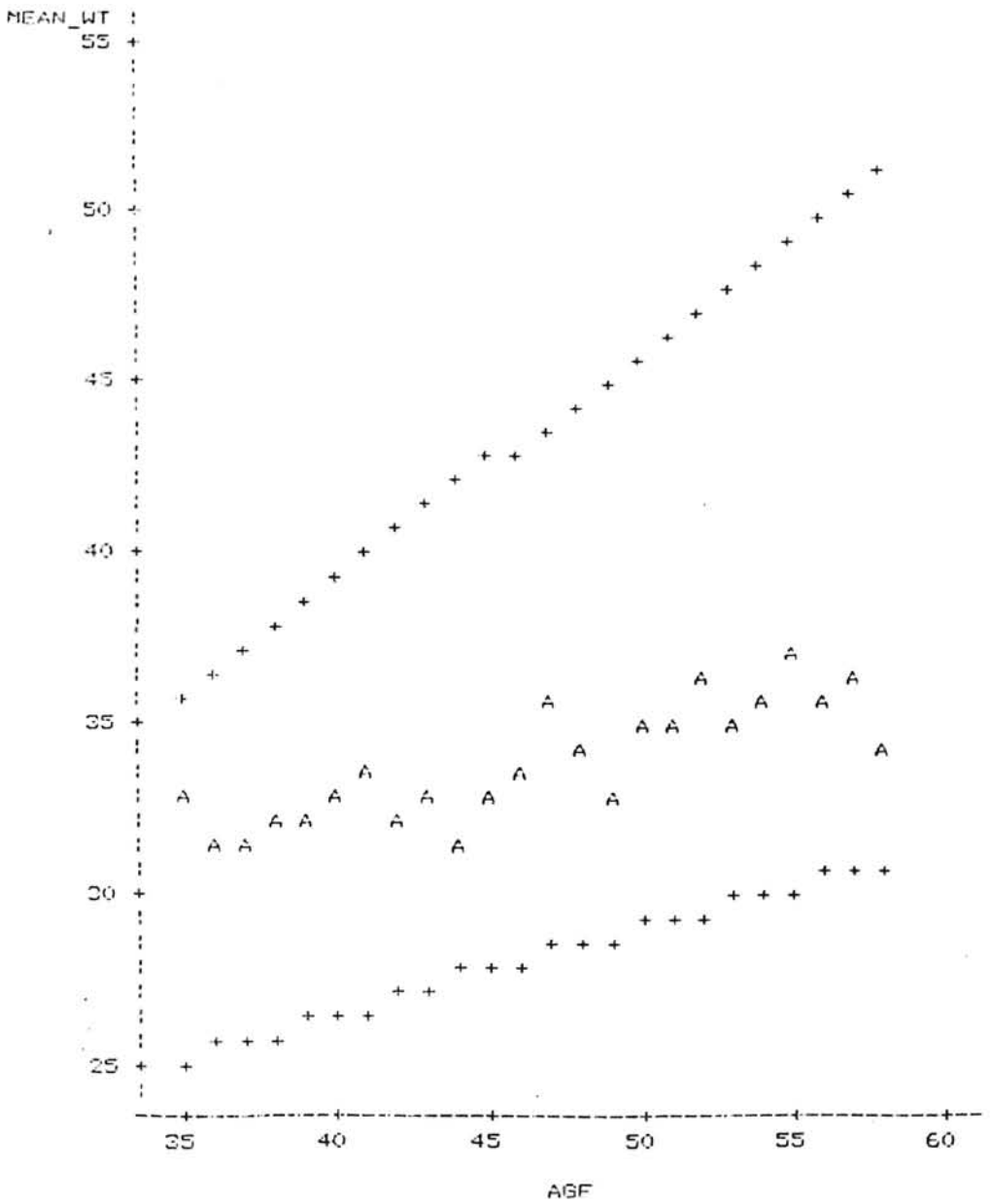
EXPECTED HEIGHT vs. ACTUAL HEIGHT IN MALES

MEAN HEIGHT AND WEIGHT FOR MALES AND FEMALES

All of the mean heights for both males and females fell within the expected range. The mean weights for females and males also fell with in the expected range. In addition all heights and weights followed an upward trend as the children grew older (Figures 13, 14, 15, and 16).

