Nutrients Analysis of Preschool Lunch Menus in Virginia

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Thesis submitted to the Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Master of Science
in
Human Nutrition, Food and Exercise

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June 17, 1999
Blacksburg, Virginia

Keywords: Child care center, Nutrients analysis, Menu plan

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(Abstract)

Child care centers are becoming much more influential in educating and caring for children because more and more families choose supplemental care for their young children in child development programs. In June 1997, Child and Adult Food Program (CACFP) served nearly 2.2 million children and provided meals to 2.6 million children in March 1998. A large number of children eat at least one and sometimes two or more of their meals at child care centers. It is imperative that nutritious and satisfying meals and snacks are served at child care centers. The purpose of this study was to examine menus planned in Head Start Program and Child Day Care Centers in Virginia and to assess if they meet the national Recommended Dietary Allowances (RDAs) standards for vitamin A, vitamin C, calcium and iron.

Lunch menus for 3-5 year old children were collected from 114 CACFP staffs attending a state wide CACFP menu training session. Fifty-seven weekly menus were selected based on geographic representation to analyze vitamin A, vitamin C, calcium and iron levels by a nutritional analysis computer program. Menus were also divided into Head Start Program and Child Day Care Center for further analysis and comparison.

For all 57 sites, the mean values of these lunches exceeded the one-third RDAs for vitamin A, vitamin C, and calcium; the average percentages were 198%, 121% and 134%, respectively. But the average iron level was only 63% RDAs. None of the child care centers met 100% of one-third RDAs for the lunch menus. Because dietary iron levels are consistently low, iron food sources were studied. The results showed no significant ($p < 0.05$) difference between the Head Start Program and Child Day Care Center.

Based on the findings of this study, following the established meal pattern guidelines for the child nutrition programs did not guarantee adequate iron levels in the planned menus of the child care centers. Some foods with high iron levels should be used more often. Further research is needed for this population in implementing the appropriate dietary guideline. In addition, the menu planing, food purchasing and preparation should be part of the training programs for child care centers.

To

My Father, Chung-Su Wu,

My Mother, Yu Lin,

who support me so much.

Acknowledgments

This study was completed with the help of many people. I would like first to take this opportunity to express my deepest appreciation to my major advisor, Dr. Ann A. Hertzler, for her excellent guidance, constant support, patience and encouragement from the beginning. Without her support, the achievement of this thesis would be impossible. I also would like to thank Dr. Denise Brochetti and Dr. Charlie R. Baffi for thoughtful discussions, supports and serving on my committee.

A special thanks goes to Ms. Shirley Miller, program specialist in UADA Food and Nutrition Service, who helped out for identifying the food, answering any questions about CACFP. In additional, I wish to thank Dr. Robert B. Frary and Dr. Susan R. Hutchinson for their help in statistics. Appreciation also is expressed to Stephen G. Hall, a graduate student in HNFE Department, who introduced me into my research and worked with me in the beginning. I would like to thank Laurie Jehle, a senior nutrition student, who helped me to code the menus and correct the food decisions.

Thanks goes out to all my friends who are still in Blacksburg, who have gone back home, and those scattered across the country. Especially thank my friends in Taiwan and my college classmates who support and encourage me so much from another side of earth over the past two years.

And, most of all, I am deeply grateful for never-ending love and support by my parents and my brother, Da-Cheng. My gratefulness can not be pressed completely in word, but I still want to say thank you all for the patience, encouragement and everything from the deepest side of my heart.

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Chapter I
Introduction

A. Background

Public food programs are of critical importance for improving the nutritional status of children and their families. In the United States, food assistance programs that help ensure adequate nutrient intake include the Special Supplemental Food Program for Women, Infants, and Children (WIC), Child and Adult Care Food Programs (CACFP), School Breakfast Program, National School Lunch Program, Summer Food Service Program (SFSP), and the Commodity Supplemental Food Program (Position of the American Dietetic Association [Position of the ADA]: Child nutrition services, 1993).

Child care centers are becoming much more influential in educating and caring for children. The reason is that more and more families choose supplemental care for their young children in child development programs. The statistics from a study in 1988 indicate that there were at least 5.1 million children under six years of age enrolled in day care outside their own homes while their parents were at work, and 4 million were enrolled in family day care homes (FDCHs). In 1991, at least 1.9 million children were enrolled in child care centers or FDCHs that participate in the CACFP (Nutrition standards in child care programs, 1994). In June 1997, CACFP served nearly 2.2 million children and it provided meals to 2.6 million children in March 1998 (Child and Adult Food Program [CACFP], 1999). The US Department of Health and Human Services (DHHS) has established national nutrition performance standards for the Head Start Program. The United States Department of Agriculture (USDA) has specified minimum requirements for meal patterns and food service in child care facilities that participate in its CACFP. The American Dietetic Association (ADA) has published standards for nutrition in child day care programs. The American Public Health Association, together

with the American Academy of Pediatrics, used all three of these sets of guidelines in developing nutrition related health and safety performance standards for out-of home child care programs. Also, most states have established licensing and other forms of regulation that include nutrition standards for child care facilities. Those standards are necessary to ensure that food services in child centers are uniform and high in quality.

The growth and development of children is more rapid during the first few years of life than at any other time. Children need to eat a wide variety of foods to obtain an adequate quantity of all the essential nutrients. A large number of children eat at least one and sometimes two or more of their meals at child care centers. It is imperative that nutritious and satisfying meals and snacks are served at child care centers.

B. Child and Adult Care Food Program (CACFP)

The CACFP provides federal funds and USDA-donated foods to non-residential child care and adult day care facilities to serve nutritious meals and snacks. CACFP reimburses participating day care operators for meal services and provides them with USDA commodity food and nutrition education materials. Day care providers in the CACFP must serve meals that meet federal guidelines, and must offer the same meal to all children regardless of the family income. Menu plan is introduced in training to new CACFP participants and followed by review of monthly menus by program specialists in the field office. If the menu plans do not meet the requirements, the facility has to return reimbursement. Most child and adult care centers include meals as a part of their fees. Types of child care institutions participating in CACFP are Head Start Programs (DHHS) and Child Day Care Centers (CACFP, 1999).

1. Child Day Care Center

Eligible institutions include any public or private nonprofit organization providing licensed or approved day care service for children. Private for-profit child care centers may also participate if they receive compensation under Title XX of the Social Services Benefits for at least 25 percent of the enrolled children or 25 percent of their licensed capacity.

States may set licensing requirements for Child Day Care Centers. The Sate Department of Education, or an alternate state agency, or the USDA regional office is the administering agency to the centers and sponsors of homes. As an administering agency, the state agency monitors the CACFP and corrective action when regulations are not being followed. However, in the Commonwealth of Virginia, the CACFP is administered by the USDA Mid-Atlantic Region, Food and Nutrition Service, Child and Adult Care Food Program Unit in Robbinsville, NJ.

Child care centers operate an average of 10 hours per day, five days per week. Nearly three-quarters (71%) of child care centers are funded by both parent fees and government subsidies; 18% of them are funded by subsidies only and another 11% need to pay full fee. 65% of children participate in Child Day Care Center are three to five years old; 23% are six to twelve years old; 10% are one to two years old and 1% are under one years old. (CACFP, 1999).

2. Head Start Program

Head Start is a national program which provides comprehensive developmental and social services to America's low-income, pre-school children, ages three to five and their families. Approximately 1,400 community-based non-profit organizations and school systems develop unique and innovative programs to meet specific needs. Head Start

emphasizes health, education, social services and parental involvement to enhance children's social competence and increase the families' abilities to take care of their children (Head Start Fact Sheet, 1997).

Head Start provides training to staff at all levels and in all program areas. The Child Development Associate (CDA) program gives professional and non-professional employees the opportunity to pursue academic degrees or certification in early childhood education. Volunteers are an important part of all Head Start programs. High school and college students, homemakers, parents of Head Start children, retired senior citizens, and others have offered critical help to local Head Start programs (Head Start Fact Sheet, 1997).

Between 1965 and 1976, Head Start served over 15.4 million children and their families. Head Start played a major role in focusing attention on the importance of early childhood development. The program also has an impact on child development and day care services; the expansion of state and local activities for children; the range and quality of services offered to young children and their families; and the design of training programs for those who staff such programs. Outreach and training activities also assist parents in increasing their parenting skills and their knowledge of child development. The cornerstone of the program is parent and community involvement, which makes it one of the most successful pre-school programs in the country (Nutrition training guide for class room personnel in Head Start Programs, 1976).

Children enrolled in Head Start Program who meet the low-income criteria of Head Start Program regulations are considered automatically eligible to participate in CACFP. Head Start centers open an average of about eight hours per day, and nearly one-third (31%) are open fewer than five days per week. 96% of Head Start centers are funded exclusively by government subsidies.

Head Start is now administered by the Administration for Children, Youth and Families (AACYF), Office of Human Development Services (OHDS), under the U.S. Department of Health and Human Services (DHHS). The following provides a picture of Head Start operational units at the regional and community levels (Handbook for local Head Start nutrition specialists, 1975).

1. Regional Level:
   The United States and its territories are divided into 10 Health and Human Services regions, each of which has a Head Start Bureau Office. Regional Head Start Offices review Head Start grant applications, allocate funds to programs, develop regional guidelines and operating policies, and monitor Head Start program for compliance with Performance Standards and regional policies.
2. Community Level:
   Regional DHHS offices award grants to local public and private nonprofit organizations and agencies to operate community Head Start programs, Programs are administered by “grantees” or “delegate agencies”. A grantee or delegate agency may have one or more “centers”. The center may be located in a church, school, storefront, house or other community facility.

In Virginia, schools, community action programs and single-purpose agencies sponsor Head Start. Virginia enhances Head Start through the Virginia Head Start to Work program. Head Start to Work, now in 54 locations across Virginia, provides full-day, full-year childcare for parents who are working or who are in education and training programs (Head Start in Virginia, 1997).

As more and more children are in child care facilities, the nutritional adequacy of meals and snacks served in those facilities is most important. The purpose of this study was to examine menus planned in Head Start Programs and Child Day Care Centers according to the standard guide and to assess if they met the national recommended nutrient

standards for vitamin A, vitamin C, calcium and iron since they are the four nutrients listed on the food label and most likely to be deficient (Yate, Schlicker, and Suitor, 1998; Oakley, Bomba, knight, and Byrd, 1995).