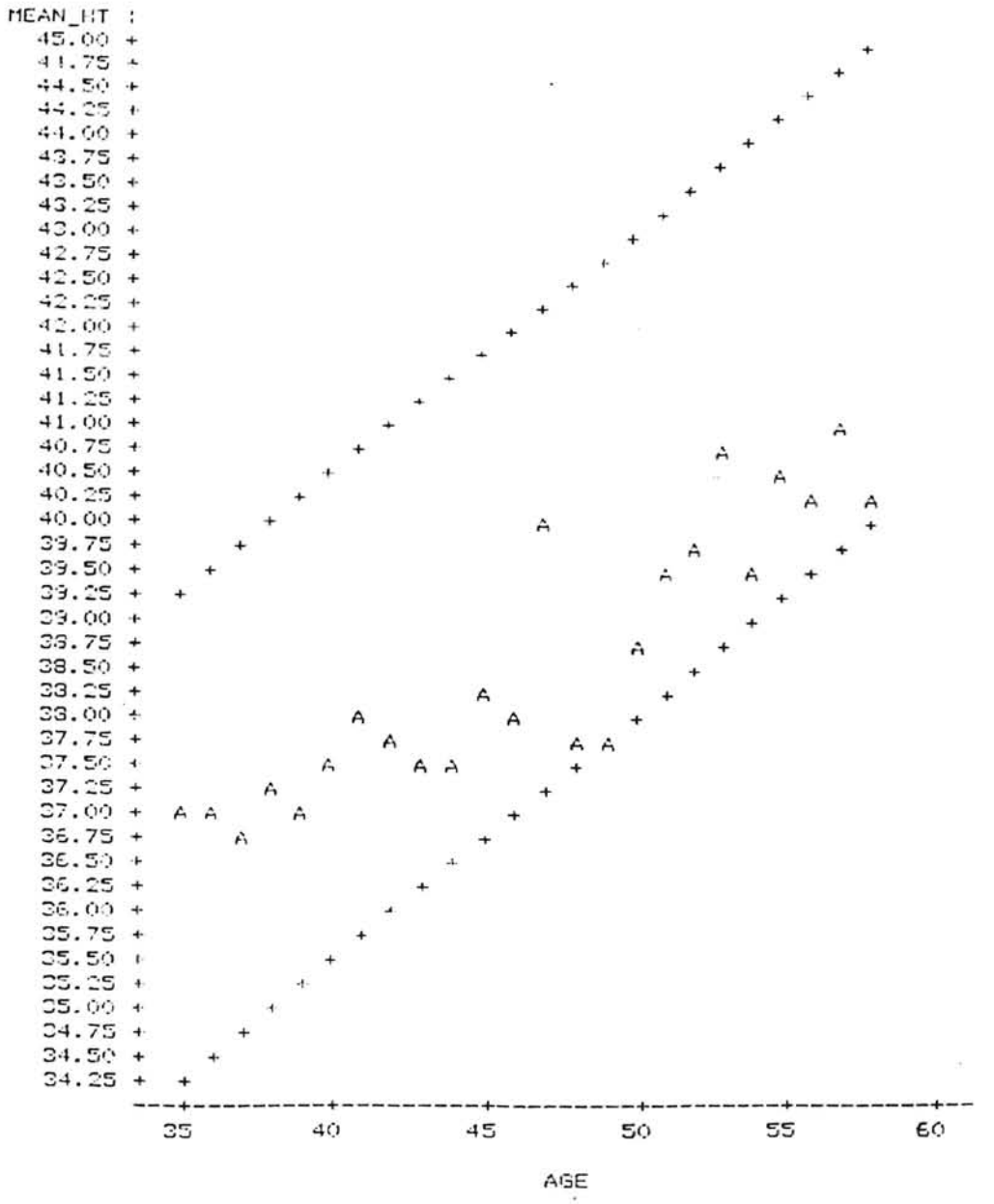
Based on the results of the scatterplots one through eight, indicating the majority of females and males fell with in their expected heights and weights, and the majority of them fell with in the mean, the researcher failed to reject Ho4.

FIGURE 13



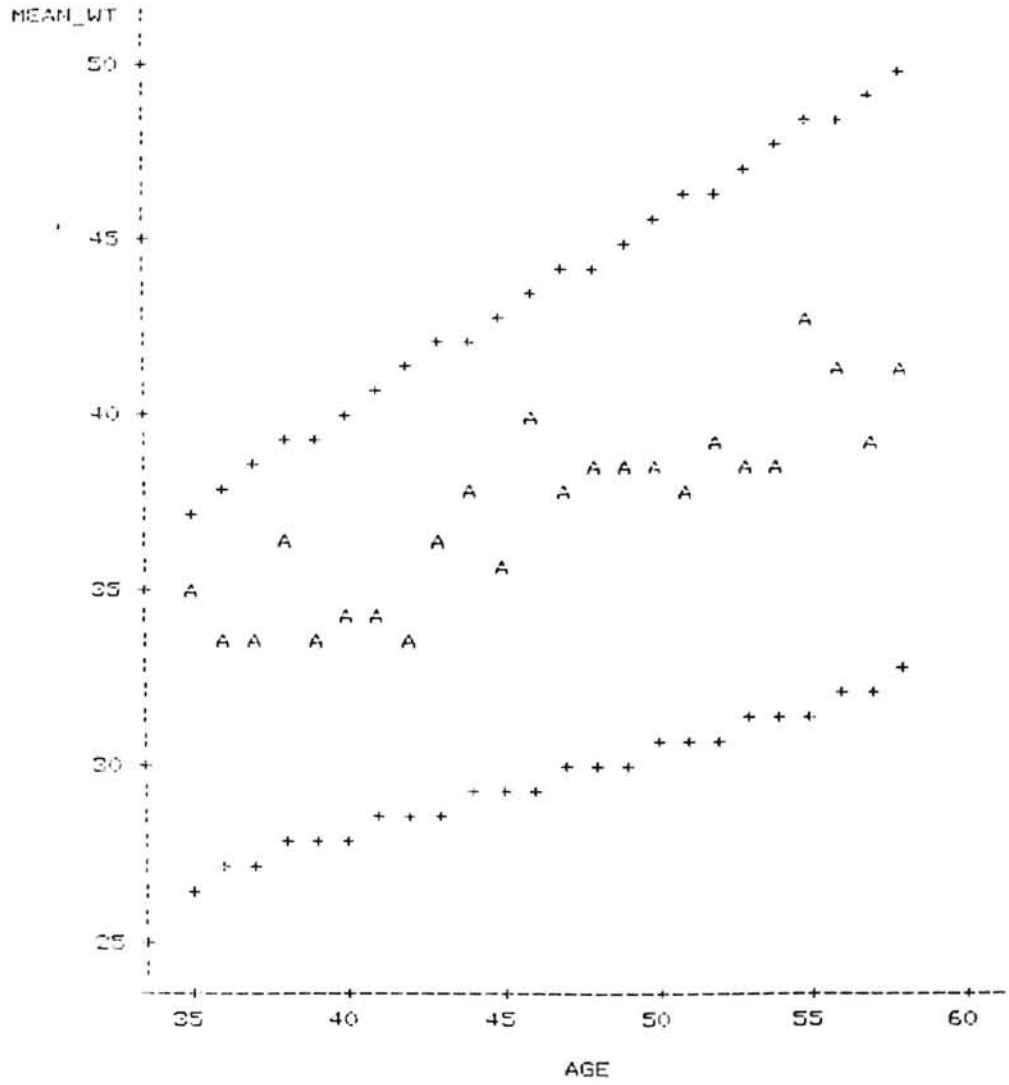
MEAN WEIGHT FOR FEMALES

FIGURE 14



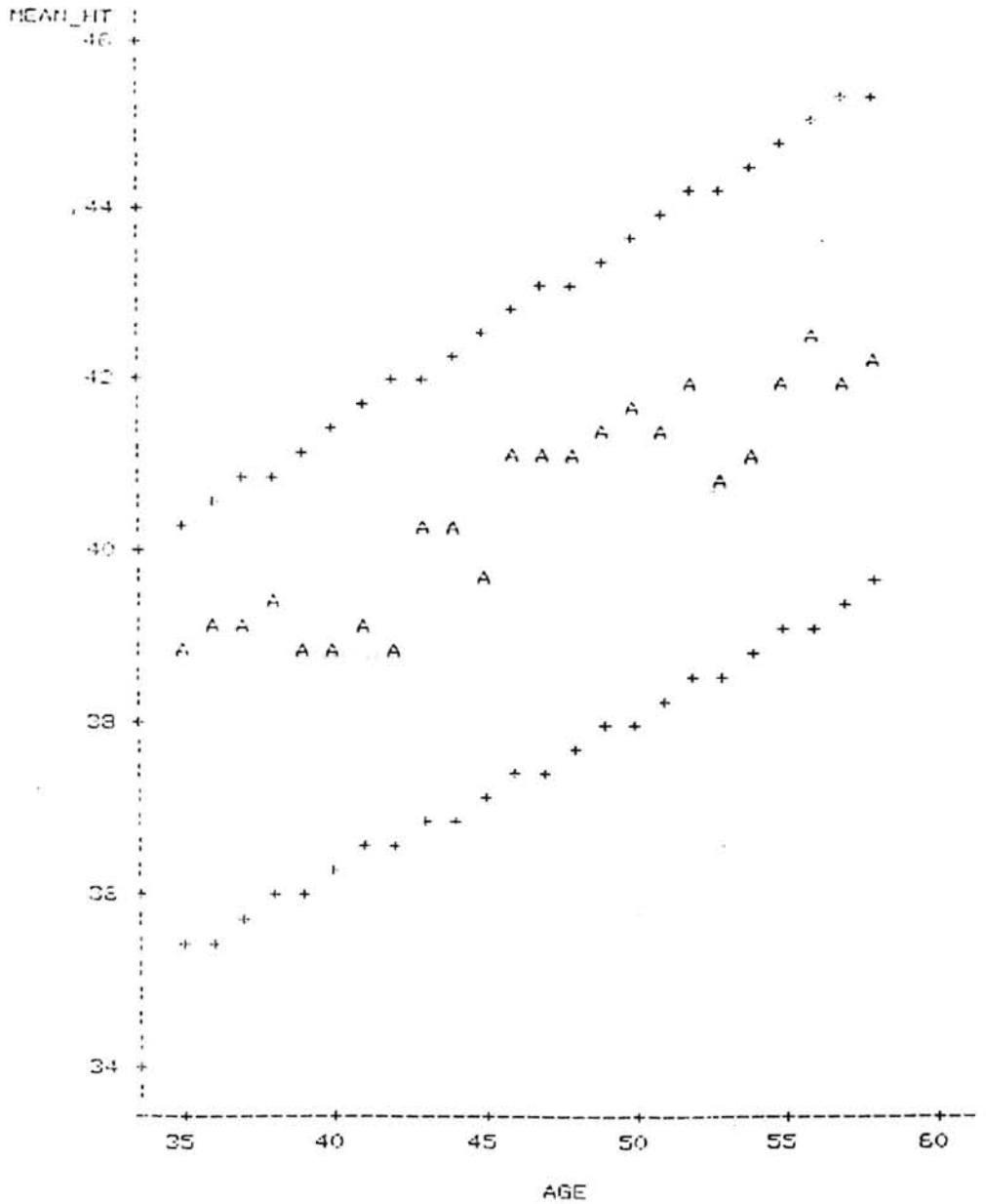
MEAN HEIGHT FOR FEMALES

FIGURE 15



MEAN WEIGHT FOR MALES

FIGURE 16



MEAN HEIGHT FOR FEMALES

CHAPTER V

SUMMARY, RECOMMENDATIONS, AND IMPLICATIONS

Summary

The purpose of this research was to determine the dietary intake and iron status of three and four year old children participating in the WIC program. Four hypotheses were postulated to determine if the children's iron status and dietary consumption were affected by personal and health variables.

The results of the data collected from the questionnaires completed by the researcher are presented in Chapter IV. The sample/population was selected from children participating in the WIC program in Las Vegas, Nevada, where the researcher was employed. Data obtained from the 875 questionnaires were analyzed using frequencies, percentages, ANOVA, Duncan's Multiple Range Test, Students t-test, Chi-Square, and scatterplots.

The majority (70.9%) of the respondents were Hispanic. Gender and age were distributed almost equally (Figure 1). The majority of the children were within normal limits for hematocrit, height, and weight (Table 1). About three-fourths of the children consumed three meals per day and about 40% consumed 2 snacks per day. The mother was the food perparer for the majority of the children, and most of the children were not on a special diet. Nearly three-fourths took no vitamin and mineral supplements.

None of the children meet the recommended number of servings for all food groups using the Nevada Food Guide for 2 to 5 year olds. If fruit and vegetables were combined, however, the majority of the children would meet the recommended number of servings which was designed as four per day. They would not however meet the five-a-day

recommended by the National Cancer Institute. Black children consumed significantly fewer total dairy products, although they consumed significantly more total protein, total fruit, total vegetables, pancakes and waffles, total sweetened beverages and other foods and combination foods. Hispanics consumed fewer oatmeal's and fats while consuming more breads and bread products. Whites consumed fewer grains than the other two groups. Females consumed more vitamin A fruits and fats while males consumed more oatmeal's. The three year old children consumed more vitamin A fruit, other fruit, other juice and total fruit. The four year olds consumed more caffeine drinks. The majority of the children fell within normal range for expected heights and weights and mean heights and weights. (Table 1)