Chapter II

Literature Review

A. Nutrition Standards for Child Care Programs

1. Recommended Dietary Allowances (RDAs) and Dietary Reference Intakes (DRIs)

The RDAs up to 1989 are expressed as recommended daily intakes to provide nutritional needs for approximately 98% of the population (the mean requirement plus 2 standard deviations)(Recommended Dietary Allowances [RDA], 1989). The goal for menu planning is to relate portions of the daily menu to the RDAs. For example, the National School Lunch Program (NSLP) requires that school lunch provide one-third or more of the RDA. The School Breakfast Program (SBP) requires that breakfasts provide one-fourth of the RDA (Early childhood and child care study, 1997). Head Start programs also are required to these same nutritional standards. Because most RDAs are expressed as averages plus 2SDs and because of variation in the sizes and activity levels of different children, a range (i.e., one half to two thirds) rather than a specific proportion of the RDA is often used as the standard for interpreting nutritional adequacy of dietary intakes (RDA, 1989).

The recent DRIs (Yates et al., 1998) represent the new approach adopted by the Food and Nutrition Board to provide quantitative estimates of nutrient intakes for use in a variety of settings. The DRIs replace and expand on the past 50 years of revisions of the RDAs. For some nutrients, 1998 recommendations are not available (i.e., vitamin A, vitamin C, iron). Some, DRI recommendations stay about the same level with RDAs for this age

group (i.e., calcium). For this reason, vitamin A, vitamin C, iron and calcium are compared with the 1989 RDA's standard in this study.

2. American Dietetic Association, Child and Adult Care Food Program and Family Day Care Homes

Child care centers should follow recommended nutrient standards in order to provide nutritious meals that meet the RDAs. But the percentages of the RDAs provided by specific meals vary depending upon the agency and meal planner. In a full-day program (8 hours or more), a child should receive food that provides at least one-half to two-thirds of the daily nutritional needs (Position of ADA: Child and adolescent food and nutrition programs, 1996). Each child should receive sufficient servings of fruits, vegetables, and whole-grain products to ensure that good sources of vitamin C, vitamin A and dietary fiber are provided (Position of ADA: Nutrition standards of child care programs, 1994). The nutrient standards recommended by the ADA reinforce and are consistent with recommendations and standards established by the DHHS for its Head Start Program, by the USDA for its CACFP, by the American Public Health Association and the American Academy of Pediatrics for out-of-home child care programs, and by the Society for Nutrition Education for child care settings (Nutrition standards in child care programs: Technical support paper, 1994).

Meals and snacks should be nutritionally adequate and consistent with the Dietary Guidelines for Americans. The addition of fat, sugar, and sources of sodium should be minimized in food preparation. Care should be taken to remain consistent with the best practices for food safety and sanitation. Child care programs must comply with local and state regulations related to wholesomeness of food, food preparation facilities, food safety, and sanitation (Nutrition standards in child care programs: Technical support paper, 1994).

Standards to ensure that the food at child care centers and FDCHs meet the children's nutritional needs should be included in licensing and other forms of regulations established to ensure quality in child care services. The American Dietetic Association stated that all child care programs should achieve the recommended standards for meeting children's nutritional needs and education needs in a safe, sanitary, supportive environment that promote healthy growth and development (Position of ADA: Nutrition standards for child care programs, 1994). Appropriate child nutrition services include food assistance, food service, nutrition education, nutrition screening and nutrition assessment and counseling (Position of ADA: Child nutrition services, 1993).

B. Food Standards for Child Care Program

1. Basic Four Food Guide (B4) / Food Guide Pyramid

Food guides have been used by nutritionists since the 1920s as a device for teaching how to plan and select adequate nutrition. The Basic Four Food Guide which was published by the United States USDA in 1956 was based on the 1953 RDAs. In 1978, King, Cohenour, Corruccini and Schneeman evaluated and recommended modifications of menus based on the Basic Four Food Guide. The researchers identified the food sources of the five nutrients below two-thirds of the RDAs (1974) (vitamin E, vitamin B-6, magnesium, zinc, and iron) in the Basic Four Food Guide. However, following the Basic Four Food Guide provided more than 70% of the RDAs for calcium, vitamin A, vitamin C and protein.

A food guidance system based on 1980 RDAs was developed in 1987 to assist healthy Americans in making food choices for good health (Cronin, Shaw, Krebs-Smith, Marsland and Light, 1987). Renamed in 1992, the Food Guide Pyramid was designed to guide food choices to meet the 1989 RDA without depending on nutrient supplements or a few highly fortified foods. In 1987, Cronin et al. estimated levels of nutrients (Table 2.1) provided by different food examples including modifications for young children. The

minimum example for adults included 2 servings of fruit, 3 servings of vegetables, 5 oz. lean from the meat and meat alternate group, 2 servings from the milk, yogurt and cheese group, and 6 servings from the bread and bread alternate group. The minimum numbers of servings were maintained for young children, but the amount was reduced by one-third except for milk, yogurt and cheese group. The 2 cups milk (or their equivalent in yogurt and cheese) were retained for providing calcium RDA. Table 2.1 is the comparison of the minimum example for adults and adaptation for 4-6 year old child in terms of % RDA met by this pattern. Analysis showed that iron level met 82% of 1980 RDA and at least 80% of the 1980 RDAs of protein, vitamins and minerals in diets for 4-6 year old children were met by the five food groups of the Food Guide Pyramid (Cronin et al., 1987).

2. Child and Adult Care Food Program

The goal of the CACFP is to provide nutritious meals and snacks to children in child care programs. USDA has established meal pattern standards designed to ensure that CACFP providers include enough food groups and amounts of food required to meet children's needs (USDA, 1997). In Table 2.2 are the CACFP meal component requirements for children. Program regulations specify minimum amounts of each food component to be offered to children of different ages.

In Table 2.3 is a comparison of the food groups, serving sizes and amounts for the Food Guide Pyramid and the CACFP standards. One day of CACFP standards include 1 breakfast, 1 lunch, 1 dinner and 2 supplements (snacks). Also, the Food Guide Pyramid serving sizes and the amounts for 4-6 year old children (Center for Nutrition Policy and Promotion, 1999) are listed in order to compare with the foods and amounts in CACFP. In addition, food groups are slightly different between Food Guide Pyramid and the

Table 2.1. Comparison Food Guide Pyramid nutrient levels by percentage of 1980 Recommended Dietary Allowances (RDAs) for adult and for age 4-6 years old (Cronin et al., 1987)

Nutrient	Percentage of the RDA Provide	
	Example A Adult	Example A2 Child 4-6 years old
Protein	264%	195%
Calcium	111	99
Iron	122	82
Magnesium	142	104
Phosphorus	166	131
Zinc	113	82
Vitamin A	361	250
Thiamin	150	107
Riboflavin	182	144
Preformed niacin	166	112
Vitamin B-6	122	86
Vitamin B-12	212	166
Ascorbic acid	251	170
Folacin	123	86

- The foods in example A were 2 servings of fruit, 3 servings of vegetable, meat 5 oz., milk 2 cups and 6 servings of grain.
- Example A2 is the foods in example A reduced by one- third in serving size, with the exception of milk, which remains at 2 cups.

Table 2.2. CACFP Meal Component Requirements for Children

Meal	Component
Breakfast	One serving each:
	Fluid milk
	100% juice, fruit, or vegetable
	Bread or cereal
Lunch or Supper	One serving each:
	Fluid milk
	Meat or acceptable meat alternate
	Bread or acceptable bread alternate
	Plus: Two servings of fruit and/or vegetables
Snacks	A total of two servings selected from:
	Fluid milk
	Meat or acceptable meat alternate
	Bread or acceptable bread alternate
	100% juice, fruit, or vegetable

Table 2.3. Comparison of Food Guide Pyramid recommendations (Center for Nutrition Policy and Promotion, 1999) for 4-6 year old children with CACFP Meal Pattern for Children (USDA Children Nutrition Program, 1994)

Food Guide Pyramid for child (4-6 yrs)		CACFP (3-5 yrs)	
Groups (Servings/ Day)	**Definition of 1 serving**	**Components** (Servings/ Day*)	**Definition of 1 serving (Lunch)**
		Milk**	
Milk,	1 cups	(2 ¾ cup) Lunch/Supper=3/4 cup Breakfast=3/4 cup Snack=1/2 cup	
Yogurt, and	1 cups		
Cheese	1 oz.		
(2 servings)		Milk, fluid	¾ cup (select one)
Meat, Poultry,	2-3 oz.	**Meat and Meat Alternates**	
Fish,	2-3 oz.		
Dry Beans,	2-3 oz.	(3 ½ oz.) Lunch/Supper=1.5 oz. Snack=1/2 oz.	
Eggs, and Nuts	½ cup		
(2 servings or 5 oz. lean)		Lean meat or poultry or fish or	1 ½ oz.
		Cheese or	1 ½ oz.
		Eggs or	1 egg
		Cooked dry beans or peas or	3/8 cup
		Peanut butter or soynut butter or other nut or seed butters or	3 tbsp.
		Peanut butter or soynuts or tree nuts or seeds	¾ oz.
		Yogurt	(select one)
Vegetable		**Vegetables & Fruits**	
(3 servings)	½ cups	(1 ¾ cup)	
		Vegetables and or fruits	½ cup total (select ½ cup total)
		(A minimum of 2 items must be served at lunch and/ or supper)	
Fruit			
(2 servings)	½ cup	Lunch/Supper=1/4 cup Breakfast=1/2 cup Snack=1/2 cup	
		Bread and Bread Alternates	
Bread,	1 slices		
Cereal, Rice,	½ cups	(2 slice) Lunch/Supper/Breakfast/Snack=1/2 slice	
and Pasta	½ cups	Enriched or whole grain	½ slice
(6 servings)		Pasta, noodle and rice	¼ cup (select one)

* For CACFP, 1 breakfast, 1 lunch, 1 dinner/supper and 2 supplements (snacks) for a day.
** Cheese and yogurt are counted in the Meat and Meat Alternates Group in CACFP

CACFP requirements. For example, for CACFP the milk group only includes fluid milk not yogurt and cheese; the vegetables and fruits are in the same group. Table 2.3 shows that the amount of food recommended by the Food Guide Pyramid is much more than the amount in CACFP.

3. National Health and Safety Performance Standards

Guidelines for Out-of-Home Child Care Programs have been outlined in National Health and Safety Performance. The guidelines state the following standards: Children in care for 8 hours or less shall be offered at least one meal and two supplements (snacks) or two meals and one supplement; a child in a part-day program (4 to 7 hours per day) should receive food that provides at least one third of the daily nutrition needs and children in care for 9 hours or more shall be offered at least two meals and two supplements (snacks) or three supplements (snacks) and one meal. In addition, a nutritious supplement (snack) shall be offered to all children in midmorning and in midafternoon (National Health and Safety Performance Standards [NHSPS], 1992).