Recommendations

The research instrument was lengthy and some of the foods listed in the frequency form were repetitious as well as difficult to translate. Future researchers may wish to simplify the questionnaire by devising their own questionnaire which had food items listed one time only. A questionnaire that more closely resembled the Food Guide Pyramid may make it easier or more accurate to interpret results.

Additional research needs to be conducted to determine how different attitudes of foods affect eating habits in differing cultures. A statewide study or nationwide study should be conducted to determine if differences in cultural food habits exist elsewhere. In addition, studies of other population groups currently immigrating to the United States need to be conducted to determine adequacy of dietary intake. Another recommendation for further study is to analyze dietary intake to determine percentages of RDA's met for calories and nutrients.

Implications

Less than half of the children met the recommended number of servings for the food groups. Nutrition educators need to identify barriers contributing to the lack of the appropriate types of foods, and focus on the importance of nutrition and health in childhood. Although the children did not meet the recommendations for the number of servings per day according to the Nevada Food Guide for 2-5 year olds, almost all were within normal limits for height, weight, and hematocrit. Nutrition educators need to develop nutrition education material for parents and other caregivers which are appropriate to different population groups they are working with. This education needs to begin in infancy in the WIC and other programs in order to develop a habit for a lifetime. Nutrition education for caregivers of preschool children should focus on introducing a variety of fruit and vegetables and protein/iron rich foods to children in order to enable them to become familiar with the foods which contribute to nutritional adequacy.

In addition, nutrition educators need to lobby for additional legislation for the WIC program which would allow for the different cultures or ethnic groups to obtain food which is more acceptable to them. Health care providers need to continue to inform local, state, and national legislators of the crucial role of the WIC program in contributing to nutritional adequacy for iron, calcium, vitamin A, vitamin C and protein, thus supporting health promotion and disease and prevention.

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APPENDIXES

APPENDIX A

FOOD GUIDE PYRAMIND

What's the Best Nutrition Advice?

It's following the Dietary Guidelines for Americans. These are seven guidelines for a healthful diet—advice 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 tip of the Pyramid.

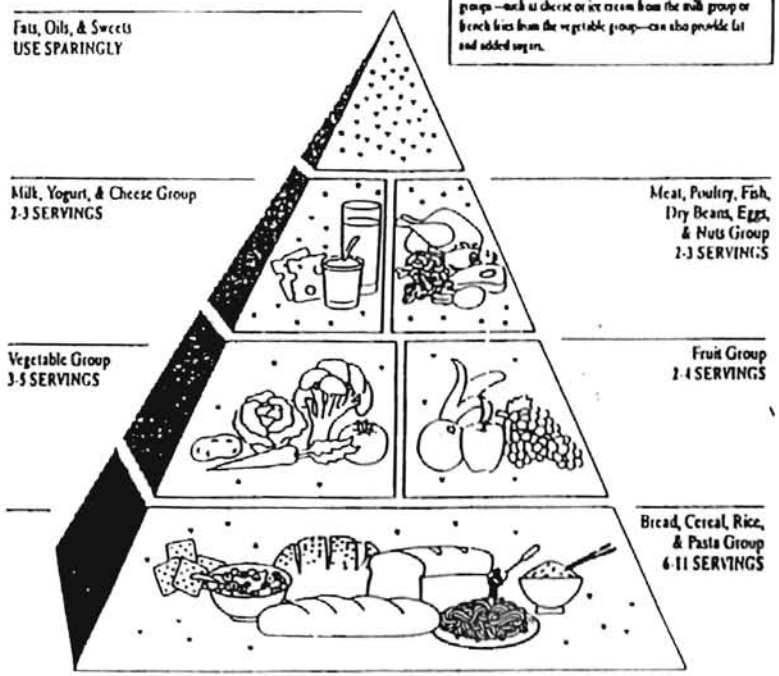
The Food Guide Pyramid

A Guide to Daily Food Choices

Key

- Fat (naturally occurring and added)
▼ Sugars (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.



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.

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 protein 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	1/2 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	3/4 cup of vegetable juice