C. The menu plan at the child care center

1. Nutrients in the Meals

Interest in meals at child care centers has grown considerably in recent years because nearly 60% of 15 million preschool children are enrolled in child care centers and family day care homes (Briley, Robert-Gray, and Simposon, 1994). Although the CACFP has made huge strides toward ensuring that children with high nutritional risk because of poverty have opportunities to eat nutritious meals and snacks, 90% of Child Day Care Center menus evaluated in Texas in 1988 and 1989 still fell short of recommended standards (Briley et al., 1994). Briley, Buller, Roberts-Gray,and Spakman (1989a) analyzed 120 sets of full day menus. Because the menus were collected from centers with full-day programs (8 hours or more, and include breakfast or morning snack, lunch, and

afternoon snack), the menus should have supplied at least one-half to two-thirds of the children's needs for all nutrients. Nutrient analysis showed that most of the menus provided 88% to 143% of the RDA of protein, riboflavin, vitamin C and vitamin A. In addition, most of the menus (i.e., 66% to 72%) provided at least 50% of the RDA for niacin, thiamin, and calcium. However, only 27% and 35% of the menus met at least 50% of the RDA for energy and iron, respectively. None of the menus evaluated supplied 67% of the RDA for calories.

Oakley et al. (1995) evaluated the lunch menus in Mississippi child care centers in 1995. Since the menus in that study were only for lunch, the results were compared with one third of the RDA. The results showed that following the established meal-pattern guidelines for the child nutrition programs might not guarantee consistent nutritional quality of planned menus in child-care centers. Most centers in the study provided at least one third of the daily nutrient recommendations for protein, vitamin D, vitamin K, and potassium. However, for 53% and 54% of the child care centers provided at least one third of the RDA requirements vitamin A and vitamin C, and only 19% of the child centers could meet the one third of standards for iron. None met the standard for calcium. Nine (13%) of the centers provided adequate energy in the lunch menus as planned.

In a study by Hertzler, Frary, and Ward (1996), one-day menus planned by nonnutritionists for 4-year-old preschoolers using the Food Guide Pyramid were analyzed by graduate students. The results showed protein was the most abundant nutrient in the menu plans, averaging about double the 1989 RDAs for 4 year-olds. Although some calcium outcomes were slightly lower than 100% of the RDA, all menus were well above 70% of the RDA for calcium. Also, Vitamin A and Vitamin C were around 100% or above the1989 RDAs. However, of the evaluations for iron, 26% of the menus were greater than 100% RDA; 47% were between 70% and 100% RDA, but 27% were less than 70% RDA. The findings substantiated that precision in meeting standards depends on incorporating the Food Guide Pyramid subgroup recommendations of dark-green

vegetables. This study showed inadequate meal plans result from not following the minimum recommended servings and the subrecommendations of the Food Guide Pyramid. Meeting the recommended number of servings for each of the food groups results in adequate nutrient intake if the nutrient is concentrated in a food group.

2. Foods in the Meals

Briley et al. (1989a) analyzed 10 full day-menu sets discussed above for 40 licensed child care facilities representing different geographic areas of Texas. The results (Table 2.4) showed beef, beans, poultry and fish were the four most frequently occurring items observed within the meat/ meal alternate group. Apple, potato, roll/ sliced bread, milk and cookie were the most frequently occurring items within the fruit/fruit juice, vegetable, bread/cereal, dairy and "extra" food groupings, respectively. Across categories, the foods used most often were milk, beef, roll/sliced bread, potatoes, apples, and cookies. Beef, roll/sliced bread, crackers, cookies, and punch appeared four or more times during the week for a substantial numbers of the menus. The results also showed that the menus have acceptable amount of vegetables and meats, but not enough fruits according to the standard. An average of 6 to 7 vegetables and 4 meat/meat alternates were used each week. Although several centers used only 1 fruit during the entire week, some centers used as many as ten varieties of fruit during a week; the average was five. Typically, three or four different kinds of extra foods such as cookie, cake and gelatin were served during the week. These results illustrate the challenges of developing menus that include a variety of foods.

Schwenk (1997) reported the percentage of children from the 1994 Continuing Survey of Food Intakes by Individuals (CSFII) who consumed food from the various Food Guide Pyramid food groups. The results showed that of the 3 year olds surveyed, 99% of the children had food from the grain products; 92 % had milk and milk products; 86% ate meat, poultry and fish. However, 19% consumed no vegetables on the day of the survey,

Table 2.4. Foods most frequently used in child day care full-day menus in Texas
(Briley et al., 1989a)

Foods	Number of weekly menus using this food				Total
	Once	Twice	Thrice	More	(no.=120)
Meats/					
Meat alternate					
Beef	26	50	22	11	109
Beans	59	11	6	0	76
Poultry	67	7	1	0	75
Fish	53	8	0	0	61
Fruit/Fruit juice					
Apple	57	26	3	2	88
Peach	59	10	3	0	72
Mixed fruit	52	11	2	0	65
Orange	23	20	14	4	61
Vegetable					
Potatoes	55	33	10	1	99
Carrots	54	17	11	0	82
Tomato/sauce	47	16	7	2	72
Green bean	62	9	0	0	71
Bread/Cereal					
Roll/sliced bread	16	22	17	45	100
Pasta	65	24	3	1	93
Crackers	33	26	23	10	92
Rice	45	4	0	0	49
Dairy					
Milk	2	4	12	98	116
Cheese	50	32	14	3	99
Pudding	50	4	0	0	54
Ice cream	11	5	0	1	17
Extra foods					
Cookie	25	21	15	11	72
Gelatin	44	11	3	0	58
Cake/pie	37	4	0	0	41
punch	10	3	6	12	31

and 34% consumed no fruit. Also, children ages 3-5 were more likely to eat food from the fats, oils, sugars and sweets group than children ages 1 to 2. Schwenk (1997) concluded that many children lack ability to choose the right foods. Low-fat and low-salt snacks should be encouraged, along with eating more fruit and vegetables.

This chapter has outlined standards for menu plan at the child care center and how standards have been used within the child care center. The purpose of the study is to evaluate the menu plan at Head Start Program and Child Day Care Center according to the USDA for CACFP standard guide and to assess if the menus meet the 1989 RDA standards for vitamin A, vitamin C, calcium and iron.

Chapter III

Methodology

A. Data Collection

A letter memo (Appendix A) was sent to all CACFP sponsors in 1997 by the USDA Mid-Atlantic Office announcing training to be held at stated dates and locations. The training for identifying credible foods and portion size was planned by Ms. Shirley Miller, Program Specialist, USDA Food and Nutrition Service and Dr. Ann Hertzler, Virginia Cooperative Extension (VCE), Food and Nutrition Specialist. Programs were presented by USDA Program Specialists and VCE Nutrition and Wellness Specialty Agents from April to July, 1997. Sixteen session meetings were held at 11 sites throughout the Commonwealth of Virginia according to distribution of the child care facility in the locations. Training sites were Weber City, Bristol, Blacksburg, Bedford (2 sessions), Harrisonburg, Winchester, Arlington (2 sessions), Hampton-Newport News, Chesapeake (2 sessions), Richmond (3 sessions), and Chatham.

The individual responsible for menu planning/ preparation in each center was asked to complete a one-week menu cycle served at their facility. Sets of planned menus were collected from all Virginia CACFP sponsors attending the training meeting.

B. Menus Selection

Menu sheets were designed for CACFP sponsors to provide menu information for one month. Sponsors listed menus for all meals and snacks provided at their center. Each menu was checked for completeness of food information at the training by the FNS specialist or VCE specialty agent.

Most centers turned in the monthly menus at the training program. In order to keep menu information comparable, the first week of lunch menus was selected from each set of menus for analysis. In order to have a similar number of sites from each area, every other site was selected from each training location in each geographic area of the state, so that half of the 114 sites were selected. The menus are from all the CACFP sponsors which included Head Start Program and Child Day Care Centers. The difference between the two groups is that Head Start Programs are required to have a nutritionist to review, evaluate and ensure the quality of their food program. Menus were divided into Head Start Program and Child Day Care Center for further analysis and comparison. However, 13 sites that could not be identified as Head Start Program or Child Day Care Center.

C. Data Processing

1. Food Coding

a. Software

The Food Processor Nutrition Analysis software (Version 7.1, ESHA Research, 1998) was used for menu analysis. The software received top ratings in the August 1995 issue of the Journal of the American Dietetic Association (Esha Research, 1999). The nutrient information in the ESHA databases, which starts with the latest USDA data-sets (release 12), is compiled from over 1,100 scientific sources including the USDA Survey Database, USDA provisional data, scientific literature, food manufacturers, and foreign food composition tables. This program tracks 165 nutrients in the database, and has over 22,000 food items. The program allows school food service operators to obtain nutrient information analysis for ingredients, recipes and menus in addition to creating cycle and calendar menus. The advantage of using the Food Processor Nutrition Analysis was that it contains age grade specific nutrient standards to evaluate foods and meals served to children in the USDA child nutrition program. The program also calculates preparation

yields so that the user can enter foods as raw, or in dry uncooked form. In addition, food search and entry are easy, and the spreadsheet with the nutrients selected (vitamin A, vitamin C, iron and calcium) can be printed out.

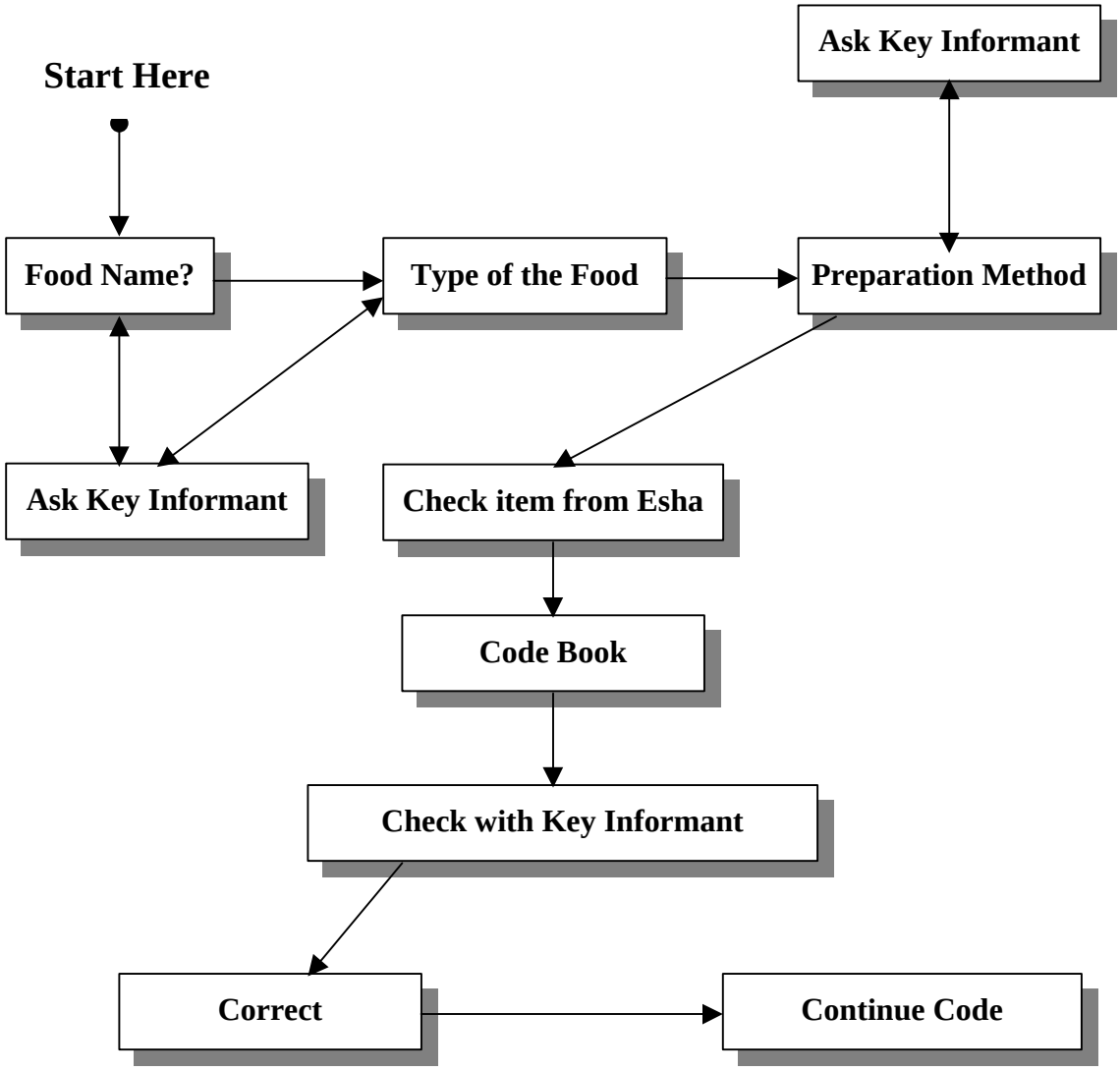
b. Serving Size

The meal pattern components for the lunch menus guided the coding of the menu lunch pattern for children 3-5 years of age (Food and Nutrition Service [FNS], 1981). The minimum portion sizes for children 3-5 years old required in the Head Start and other CACFP program (Table 2.3) were used as the specified amounts for each lunch menu item. Although children may have eaten more or less than the stated serving sizes, the goal in this study was to examine the nutrient value for the planned lunch menu. All foods listed in the lunch menus were analyzed even if they were beyond the minimum food pattern.

c. Menus Coding

Figure 3.1 outlines the process of coding foods, so that the analysis closely represented the foods served in the centers and the coding was consistent. First, the food was identified by name and then the type of the food. For example, 2% milk was translated as milk (food name) and as 2% (the type).

Food names which could not be identified by a single term, such as “Cheesy Shells” were described with the help of key informants. The key informants were the USDA Program Specialist and the VCE Food and Nutrition Specialist who were working with child care feeding programs and with other community food programs in Virginia. The senior nutrition student who helped coding also provided input into identifying the unfamiliar names.



1. Identify the food name on menus.
2. If can not identify the food name, ask the key informant.
3. Identify the type of food and the components.
   Ex: What kind of cheese would be used?
4. Choose the close items from Food Processor to analyze the menus.
5. Keep a record of all food decision in a food code book.
6. Check the code book with key informant to make sure the definitions of the foods are correct.

Fig 3.1. Process of Coding Food

All food names and types were maintained in the code book to make sure the coding of the foods was based on the same decisions. For example, if milk was listed singularly on the menu, the code book indicated coding milk as 2% since this is the kind in milk likely to be used of CACFP. All decisions were maintained in the code book (Appendix B) for coding extra food items (e.g. lettuce leaf), or combination foods (e.g. cheesy shells).

d. Combination Codes

Any food mixture containing more than one food item was broken down into its food components, and coded separately following patterns in " Crediting Foods" in the CACFP (USDA, 1994). For example, for "Chicken and Dumpling", the key informant identified the type (e.g. chicken, dumpling) and amount of foods in this menu item. Chicken would be coded 1.5 oz. cooked meat if no other meat/meat alternate was served at lunch for the 3-5 year age group, and dumpling must be equivalent to ½ bread serving. So 1.5 oz "Skinless-chicken-boneless-roasted-chopped"and ¼ cup of "cooked enriched egg noodle" were chosen.

A meat or meat alternate can only appear in two menu items of a specified meal. An example, " Turkey & Cheese Sandwich" was first identified by the food name (e.g. turkey, cheese and bread), and the key informant interpreted the type and amount of the foods: 1 oz. turkey with 0.5 oz. cheese for total required amount of meat and meat alternates specified for lunch. Based on one CACFP serving for bread, the amount must be equivalent to ½ slice. Since this is for a sandwich, 1 item was determined to serve. Thus the final entries were 1 oz. "All Turkey-Skinless-Boneless-Roasted", 0.5 oz. "American Processed Cheese" and 1 " Sandwich Roll".

Vegetables or fruits in combination food were considered only one item. For example, the amount for "Lettuce and Tomato" are one serving (1/4 cup). So 1 leaf of lettuce and 1/8 cup of tomato was chosen.

Salad dressing, margarine, and other high-fat extra items were usually not included in analysis because they were considered not to influence vitamin and mineral content. Also, gravy or other food items in the combination food were ignored. However, if gravy was listed (e.g. ”Turkey with Gravy”), both were included in coding.

2. Code Book

Food decisions were maintained in a code book (Appendix B) according to food groups in the Food Guide Pyramid (USDA 1992): Bread and bread alternates, vegetables, fruits, milk, meat and meat alternates, and fats/sweets group. Combination foods were separated into ingredients and amounts in the code book. Table 3.1 shows the classification system and how they were classified.

3. Nutrient Standards

Foods and amounts for the 5 lunches for each site were entered into the nutrient analysis program. The average of one week (5-days) was compared with one third of the 1989 RDA for four selected nutrients. One third RDA was selected because it represented the level used by DHHS for its Head Start Program, USDA for its CACFP, American Public Health Association and the American Academy of Pediatrics for the Out-of-Home Child Care Programs (Position of the ADA: nutrition standards for child care programs, 1994).

The recent DRIs (Yates et al., 1998) represent the new approach adopted by the Food and Nutrition Board to provide quantitative estimates of nutrient intakes. Since the age range of children in Head Start is 3 to 5 years, the 1989 RDA values for age 4-6 were compared with 1998 DRI values of 4-8 years for nutrients listed in the study.

Table 3.1. Code Classification System for CACFP Lunch Menu

(1) Bread / Bread Alternates Foods that count in the grain group include yeast breads and rolls, quick breads such as plain muffins, biscuits, pancakes, and tortillas; rice; pasta; grain-based items such as crackers, pretzels, and croissants.
(2) Vegetable Group According to Food Guide Pyramid, vegetables are separated into five subgroups: dark-green leafy vegetables; deep-yellow vegetables; starchy vegetables; dry beans and peas (legumes); and other vegetables.
(3) Fruit Group Fruit group could be separated fruits into two subgroups: “citrus, melons, berries “ and “ other fruits”.
(4) Milk Group 2% fat milk is the only food in this group according to the nutritional specialist.
(5) Meat / Meat Alternate Both meats and meat alternates are classified in the meat group. Meats include beef, pork, lamb, veal, poultry, fish, shellfish, frankfurters, sausages, luncheon meats, and organ meats. Meat alternates include cheese, yogurt, eggs, soy-based products such as tofu (VPP*) and meat analogs, nuts, and seeds. Dry beans and peas** can be used as vegetables but they are also alternates for meat, poultry, and fish.
(6) Other Foods The food in this group includes the fats or sugars as primary ingredients. Examples are candies, jams, puddings, cookie, cakes and jello.
(7) Combination Foods Two or more foods linked together will be put in combination foods.

*Vegetable Protein Product

** If dried beans are on entree and there is other vegetable / fruit are listed on the menu, than dried bean/pea are considered a meat serving.

Table 3.2 compares the 1989 RDAs and the 1998 DRIs for the nutrients analyzed in this study: Calcium, iron, vitamin A and vitamin C were of primary interest because they are the four nutrients listed on the food label and most likely to be deficient in U.S diets (Oakley et. al, 1995).

As mentioned in Chapter II, vitamin A, vitamin C and iron were not available in 1998 recommendations and calcium stayed about the same level. For this reason, vitamin A, vitamin C, iron and calcium are compared with the 1989 RDA's standard in this study.

D. Quality Control

Validate Coding -

1. Researcher coded menus with one nutrition expert (e.g. experienced graduate student) at the beginning of the analysis in order to gain experience making coding decisions.
2. Researcher trained a senior nutrition student to code food, the amount planned and how to enter the data into the computer analysis program. Then several weeks of the lunch menus were coded and analyzed by each. A check for decision making when coding different menus to identify mistakes and differences in interpretation. This process also helped to refine the code book. The results of analysis were compared with each other until the difference between coders achieve less than 15 percent error rate on each of the four nutrients (Lee R.D. & Nieman D.C., 1996).
3. After the first set of the coding, 10% of menus were double-code and checked to be within 15 percent of error rate to establish reliability.
4. The code book was reviewed by a nutrition specialist after completing coding and entering data for every 5 schools.

Factor Affecting Validity –

Factors can affect the validity of coding because:

Table 3.2. The Comparison of 1989 RDAs And the 1998 DRIs for the Age, Weight, Height, Energy and Nutrients for the Preschoolers

	RDAs (1989)	IRDs (1998)
Age Range (yr)	4-6	4-8
Weight (lb)	44	46
Height (in)	44	48
Energy (Kcal / day)	1800	*
Vit A (μg RE)	500	*
Vit C (mg)	45	*
Calcium (mg)	800	800
Iron (mg)	10	*

* 1998 recommendation is not available

1. Coders might choose different items from data analysis program because of different definition of the recipes. Combination food might be broken down into different foods.
2. Coders may choose different amounts for the food items. For example, there should be ½ cup for vegetables and fruits group; however, sometimes the menus planed more than two items. So how the coders coded the amount could influence the results.

In this study, we tried to avoid those problems, so a 15% error rate between coders was allowed for each of the four nutrients (vitamin A, vitamin C, calcium and iron).