Fruit

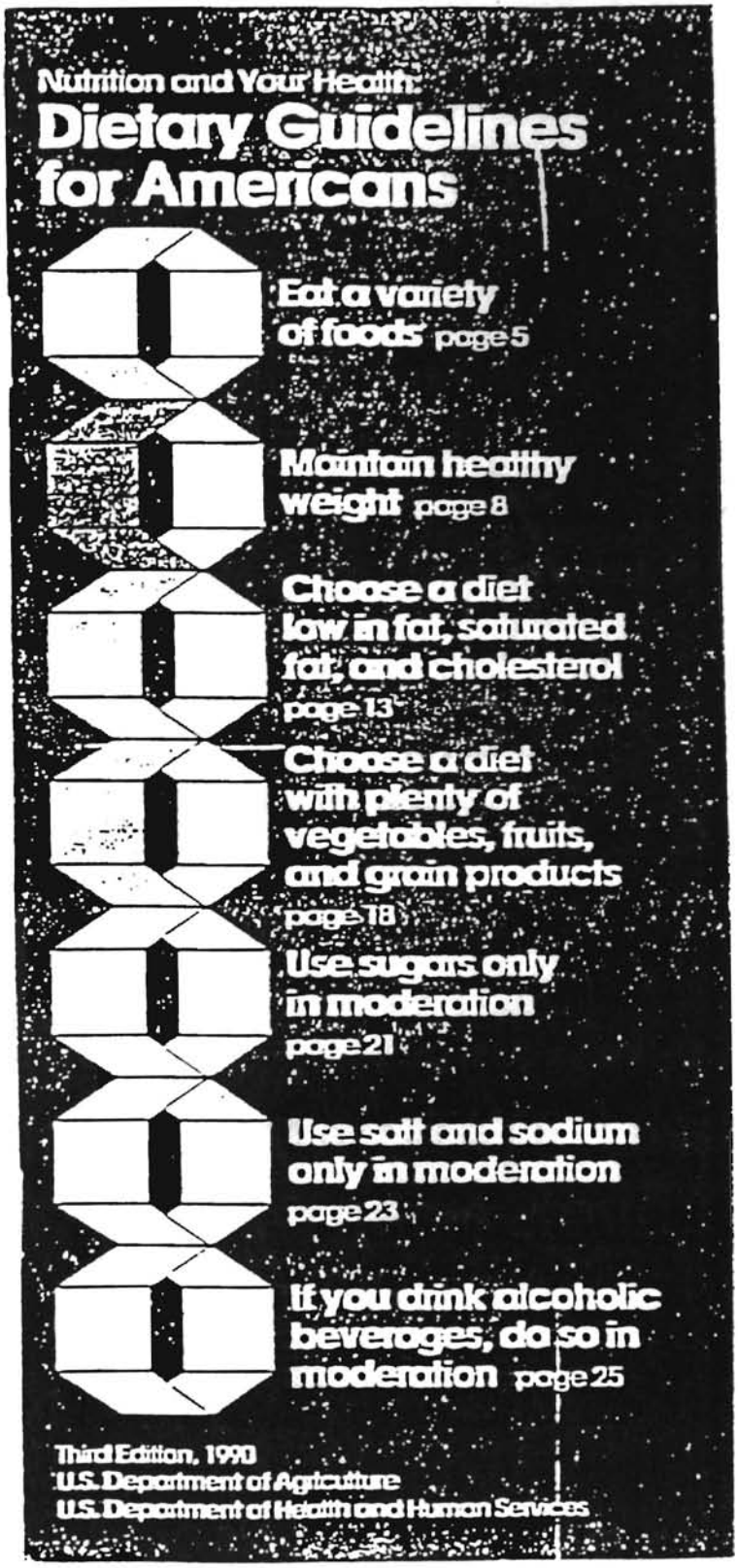
1 medium apple, banana, or orange	1/2 cup of chopped, cooked, or canned fruit	3/4 cup of fruit juice

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

APPENDIX B

DIETARY GUIDELINES FOR AMERICANS


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

FOOD GUIDE FOR TWO TO FIVE YEAR OLDS

FOOD GUIDE FOR CHILDREN 2 THRU 5

FOOD GROUP	SERVINGS PER DAY	FOODS	SERVING SIZE
DAIRY (Protein, Calcium, Vitamin D)	4 - 6	Milk Yogurt Cheese Tofu (soybean curd)	1/2 cup 1/2 cup 3/4 ounce 1/2 ounce
MEAT OR MEAT SUBSTITUTE (Protein and iron)	2 - 3	Meat, Poultry, Fish Dry Beans, Lentils, Peas Peanut Butter Egg	1 ounce 1/4 cup 2 tablespoons One whole
FRUITS AND VEGETABLES	1 Vitamin C 1 Vitamin A 2 Any Kind 4 Total	Vitamin C sources: WIC juices, citrus fruit strawberries, broccoli, green pepper, cabbage tomatoes, melons, brussel sprouts Vitamin A sources: Carrots, squash, sweet potatoes, melons, apricots pumpkin, leafy green vegetables broccoli, nectarines Other: Apple, corn, green beans, avocado, banana	 1/2 cup juice or 1/4-1/2 cup 1/4-1/2 cup 1/4-1/2cup
BREADS AND CEREALS (Thiamin, Magnesium, iron)	4 - 6	Bread or tortillas Hot cereal Cold cereal Rice or pasta Saltine crackers Graham crackers	1/2 - 1 piece 1/4 - 1/2 cup 1/2 - 1 cup 1/4 - 1/2 cup 3 - 6 squares 2 - 4 squares
FATS AND OILS	Use Sparingly	Mayonnaise Margarine Butter Oil Lard Salad dressing	1 teaspoon