E. Analysis

The first five lunch menus on each monthly menu plan were coded and entered for each of 57 sites throughout Virginia. Nutrient values for the five lunch menus at each site were averaged to represent nutrient adequacy at each site. Thereby, allowing for daily variation in nutrient levels. These average menu nutrient levels were entered into a table in order to study the nutritional adequacy of menus and to compare with the menu standard.

The average nutrient values for 5-day lunch menus were compared with one third of 1989 RDAs in vitamin A, vitamin C, calcium and iron for each site. Appendix A is a list for some foods high in vitamin A, vitamin C, calcium, and iron.

In addition, the Head Start group was compared with Child Day Care Center group in order to study the difference between the center with registered dietitian and without dietitian. The two-way t-test was used to identify the difference between Head Start Program and Child Day Care Center.

In subsequent analysis, the researcher hand coded the use of foods in each of menus studied specific to nutrients concerned. Correlation coefficients were used to identify the relationship between the dietary iron levels and the number of servings of iron-rich foods.

Chapter IV

Results

A. Procedure

1. Validity

The researcher (nutrition graduate student) trained a senior nutrition student to code the sets of lunch menus. Food items and amounts were compared and code book decisions were adjusted based on the first 11 sites in order to check that food item choices of the researcher and the coder where based on similar decisions. This process was important in making sure amounts were correct according to the CACFP lunch menu (Table 2.3).

Secondly, six more sites (30 menus) were coded by the same two individuals to compare how nutrient analysis affected four nutrients (vitamin A, vitamin C, calcium and iron). In this study, a 15% error rate between coders was considered to be the amount of variation allowable for each of the four nutrients. An example of a 15% error rate between nutrient translated as 25 RE for vitamin A, 2.3 mg for vitamin C, 40 mg for calcium and 0.5 mg for iron. Although some error rates between coders in this second step were practically zero, some were up to 40%. Table 4.1 presents a sample food list for a one-day lunch menu from the computer nutrient analysis program (Food Processor, Version 7.1, ESHA Research, 1998). In the spreadsheet, the food source for each nutrient is listed. If vitamin C values were high, a review of the information could identify foods providing the higher level of this nutrient. This was important in identifying coding problems, and in studying foods with higher level of the nutrients. Additional adjustments were made in the code book. For example, canned peaches rather than fresh peaches were thought more likely to be used in programs at this time of the year. The researcher and coder continued to compare and discuss choices in adjusting coding decisions.

Table 4.1. Sample Food List Sheet for Nutrients Analysis for One Lunch Menu

Foodlist

Amount		Food Item	Cost	ESHA Code
1.5	oz-wt	Beef Stew Meat-Cooked-Lean Only		
1/4	cup	Cabbage-Shredded-Boiled-Cup		
1/4	cup	Applesauce-Sweetened-Canned,w/o salt-Cup		
1/2	piece	Cornbread-Dry Mix-Prepared		
3/4	cup	2% FatMilk-w/oVit A-w/NonFat Milk Solids		

Nutrients per Serving

Calories	352.52		Fat - Total	11.70	g	
Protein	23.14	g	Saturated Fat	4.92	g	
Carbohydrates	38.88	g	Vitamin A RE	130.80	RE	
Dietary Fiber	2.35	g	Vitamin C	10.71	mg	
% Calories from fat		30 %	% Calories from carbs		44	%

Spreadsheet

Amount		Food Item	A-RE	Vit C (mg)	Calc (mg)	Iron (mg)
1.5	oz-wt	Beef Stew Meat-Cooked-Lean Only	0	0	4.39	1.50
1/4	cup	Cabbage-Shredded-Boiled-Cup	4.88	7.54	11.63	0.06
1/4	cup	Applesauce-Sweetened-Canned,w/o salt-Cup	0.64	1.08	2.55	0.22
1/2	piece	Cornbread-Dry Mix-Prepared	13.20	0.03	21.90	0.57
3/4	cup	2% FatMilk-w/oVit A-w/NonFat Milk Solids	112.09	2.06	262.76	0.11
		Totals	130.80	10.71	303.23	2.47

Multi-Column (comparison with 1989 RDAs)

Vitamins			
Vitamin A RE	130.80	RE	26%
Vitamin C	10.71	mg	24%
Minerals			
Calcium	303.23	mg	38%
Iron	2.47	mg	25%

The third step was to code menus from another 10 sites to compare the four nutrients and again update the coding decisions. Table 4.2 compares a 5-day analysis of a lunch menu cycle for one of the ten sites for two coders for four nutrients to illustrate the outcome. All of the error rates between two coders for this one site were between 0-4% for this week. The average error rate for vitamin A, vitamin C, calcium and iron are 0, 1%, 0 and 1%, respectively. For other nine sites, the food choices and amount were compared to ensure the validity.

Since all of the 27 coded menus from these three steps were within agreement of the standard, the coders were considered trained for completing the menus from the other 30 sites. Half of the remaining 30 sites were coded by the researcher and half by the trained coder following the listed protocol. In addition, the researcher reviewed all coding decisions of these last 30 sites for correctness and accuracy.

2. Re-coding

After all lunch menus had been coded, 10% of 57 sites were coded again by both coders to identify the coding consistency. These six sites were selected from the first 27 sites when errors were considered most likely to occur. A 15% error rate was allowed for each of the four nutrients. Results for each weekly average were compared to the previous coding for four nutrients (Table 4.3). The error range for those 6 sites is from 0 to 5%. The average error rate for vitamin A, vitamin C, calcium and iron are 0, 1%, 0 and 1%, respectively. Re-coding portions of the menus suggested previous coding was similar to current coding, and based on similar decisions.

Table 4.2. Comparison of One Week Lunch Menu Cycle for Two Coders for Four Nutrients

Day	Vit A (RE)* Coder 1	Coder 2	Error Rate	Vit C (mg) Coder 1	Coder 2	Error Rate	Calcium (mg) Coder 1	Coder 2	Error Rate	Iron (mg) Coder 1	Coder 2	Error Rate
1	132.09	132.09	0%	13.25	13.25	0%	382.52	390.88	1%	3.65	3.87	2%
2	135.04	135.04	0%	6.24	6.24	0%	292.86	292.86	0%	1.4	1.4	0%
3	142.85	142.85	0%	10.75	10.75	0%	298.42	310.32	1%	1.06	1.46	4%
4	220.17	221.74	0%	9.27	11.03	4%	310.52	308.35	0%	1.61	1.68	1%
5	262.68	262.68	0%	8.24	8.24	0%	549.29	549.29	0%	1.24	1.24	0%
Average	178.566	178.88	0%	9.55	9.902	1%	366.722	370.34	0%	1.792	1.93	1%

* Standards are the 1989 RDAs (full-day) for 4-6 year old child- vitamin A (500RE), vitamin C (45 mg), calcium (800 mg), and iron (10 mg).

Table 4.3. Comparison of Original Coding and Re-coded Weekly Menus For 10% Of Sites (N= 6 sites)

Site	VitA (RE)* Code	Re-Code	Error Rate	VitC (mg) Code	Re-Code	Error Rate	Calcium (mg) Code	Re-Code	Error Rate	Iron (mg) Code	Re-Code	Error Rate
1	235.78	235.78	0%	23.26	23.26	0%	364.6	364.6	0%	1.82	1.82	0%
2	298.54	298.54	0%	9.9	9.9	0%	406.38	406.38	0%	1.86	1.86	0%
3	239.03	239.03	0%	54.84	54.84	0%	455.42	455.42	0%	2.42	2.42	0%
4	299.21	291.93	1%	14.93	12.98	4%	315.89	310.26	1%	2.05	1.94	1%
5	344.74	343.38	0%	7.14	7.55	1%	311.94	317.62	1%	2.41	2.6	2%
6	285.81	283.38	0%	31.41	31.22	0%	329.08	337.65	1%	2.66	3.13	5%
Ave	283.8517	282.0067	0%	23.58	23.29167	1%	363.885	365.3217	0%	2.203333	2.295	1%

* Standards are the 1989 RDAs (full-day) for 4-6 year old child- vitamin A (500RE), vitamin C (45 mg), calcium (800 mg), and iron (10 mg).

B. Nutrients Analysis

1. Menus in CACFP

The weekly average amount and percentage of one-third of RDAs for vitamin A, vitamin C, calcium and iron for each of the 57 sites are shown in the Table 4.4. The weekly average of the five lunch menus of each site is given to allow variation in daily nutrient levels.

- For vitamin A, %RDA for the lunch menu ranged from 99-395%. Ninety-nine percent of the sites met and exceeded the RDAs standard for the lunch menus. Only 2% (n=1) of the 57 child care centers averaged below 100% of one-third RDAs; 46% (n=26) averaged between 100-200%; 42% (n=24) averaged between 200-300%; and 11% (n=6) of the child care centers greater than 300%.

- For vitamin C, %RDA for the lunch menu ranged from 48-366%. Sixty-one percent (n=35) of the 57 sites exceeded 100% of one-third RDAs. However, 12% (n=7) of the child care centers were below the 67% of the one-third RDAs.

- For calcium, %RDA for the lunch menu ranged from 113-171%. All the centers met and exceeded 100% of standard.

- For iron, %RDA for the lunch menu ranged from 43-87%. None of the centers averaged more than100% one-third RDA in their 5-day cycle menu. Only 28% (n=16) of the 57 sites met 67% of one-third of RDAs. Seventy-two percent (n=41) averaged less than 67% of the standards.

Table 4.5 shows the mean and standard deviation of vitamin A, vitamin C, calcium and iron provided in the 5-day cycle lunch menus for all 57 sites. The lunches provided in the centers should meet one- third of the RDAs according to the analysis. The mean value of

Table 4.4. Average Weekly Nutrients Level For Lunch Menus For 57 Child Care Centers Based On One-Third 1989 RDA For Children

	Vit A RE*	% of 1/3 RDA	Vit C Mg	% of 1/3 RDA	Calcium mg	% of 1/3 RDA	Iron mg	% of 1/3 RDA
1	354.82	213%	12.96	86%	334.63	125%	1.98	59%
2	195.75	117%	22.67	151%	366.36	137%	1.97	59%
3	402.01	241%	13.03	87%	323.21	121%	2.09	63%
4	354.13	212%	16.97	113%	362.58	136%	1.90	57%
5	399.59	240%	11.06	74%	343.59	129%	2.69	81%
6	356.34	214%	19.24	128%	347.20	130%	2.63	79%
7	408.56	245%	18.40	123%	333.90	125%	2.36	71%
8	241.54	145%	15.64	104%	325.17	122%	1.80	54%
9	399.18	240%	12.98	87%	302.06	113%	1.97	59%
10	164.31	99%	27.09	181%	360.37	135%	1.76	53%
11	227.48	136%	18.19	121%	315.34	118%	2.00	60%
12	235.78	141%	23.26	155%	364.60	137%	1.82	55%
13	537.48	322%	10.06	67%	335.51	126%	2.37	71%
14	621.65	373%	9.79	65%	338.58	127%	2.34	70%
15	655.73	393%	16.92	113%	405.32	152%	1.42	43%
16	298.54	179%	9.90	66%	406.38	152%	1.86	56%
17	239.03	143%	54.84	366%	455.42	171%	2.42	73%
18	299.21	180%	14.93	100%	315.89	118%	2.05	62%
19	344.79	207%	7.14	48%	311.94	117%	2.41	72%
20	285.81	171%	31.41	209%	329.08	123%	2.66	80%
21	387.80	233%	9.91	66%	391.12	147%	2.42	73%
22	182.69	110%	17.43	116%	303.33	114%	2.05	62%
23	247.74	149%	46.98	313%	449.73	169%	2.15	65%
24	198.87	119%	21.16	141%	433.99	163%	1.78	53%
25	244.68	147%	20.90	139%	344.89	129%	2.90	87%
26	178.88	107%	9.97	66%	366.29	137%	1.81	54%
27	173.19	104%	20.44	136%	325.41	122%	2.14	64%
28	340.00	204%	11.56	77%	366.89	138%	2.86	86%
29	174.15	104%	22.56	150%	339.90	127%	2.12	64%

Table 4.4. Average Weekly Nutrients Level For Lunch Menus For 57 Child Care Centers Based On One-Third 1989 RDA For Children (Cont.)

	Vit A RE	% of 1/3 RDA	Vit C Mg	% of 1/3 RDA	Calcium mg	% of 1/3 RDA	Iron mg	% of 1/3 RDA
30	175.86	106%	22.16	148%	355.60	133%	1.60	48%
31	299.27	180%	19.74	132%	388.52	146%	1.60	48%
32	381.53	229%	12.77	85%	415.27	156%	2.54	76%
33	392.62	236%	15.78	105%	407.84	153%	1.32	40%
34	529.40	318%	20.58	137%	398.95	150%	2.59	78%
35	658.42	395%	16.35	109%	375.73	141%	2.19	66%
36	382.61	230%	8.72	58%	343.58	129%	2.71	81%
37	236.67	142%	13.76	92%	390.08	146%	1.91	57%
38	318.41	191%	22.64	151%	370.55	139%	2.05	62%
39	202.88	122%	13.87	92%	332.20	125%	2.11	63%
40	206.98	124%	12.71	85%	368.30	138%	2.52	76%
41	264.35	159%	16.71	111%	371.79	139%	1.73	52%
42	339.72	204%	17.53	117%	342.62	128%	2.70	81%
43	383.97	230%	22.39	149%	376.28	141%	1.86	56%
44	214.23	129%	21.61	144%	342.84	129%	2.06	62%
45	187.81	113%	29.77	198%	344.84	129%	1.90	57%
46	334.25	201%	15.26	102%	322.33	121%	2.00	60%
47	373.78	224%	13.54	90%	315.81	118%	1.79	54%
48	391.90	235%	15.46	103%	353.78	133%	1.73	52%
49	427.56	257%	16.86	112%	317.12	119%	1.94	58%
50	428.06	257%	12.48	83%	414.22	155%	2.08	62%
51	582.24	349%	9.49	63%	409.98	154%	1.62	49%
52	375.24	225%	15.12	101%	365.01	137%	1.85	56%
53	402.56	242%	12.01	80%	373.77	140%	1.83	55%
54	209.42	126%	40.57	270%	314.19	118%	1.93	58%
55	201.15	121%	24.22	161%	313.51	118%	2.15	65%
56	398.36	239%	10.16	68%	347.74	130%	2.09	63%
57	393.02	236%	13.47	90%	337.87	127%	1.92	58%

* Standards are the 1989 RDAs (full-day) for 4-6 year old child- vitamin A (500RE), vitamin C (45 mg), calcium (800 mg), and iron (10 mg).

Table 4.5. Comparison Of Nutrients Provided In School Lunches With Recommended Dietary Allowances (No.=57)

	Recommended Dietary Allowances*		Actual Menu
	Daily	**1/3 Daily**	**Mean (**) ± SD**
Vitamin A, RE	500	166.7	330.56 (198%) ± 124.54
Vitamin C, mg	45	15.0	18.12 (121%) ± 8.86
Calcium, mg	800	266.6	358.05 (134%) ± 36.80
Iron, mg	10	3.3	2.09 (63%) ± 0.36

*Based on 1989 Recommended Dietary Allowances for children aged 4-6 years old. The school lunch should provide one-third of the RDAs.

** Percentage of one-third of RDA

these lunches exceeded the standard one-third RDAs for Vitamin A, vitamin C, and calcium (Table 4.5). But the average iron level was only 63% RDAs.

2. Menus in Child Day Care Centers and Head Start Programs

All the CACFP sponsors were divided into one of two groups - Child Day Care Center and Head Start Program - in order to discover if there were differences in the two kinds of programs. Of the 57 sites studied, 33 were Child Day Care Centers and 11 were Head Start Programs; 13 sites could not be identified. Overall, the values show both the Child Day Care Center and Head Start Program averaged well above RDA standards for vitamin A (Table 4.6), vitamin C (Table 4.7) and calcium (Table 4.8). For iron (Table 4.9), the mean and average percentage is 2.07 mg (62%) for the Child Day Care Center and 2.25 mg (68%) for the Head Start Program. According to the two-way t-test, there is no significant difference between Child Day Care Center and Head Start Program in vitamin A, vitamin C, calcium and iron ($p<0.05$).

- In the analysis of vitamin A, menus from both Child Day Care Center and Head Start Program met one-third of RDAs. In Child Day Care Center menus, 45% (n=15) of the 33 sites had between 100-200% of one-third RDAs; 42% (n=14) between 200-300%; and 12% (n=4) greater than 300%. In Head Start Program, 64% (n=7) of 11 sites had between 100-200% of one-third RDAs; 27% (n=3) between 200-300%; and 9% (n=1) greater than 300%.

- In the analysis of vitamin C for Child Day Care Center menus, 18% (n=6) of the 33 sites had below to 67% of one-third RDAs and 58% (n=19) greater than 100%. In Head Start Program, none of the 11 sites was below 67% of one-third RDAs, and 73% (n=8) were greater than 100% of one-third RDAs.

Table 4.6. The comparison of Child Care Center and Head Start Program for Vitamin A

	Vit A	(500RE)		
	Child Care Center	**% of 1/3 RDA**	**Head Start**	**% of 1/3 RDA**
1	195.75	117%	402.01	241%
2	399.59	240%	235.78	141%
3	399.18	240%	247.74	149%
4	621.65	373%	173.19	104%
5	655.73	393%	175.86	106%
6	298.54	179%	381.53	229%
7	239.03	143%	529.40	318%
8	299.21	180%	318.41	191%
9	387.80	233%	187.81	113%
10	182.69	110%	201.15	121%
11	198.87	119%	398.36	239%
12	244.68	147%		
13	178.88	107%		
14	340.00	204%		
15	174.15	104%		
16	299.27	180%		
17	392.62	236%		
18	658.42	395%		
19	382.61	230%		
20	236.67	142%		
21	202.88	122%		
22	206.98	124%		
23	264.35	159%		
24	339.72	204%		
25	383.97	230%		
26	334.25	201%		
27	391.25	235%		
28	427.56	257%		
29	428.06	257%		
30	582.24	349%		
31	375.24	225%		
32	209.42	126%		
33	393.02	236%		
SD	**135.78**		**118.40**	
Ave	**343.16**	**206%**	**295.57**	**177%**

Table 4.7. The Comparison of Child Care Center and Head Start Program for Vitamin C

	Vit C	(45mg)		
	Child Care Center	% of 1/3 RDA	Head Start	% of 1/3 RDA
1	22.67	151%	13.03	87%
2	11.06	74%	23.26	155%
3	12.98	87%	46.98	313%
4	9.79	65%	20.44	136%
5	16.92	113%	22.16	148%
6	9.90	66%	12.77	85%
7	54.84	366%	20.58	137%
8	14.93	100%	22.64	151%
9	9.91	66%	29.77	198%
10	17.43	116%	24.22	161%
11	21.16	141%	10.16	68%
12	20.90	139%		
13	9.97	66%		
14	11.56	77%		
15	22.56	150%		
16	19.74	132%		
17	15.78	105%		
18	16.35	109%		
19	8.72	58%		
20	13.76	92%		
21	13.87	92%		
22	12.71	85%		
23	16.71	111%		
24	17.53	117%		
25	22.39	149%		
26	15.26	102%		
27	15.46	103%		
28	16.86	112%		
29	12.48	83%		
30	9.49	63%		
31	15.12	101%		
32	40.57	270%		
33	13.47	90%		
SD	**9.04**		**10.00**	
Ave	**17.06**	**114%**	**22.36**	**149%**

Table 4.8. The Comparison of Child Care Center and Head Start Program for Calcium

	Calcium	(800mg)		
	Child Care Center	% of 1/3 RDA	Head Start	% of 1/3 RDA
1	366.36	137%	323.21	121%
2	343.59	129%	364.60	137%
3	302.06	113%	449.73	169%
4	338.58	127%	325.41	122%
5	405.32	152%	355.60	133%
6	406.38	152%	415.27	156%
7	455.42	171%	398.95	150%
8	315.89	118%	370.55	139%
9	391.12	147%	344.84	129%
10	303.33	114%	313.51	118%
11	433.99	163%	347.74	130%
12	344.89	129%		
13	366.29	137%		
14	366.89	138%		
15	339.90	127%		
16	388.52	146%		
17	407.84	153%		
18	375.73	141%		
19	343.58	129%		
20	390.08	146%		
21	332.20	125%		
22	368.30	138%		
23	371.79	139%		
24	342.62	128%		
25	376.28	141%		
26	322.33	121%		
27	353.78	133%		
28	317.12	119%		
29	414.22	155%		
30	409.98	154%		
31	365.01	137%		
32	314.19	118%		
33	337.87	127%		
SD	**38.18**		**42.01**	
Ave	**363.98**	**136%**	**364.49**	**137%**

Table 4.9. The Comparison of Child Care Center and Head Start Program for Iron

	Iron	(10mg)		
	Child Care Centers	% of 1/3 RDA	Head Start	% of 1/3 RDA
1	1.97	59%	2.09	63%
2	2.69	81%	1.82	55%
3	1.97	59%	2.15	65%
4	2.34	70%	2.14	64%
5	1.42	43%	1.60	48%
6	1.86	56%	2.54	76%
7	2.42	73%	2.59	78%
8	2.05	62%	2.05	62%
9	2.42	73%	1.90	57%
10	2.05	62%	2.15	65%
11	1.78	53%	2.09	63%
12	2.90	87%		
13	1.81	54%		
14	2.86	86%		
15	2.12	64%		
16	1.60	48%		
17	1.32	40%		
18	2.19	66%		
19	2.71	81%		
20	1.91	57%		
21	2.11	63%		
22	2.52	76%		
23	1.73	52%		
24	2.70	81%		
25	1.86	56%		
26	2.00	60%		
27	1.73	52%		
28	1.94	58%		
29	2.08	62%		
30	1.62	49%		
31	1.85	56%		
32	1.93	58%		
33	1.92	58%		
SD	**0.40**		**0.28**	
Ave	**2.07**	**62%**	**2.10**	**63%**

- Both Child Day Care Center and Head Start menus met and exceeded 100% one-third of RDAs for calcium.