APPENDIX D

RESEARCH INSTRUMENT

Questionnaire for Children's Personal and Health Information

Date of Birth_____

Height_____

Weight_____

Hematocrit_____

Gender_____

How many meals per day does the child have?_____

How many snacks per day does the child have?_____

Who prepares the meals?_____

Is the child on a special diet?_____

Is the child taking and vitamin or mineral supplements?_____

CHILD'S FOOD FREQUENCY

Please circle the foods below that your child eats and how often they are eaten

FOODS	How often does your child eat these foods.....	How many times per week
DAIRY	Milk whole, 1%, 2%, skim (nonfat), cottage cheese, milkshakes, yogurt chocolate milk, Mexican chocolate, goat milk, cream soup (made with milk)	____
	How many ounces of milk does she/he drink at each serving?_____	
	Hard cheese, American cheese, cottage cheese	____
	Ice cream, ice milk, frozen yogurt, pudding, custard, flan	____
PROTEIN	Eggs	____
	Peanut butter, nuts, seeds, dried beans, lentils, tofu	____
	Hamburger, chicken, turkey, tuna, ham, beef, pork, fish, liver, lamb, game	____
	Hot dogs, bologna, bacon, lunchmeat, cold cuts, fish sticks	____
FRUITS		
Vitamin C	Juices: Orange, grapefruit, pineapple, or WIC juices	____
	Oranges, grapefruit, cantaloupe, strawberries, tangerines, kiwi, mango, papaya	____
Vitamin A	Apricots, apricot nectar, peach nectar	____
Other	Raisins, apples, applesauce, grapes, melon, bananas, berries, peaches, pears, pineapple, plums, watermelon, cherries, nectarines, persimmons, pomegranate, loquates, dates, figs, combination fruit	____
	Juices: apple, grape, pineapple, prune, pear, cranberry, and others without vitamin C	____
VEGETABLES		
Vitamin C	Brussel sprouts, broccole, green pepper, peas, cauliflower, cabbage, salsa, chilies, green chilies, tomatoes, tomato juice, and vegetable juice	____
Vitamin A	Carrots, yams, winter squash, green onion, bok choy, spinach, greens (turnip greens, dandelion greens, red greens, beet greens, mustard greens, cabbage)	____
Other	Green beans, corn, potatoes, chayota, chick peas, artichoke, asparagus, beets, okra, combination vegetables, eggplant, parsnips, mushrooms, celery, onion, summer squash, zucchini, lettuce, turnips avocado, cucumber, radishes	____
GRAINS	Dry oats, cooked oats	____

	Rice, noodles, ramen noodles, macaroni, pasta, cereal	____
	Bread, crackers, cornbread, muffin, biscuits, tortilla, bagel pita	____
	Waffles, pancakes	____
OTHER SWEET BEVERAGES	Koolaid, soda, Tang, Hi"C", Gatorade, orange drink, cranberry cocktail, Fruit Juice, Sunny Delight, rice milk	____
SNACK FOOD	Popsicles, candy, granola bars, cookies, pastries, pies, gelatin, chips, chocolate, french fries, caramel, sugar candy, snack crackers, Cracker Jacks, cornnuts	____
COMBINATION FOODS	Macaroni and cheese, spaghetti, spaghettios, lasagna, pizza, stew, tacos enchiladas, pot pie, mince meat	____
OTHER BEVERAGES	Coffee, tea, diet soda	____
	Water	____
FATS	Butter, margarine, lard, cooking oil, salad dressing, homemade gravy, sour cream, whipping cream	____

FRECUENCIA CON QUE SU NINO COME ESTAS COMIDAS

Porque las comidas abajo anotadas que come su nino com mas frecuencia

COMIDAS	Cada cuando come su nino estas comidas.....	Numero de porciones por semana
LECHERIA	Leche entera. 1%. 2%. desnatada. requeson. malteadas. yogurt. leche con chocolate. chocolate mexicano. leche de cabra. sopa de crema (hecha con leche)	____
	Cuantas onzas de leche se toma el o ella cada vez?_____	
	Queso duro. queso americano. requeson	____
	Nieve. leche helda. yogurt congelado. pudin. natillas. flan	____
PROTEINA	Huevos	____
	Mantequilla de cacahaute. nueces. semillas. frijol seco. lentejas. tofu	____
	Carne molida. gallina. pavo. atun. jamon. res. puerco. pescado. higado. borrego. de cacria	____
	Perros calientes. balogna. tocino. carne de lonche. carne fria. varitas de pescado	____
FRUTAS		
Vitamina C	Jugos: naranja. toronja. pina y jugos de WIC	____
	Naranja. toronjas. canteloupe. fresas. kiwi. mandarinas. mango. papaya	____
Vitamina A	Albaricoques. nectar de albaricoques. nectar de duranzo	____
Otros	Pasas. mansanas. compota de mansanas. uvas. melon. platanos. bayas. duraznos. peras. pina. ciruelas. sandia. cerezas. nectarinas. granda. persimmons. loquates. datiles. higos. combinacion de fruta	____
	Jugos: manzana. uva. pina. ciruela. pera arandano. y otros jugos sin Vitamina C	____
VERDURAS		
Vitamina C	Bruselas. brecol. pimento verde. chicharos. coliflor. repollo. salsa. chiles. chiles pimientos. tomates. o jugo de tomate. o jugo de verduras combinada	____
Vitamina A	Zanaborias. calabaza de invierno. camotes. cebolla verde. bok choy. espinacas. verduras (chicoria. diente de leon. escarole. hoja roja. remolacha. nabos verde. mostaza verde. col)	____
Otros	Elotes. frijol. maiz. papas. chayota. chicharos. alcahofa. esparagos.	