For iron, none of the Child Day Care Centers met the one-third of RDAs. Seventy-three percent (n=24) of the centers were below 67% but 27% (n=9) met 67% of one-third RDAs. In Head Start Program, 18% met 67% of RDA standard, and 82% (n=9) did not meet 67% of one-third RDAs.

B. Food Analysis

Because vitamin A, vitamin C and calcium met RDAs standards, outcomes are briefly surveyed below to identify foods contributing better quality.

- **Vitamin A**

All Child care centers provided more than 100% of one-third RDAs for vitamin A. Table 4.10 shows foods reported in the lunch menus that provided more than one-third RDA for vitamin A and vitamin C for 4-6 year old children. In this study, carrot was the most frequently used and provided abundant vitamin A in the meal. Sweet potato and kale provide more than the standard; cantaloupe (128.8 RE), spinach (50 RE), and boiled broccoli (54.2 RE) also provide some iron. Three-fourth cups of milk is also an important vitamin A source.

- **Vitamin C**

Mixed fruit and kiwifruit provided high vitamin C levels. Table 4.10 also shows one serving of broccoli, fresh orange, fresh strawberry and tangerine exceed vitamin C level for 4-6 year old child.

Table 4.10. Foods Provide More Than One-Third RDA for Vitamin A and Vitamin C for 4-6 Year Old Children

Nutrients	1/3 RDAs*	Food	Amount	Level
Vitamin A	167 RE	Sweet potato	¼ cup	1091 RE
		Fresh carrot (boiled)	¼ cup	958 RE
		Raw carrot	¼ cup	858 RE
		Kale	¼ cup	241 RE
		Turnip greens	¼ cup	198 RE
Vitamin C	15 mg	Mixed fruits	¼ cup	47 mg
		Kiwifruit	¼ cup	43 mg
		Broccoli (boiled)	¼ cup	29 mg
		Fresh orange	¼ cup	24 mg
		Fresh strawberry	¼ cup	22.57
		Tangerine	¼ cup	15 mg

* 1989 RDA

- **Calcium**

All the child centers provided enough calcium in the meal by providing at least three-fourth cup of milk in the lunch meals (262.76mg (99%) of calcium). If the child care center serves milk as the guideline states, calcium level should not be a problem to meet the standard. In addition, American process cheese (1.5 ounces) can provide 261 mg calcium, and mozzarella cheese could provide 275 mg calcium. Cheese in the pizza, hamburger, or mixed dishes would be a good source for calcium.

- **Iron**

Since none of the child care center menus met 100% of the one-third RDAs, the food item in the lunch menus were checked for iron-rich foods. Table 4.11 lists " iron rich foods" recommended by the CACFP (Appendix C), foods listed on an iron check list for a nutrition education program (Appendix D), and some additional foods with higher iron levels from the actual menus. Foods were placed into the resulting nine categories. The number of servings of these foods were counted and sorted by the iron level for all 57 sites (Table 4.12).

The 57 sites were assigned to five iron adequacy groups according to the percentage of one-third of iron RDAs in 10% increments. Table 4.13 shows the number of sites in each iron adequacy group, the average mg iron, and percentage RDAs for the lunch menus of these sties, average number of servings for each of the nine foods, and the average total number of servings.

The largest group, 50 to 59% of one-third iron RDAs, contained 21 of the 57 sites. From the average total number of servings (Table 4.13), it is clear that, as more iron-rich food

Table 4.11. Foods Provide Iron* in the Meal Analyzed by Nutrition Analysis Program**

Food	Amount	Iron Level
Beef -Roast	1.5 oz.	1.56 mg
Cornmeal Muffin	½ each	1.19 mg
Fish Sticks	4 each	0.83 mg
Fresh Pork Loin	1.5 oz.	0.46 mg
Green Pea	¼ cup	0.63 mg
Ground Beef Patty	1.5 oz.	0.89 mg
Hot Dog Bun/Roll	1 each	1.56 mg
Light Tuna in Water	1.5 oz.	0.65 mg
Lima Bean-Drained	¼ cup	0.73 mg
Macaroni	¼ cup	0.49 mg
Plain Bagel	½ each	1.26 mg
Skinless Chicken	1.5 oz.	0.51 mg
Small Shells Pasta	¼ cup	0.40 mg
Spaghetti Noodles	¼ cup	0.49 mg
Spinach-Boiled	¼ cup	1.61 mg
Spinach-Raw	¼ cup	0.20 mg
Turkey	1.5 oz.	0.76 mg
Wheat Bread	½ piece	0.41 mg
White Pita	½ each	0.79 mg
White Rice	¼ cup	0.47 mg

***One-third of 1989 RDA for iron for 4-6 year old child is 3.3 mg**
****Food Processor (Version 7.1, ESHA Research,1998)**

Table 4.12. The Number of Times A Designated Food Served in 5-Day Lunch Menus for 57 Sites

Iron	% of 1/3 RDA	Total	Beef & Pork	Fish	Chicken & Turkey	Spinach, Lima Bean, Green Pea	Lentils, Baked Bean, Pinto Bean	Bagel, Muffin	Bread, Bun	Noodles, Spaghetti, Pasta, Macaroni	Rice
1.32	40%	5	2	1	0	0	0	0	1	1	0
1.42	43%	6	1	0	2	0	0	0	2	1	0
1.60	48%	3	2	0	1	0	0	0	0	0	0
1.60	48%	9	1	0	3	2	0	0	1	2	0
1.62	49%	8	1	0	1	2	0	0	2	2	0
1.73	52%	7	2	1	2	0	0	0	2	0	0
1.73	52%	6	1	0	3	0	0	0	2	0	0
1.76	53%	8	2	1	1	0	0	0	4	0	0
1.78	53%	5	1	0	1	0	0	0	2	1	0
1.79	54%	8	1	1	2	0	0	0	2	2	0
1.80	54%	6	1	1	1	0	0	1	2	0	0
1.81	54%	10	3	1	1	0	1	0	4	0	0
1.82	55%	7	2	0	2	0	0	0	0	3	0
1.83	55%	9	2	0	2	1	0	0	2	1	1
1.85	56%	9	1	1	2	0	0	0	5	0	0
1.86	56%	7	1	0	1	1	0	1	1	0	2
1.86	56%	5	1	1	1	1	1	0	0	0	1
1.90	57%	11	2	0	2	1	0	0	5	1	0
1.90	57%	7	3	1	0	1	0	0	1	1	0
1.91	57%	8	2	1	1	0	1	0	2	1	0
1.92	58%	9	2	2	1	1	0	0	2	1	0

Table 4.12. The Number of Times A Designated Food Served in 5-Day Lunch Menus for 57 Sites (Cont.)

Iron	% of 1/3 RDA	Total	Beef & Pork	Fish	Chicken & Turkey	Spinach, Lima Bean, Green Pea	Lentils, Baked Bean, Pinto Bean	Bagel, Muffin	Bread, Bun	Noodles, Spaghetti, Pasta, Macaroni	Rice
1.93	58%	11	2	1	2	2	1	0	3	0	0
1.94	58%	10	2	1	1	0	1	0	4	1	0
1.97	59%	9	2	1	1	0	0	0	4	1	0
1.97	59%	8	4	1	0	1	0	0	0	1	1
1.98	59%	7	1	1	1	1	0	0	3	0	0
2.00	60%	11	4	0	1	0	0	0	5	1	0
2.00	60%	11	3	1	1	1	1	0	3	1	0
2.05	62%	8	2	1	2	1	0	0	0	1	1
2.05	62%	10	3	1	0	0	0	0	5	1	0
2.05	62%	9	3	1	1	1	0	0	3	0	0
2.06	62%	10	3	1	1	2	0	0	3	0	1
2.08	62%	8	1	1	1	1	0	0	1	2	1
2.09	63%	9	3	0	2	1	1	0	2	0	0
2.09	63%	5	1	0	1	1	0	0	2	0	0
2.11	63%	7	1	0	2	1	0	1	1	1	0
2.12	64%	11	2	1	2	3	0	0	3	0	0
2.14	64%	6	4	0	0	0	0	0	2	0	0
2.15	65%	4	0	0	2	0	0	0	2	0	0
2.15	65%	8	3	1	1	0	1	0	1	1	0
2.19	66%	5	1	0	1	1	1	0	1	0	0

Table 4.12. The Number of Times A Designated Food Served in 5-Day Lunch Menus for 57 Sites (Cont..)

Iron	% of 1/3 RDA	Total	Beef & Pork	Fish	Chicken & Turkey	Spinach, Lima Bean, Green Pea	Lentils, Baked Bean, Pinto Bean	Bagel, Muffin	Bread, Bun	Noodles, Spaghetti, Pasta, Macaroni	Rice
2.34	70%	14	4	0	0	2	0	0	5	3	0
2.36	71%	11	3	1	1	2	0	0	3	1	0
2.37	71%	8	2	0	2	1	0	0	0	3	0
2.41	72%	9	4	0	0	0	0	0	4	1	0
2.42	73%	7	2	0	1	2	0	0	1	1	0
2.42	73%	7	2	1	1	1	0	0	1	0	1
2.52	76%	12	4	0	1	0	1	0	3	2	1
2.54	76%	6	2	1	1	0	1	0	1	0	0
2.59	78%	9	3	0	1	1	0	0	3	1	0
2.63	79%	11	3	1	1	0	0	0	5	1	0
2.66	80%	9	2	1	2	1	1	0	2	0	0
2.69	81%	13	4	1	1	1	1	0	4	1	0
2.70	81%	12	2	2	1	1	1	0	4	1	0
2.71	81%	12	5	0	1	2	0	0	2	2	0
2.86	86%	9	0	0	2	0	1	0	5	1	0
2.90	87%	9	4	0	0	0	1	0	3	1	0
Total			125	33	69	41	16	3	136	47	10

Table 4.13. Average Number of Servings of Various Foods for Locations Grouped According To Adequacy of Iron in Menus

			Meat/Meat Alternates*			Vegetables		Bread/Bread Alternates				
Range (1/3 RDA)	N**	Average Iron Level (mg)	Beef & Pork	Fish	Chicken & Turkey	Spinach, Lima Bean, Green Pea	Lentils, Baked Bean, Pinto Bean	Bagel, Muffin	Bread, Bun	Noodles, Spaghetti, Pasta, Macaroni	Rice	Average Total
40-49%	5	1.51	1.4	0.2	1.4	0.8	0	0	1.2	1.2	0	6.2
50-59%	21	1.86	1.8	0.8	1.3	0.5	0.2	0	2.4	0.7	0.2	8.0
60-69%	15	2.09	2.3	0.5	1.2	0.9	0.3	0.1	2.3	0.5	0.2	8.1
70-79%	10	2.46	2.9	0.4	0.9	0.9	0.2	0	2.6	1.3	0.2	9.4
80-89%	6	2.75	2.8	0.7	1.2	0.8	0.8	0	3.3	1	1	10.7
Correlation coefficient* **			0.39	-0.03	0.19	0.14	0.37	0.11	0.27	0.11	-0.04	

* Cheese which is not shown because of its low iron level as a meat alternates.

** Number of Sites (locations)

*** Across-site correlation between numbers of servings and average iron level

items were chosen, more iron was provided. Across-site correlation coefficients were computed for 57 sites to aid interpretation of the relationship between the food items and iron level. The correlations showed that the iron level was most related to the serving of Beef and Pork (r=. 39); Lentils, Baked Bean and Pinto Bean (r=. 37); and Bread/Bun (r=. 27). Poor menus provided an average of 6.2 servings of iron rich foods during the week. The best menus served an average of 10.7 servings of iron rich foods in the week. The foods used proportionally more often with highest iron levels were Bread /Bun (1.2 vs. 3.3 servings) and Beef /Pork (1.4 vs. 2.8 servings). The difference between the low iron level group and the higher iron level group is accounted for the Beef /Pork and Bread /Bun groups. Table 4.14 is a comparison of a one-day actual poor iron menu and one-day rich iron menu. The rich iron menu provided more than two times the amount of iron in the lunch. In the iron rich menu, meat/meat alternates and vegetables groups are two major sources for iron.

The CACFP guidelines (Appendix C) also list the higher iron foods: clams, mussels, pork liver and oysters, especially the organ meats. However, none of those food items were use in preschool lunch menus. The reasons might be the economic factors or the acceptance by the child. Rice was not used often, however, it is inexpensive and children might like it.

Table 4.14. Comparison of One-Day Poor Iron Menu and One-Day Rich Iron Menu

CACFP Food Components	Poor Iron Menu			Rich Iron Menu		
	Food Items	**Amounts**	**Iron Level (mg)**	**Food Items**	**Amounts**	**Iron Level (mg)**
Milk	2% Fat Milk	¾ cup	0.11	2% Fat Milk	¾ cup	0.11
Meat/Meat Alternates	American Processed Cheese	1.5 oz.	0.17	Beef Hotdog	1.5 oz.	1.89
Vegetables	Broccoli	¼ cup	0.19	Baked Bean	¼ cup	0.61
				Spinach-Raw	1/8 cup	0.10
Fruits	Peaches	¼ cup	0.05	Apricot	¼ cup	0.25
Bread/Bread Alternates	Macaroni	¼ cup	0.49	Cornbread	½ piece	0.57
Total Iron Level			**1.01**			**3.53**

Chapter V

Discussion & Conclusion

A. The Nutrient Component In The Meal

1. Vitamin A, C , and Calcium

Lunch menus were evaluated to determine if they met one-third of 1989 RDA standard. Although some vitamin C (12%, n=7) outcomes were slightly lower than 67% of one-third RDAs, overall, the average of vitamin A, vitamin C and calcium are over the RDAs standards.

- Briley's study (1989a) showed the full day menus for 3-5 years old were over 100% of RDAs for vitamin A and vitamin C, but were 66% for calcium.

- Oakley et al. (1995) concluded that none of child-care centers that participated in the USDA CACFP met calcium requirements based on menu analysis. However, ¾ cup of milk provides almost 99% of calcium requirement for lunch. Apparently, guidelines for providing the ¾ cups milk was not followed.

- In Hertzler's study (1996), six graduate nutrition students coded 30 menus designed by college students according to Food Guide Pyramid. Those designed menus were adequate for vitamin A, vitamin C and calcium.

- In the Early Childhood and Child Care Study (1997), a total of 1962 menus were collected from nationally representative samples between January and June, 1995. The results showed the lunch menus met the requirements for vitamin A, vitamin C and calcium.

2. Iron

The average iron level in the current CACFP menus was 63% of one-third 1989 RDAs. Seventy-two percent of 57 child care centers in Virginia were less then 67% of iron standard. Only four weekly menus in iron level averaged 80% or above, which is the level calculated for iron in the original design of the Food Guide Pyramid (Cronin et al, 1987).

- Briley's study (1989a) in Texas showed there were frequent shortfalls for iron. Only 35% of 120 Child Care Food Program (CCFP) could meet 50% of the RDAs for iron in a full day menu. Average iron level for the daily menus was only 47% of iron recommended for children 3-5 years.

- Oakley et al. (1995) also showed that only19 % of 69 CACFP child care centers in Mississippi could meet one-third of 1989 RDAs for iron for the lunch menus.

- In Hertzler's study (1996), the results showed some iron levels were not adequate; 27% were less then 70% RDA and the lowest ratings for 17 of 30 menus evaluations were below to 70% RDA.

- In the Early Childhood and Child Care Study (1997), CACFP lunch menus provided more then one-third of the RDA for all key nutrients except iron and calories. Iron level averaged 82% one-third 1989 RDAs in the study (Early Childhood and Child Care Study, 1997).

The food choices of most US children (2-19 year old) do not meet the recommended intake of food groups outlined in the Food Guide Pyramid (Position of ADA, 1999). Results of the computerized analyses of the iron in those studies all show that following

the established meal-pattern guidelines for the child nutrition programs may not guarantee consistent iron quality in the planned menus of the child care centers. From the computerized analyses, iron is concentrated in few foods.

B. The Food Providing Nutrition

Because dietary iron levels are consistently low when compared with RDAs, iron food sources were studied. Table 2.3 shows the difference between the 1999 Food Guide Pyramid recommendation for 4-6 year old child and CACFP standard for 3-5 year old child. This new children's Food Guild Pyramid provides more servings in meat and meat alternate, vegetables and fruits, and bread and bread alternates groups for a full day meal (Table 2.3).

ADA reported (1999) the type of milk children consumed in the day care center has changed between 1977 and 1994. The reduced-fat or fat-free milk has been provided more frequently than whole milk and only those with a source of milk in the noon-time meal met or exceeded 100% of the 1989 RDA for calcium. Three servings a day of milk or dairy products in children's diets are recommended.

Inadequacy of iron in the lunch menus in this study caused special concern. A deficiency in iron makes the body more susceptible to lower learning levels and to poorer growth ((Briley, Roberts-Gray, and Rowe, 1993)). Children need iron both for maintaining hemoglobin concentrations and increasing their total iron mass which related to body size during the period of growth (RDA, 1989). Two menus from the analyzed menus compare the difference between an iron rich menu and iron poor menu (Table 4.14). Green vegetables are contributing small amounts of iron to each menu because of infrequent use; nevertheless, the amount of iron in a serving is greater than the amount from vegetables shown in the poor example. The use of dried beans and legumes, as iron rich vegetable choice would fulfill a similar supposition. In this study, Beef / Pork and Bread/

Bun groups are the most frequent foods used and this result is consistent with Briley's study (Table 2.4). Hertzler mentioned that greater use of dark green leafy vegetables, vegetable choices from the Meat-Poultry-Fish group, and the Bread-Cereal-Rice-Pasta selection parallel menus with higher recommended iron levels (Hertzler et al. 1996).

C. Conclusion

Based on the findings of this study, menus in CACFP averaged at least one-third of 1989 RDAs in vitamin A, vitamin C and calcium. The planned menus did meet the RDAs requirement for those three nutrients if the menus follow the guidelines established by the CACFP. However, the iron level in the menus did not meet one-third of RDAs even though the planed menus follow the pattern recommended. Some foods with high quality iron level should be used more often.

In this study, the planed menus are evaluated based on the nutrients levels. Future study in the area of nutrition and child care should include the dietary guidelines as standards for menu planning and examine the children's acceptance of these foods in the menus, and the children's dietary consumption in the day care centers.

Chapter VI

Implication

Dietary guidelines are important in order to guide the nutritional adequacy in the child care center meals. This study revealed discrepancies between 1989 RDAs and the dietary guidelines established by USDA for preschoolers.

For vitamin A, vitamin C and calcium, the food list appears to adequately guide food choices in menu plans. However, the actual iron level in the menus in child care centers did not guarantee the nutritional adequacy for 3-5 year old child. The Dietary Guideline is an appropriate first step. Then communication between educators, child center managers, and cooks is imperative for prompt change.

The iron check list in Appendix D (Hertzler AA, 1998) is a guide for selecting the rich-iron foods from different food groups. The food in CACFP rich iron list (Appendix C) also lists sources, and some food such as liver and oyster never appeared in the menus. Apricot also can be substituted for some frequent fruits such as apple and pear. But dried fruits are usually higher because of concentration. If menu use baked beans or green peas instead of other vegetables, the iron deficiency might be improved. It is also important to consider other nutrient levels when exchange the food item, and the children's food acceptance. Another way to increase iron level is to increase the amount of those rich-iron foods. For example, provide extra green peas or extra dark green vegetables. Since those children in centers most often come from low-income families, it is unlikely that they would get sufficient iron from homemade meals. So the child center planned menu is necessary for providing optimum nutrition through the adequate serving of iron rich foods.

Change also can occur in training child care providers menu planning, purchasing, and preparation that are congruent with the dietary guidelines. This study focused on the evaluation of menu planning, however, the purchasing and preparation of food are both related to the nutrient level. So the nutritional education and food preparation for staff and for families of the children should be part of the training program.

Further research is needed for any problems related to malnutrition in this population and to implementing the appropriate dietary guideline. In addition, the different types of training methods should be evaluated in order to determine which are most effective for the food service. Moreover, the nutrition education for 3-5 year old child and their parents will also improve the child nutrition status.

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