	remolacha, okra, verduras combinadas, planta de huevo, chirivia, hongos, apio, cebolla, calabaza de verano, calabaza verde, lechuga, nabos, aguacate, pepinos, rabanos	____
GRANOS	Avena seca, avena cocida	____
	Arroz, tallarin, top ramen tallarin, macarron, pasta, cereal	____
	Pan, galletas, pan de maiz, mollete, bizcocho, panecillo, tortilla, bagel, pita	____
	Waffels, panquecas	____
OTROS DULCES	Koolaid, soda, Tang, Hi"C", Gatorade, naranja en polvo, jugo de arando, jugo de fruta, Sunny Delight, orchatta	____
MERIENDAS	Helados, dulces, barras de granola, galletas, pastel, postres, gelatina, tositos, chocolate, galletas, papitas fritas, caramelo, esquite caramelado, galletas de soda, Cracker Jacks, Nueces de maiz	____
COMIDAS COMBINADOS	Macarron con queso, espaguetti con salsa, spaghettios, pasta lasagna, pizza, guisados, tacos, enchiladas, pasta de carne, pasteles de carne,	____
OTROS BEBIDAS	Cafe, te, soda de dieta	____
	Agua	____
GRASA	Mantequilla, margarina, manteca, aceite para guisar, condimento para ensalada, salsa hecha en casa, crema batida, crema cortada	____

APPENDIX E

INSTITUTIONAL REVIEW BOARD APPROVAL

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 07-13-95 **IRB#:** HE-96-004

Proposal Title: IRON STATUS OF HISPANIC CHILDREN PARTICIPATING IN WOMEN, INFANTS AND CHILDREN (WIC) PROGRAM

Principal Investigator(s): Lea Ebro, Jennifer Van Auken

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

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

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

Signature:  Date: July 21, 1995

Chair of Institutional Review Board

APPENDIX F

CHI-SQUARE FREQUENCY ANALYSIS TABLES FOR THOSE ASSOCIATIONS WHICH WERE SIGNIFICANT

TABLE OF

Frequency Percent	0	1	2	Total
1	28	83	11	122
	3.22	9.55	1.27	14.04
2	52	67	12	131
	5.98	7.71	1.38	15.07
3	159	398	59	616
	18.30	45.80	6.79	70.89
Total	239	548	82	869
	27.50	63.06	9.44	100.00

Frequency Missing = 6

STATISTICS FOR TABLE

Statistic	DF	Value	Prob
Chi-Square	4	12.348	0.015
Likelihood Ratio Chi-Square	4	11.747	0.019
Mantel-Haenszel Chi-Square	1	0.253	0.615
Phi Coefficient		0.119	
Contingency Coefficient		0.118	
Cramer's		0.084	

Effective Sample Size = 869
Frequency Missing = 6

TABLE OF

Frequency Percent	1	2	Total
1	28	102	122
	12.074	109.93	14.04
2	20	111	131
	12.964	118.04	15.07
3	46	570	616
	60.962	555.04	70.89
Total	86	783	869
	9.90	90.10	100.00

Frequency Missing = 6

STATISTICS FOR TABLE

Statistic	DF	Value	Prob
Chi-Square	2	14.088	0.001
Likelihood Ratio Chi-Square	2	13.035	0.001
Mantel-Haenszel Chi-Square	1	12.836	0.000
Phi Coefficient		0.127	
Contingency Coefficient		0.126	
Cramer's V		0.127	

Eflicent Sample Size = 869
Frequency Missing = 6

VITA 2

Jennifer Lee Van Auken

Candidate for the Degree of

Master of Science

THESIS: DIETARY INTAKE AND IRON STATUS OF 3 AND 4 YEAR OLD HISPANIC, BLACK AND WHITE CHILDREN PARTICIPATING IN THE SPECIAL SUPPLEMENTAL FOOD PROGRAM FOR WOMEN INFANTS AND CHILDREN

Major Field: Nutritional Sciences

Biographical:

Personal Data: Born in Norman, Oklahoma, November 1, 1969. The daughter of Joe M. Van Auken and Christina L. Vanauken.

Education: Graduated from Putman City North High School, Oklahoma City, Oklahoma, in May, 1987; received Bachelor of Science Degree in Nutritional Sciences from Oklahoma State University, Stillwater, Oklahoma in May 1993; completed Approved Pre-Professional Practice Program at Oklahoma State University, May 1994; passed registration exam to meet requirements for American Dietetic Association membership in October, 1994; completed requirements for the Master of Science Degree at Oklahoma State University in May 1996.

Professional Experience: WIC Dietitian Economic Opportunity Board, Las Vegas, NV, January 1995 to August 1995.

Professional Organizations: American Dietetic Association, Oklahoma Dietetic Association, American Society for Parenteral and Enteral Nutrition