Dietary Intakes in North Carolina Child-Care Centers: Are Children Meeting Current Recommendations?

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ABSTRACT
The purpose of this study was to determine whether food consumed by children while in center-based child care meets the new MyPyramid food group recommendations for children 2 to 5 years of age. Dietary observation of 117 children from 20 child-care centers throughout North Carolina was conducted. The type and amount of food served to and consumed by children was observed and assessed using Nutrition Data System for Research (NDS-R) software (version 2005, Nutrition Coordinating Center, University of Minnesota, Minneapolis). Portion sizes were then compared to the new MyPyramid food group recommendations to see whether 1/2 to 2/3 (for time spent in full-day child care) of the recommended amounts were consumed. On average, of the five main food groups, children consumed only the 1/2 to 2/3 recommendation for milk. Children also consumed less than 13% of MyPyramid recommendations for whole grains and 7% of MyPyramid recommendations for dark vegetables. Also noteworthy, 50% of milk consumed was whole milk and 75% of the meat consumed was of the high-fat or fried variety. Overall, our data suggest that children are not consuming recommended amounts of whole grains, fruits (excluding 100% fruit juice), or vegetables while attending full-time child care, and are consuming excess amounts of saturated fat and added sugar.


A number of national recommendations, publications from national health organizations, and position statements are available to guide dietary intake for young children. Specifically, the new MyPyramid guidelines (1) provide recommendations for daily amounts from the five main food groups (grains, vegetables, fruits, milk, and meat/beans) by age, sex, and activity level. The Recommended Dietary Allowances offer guidelines for macronutrients and micronutrients for children age 4 to 8 years (2). In addition, guidelines from the American Heart Association (3) and the American Dietetic Association (4) outline healthful eating recommendations for young children. These guidelines and recommendations are much needed, but unfortunately address mainly dietary intake of children while at home. The 2005 Position of the American Dietetic Association: Benchmarks for Nutrition Programs in Child Care Settings (5) and the Head Start Program Performance Standards for Nutrition (6) are unique in that they are intended to guide nutrition programs in child-care settings. In addition, the MyPyramid guidelines can be used to guide child-care meal planning.

According to 2005 estimates, the prevalence of young children age 3 to 6 years enrolled in center-based child care is 57% (7). It is recommended that child-care facilities provide half to two thirds of the Recommended Dietary Allowances for children in full-day child care (5,6), placing a great deal of responsibility on the provider to ensure nutritionally adequate, healthful food.

Few studies have assessed dietary intake of children in child care. Padget and colleagues compared dietary intake in child care with the 1992 Food Guide Pyramid for Young Children recommendations (8). No child met two thirds of the vegetable recommendation, and only 18.2% and 3.6% of 3-year-olds and 4- to 5-year-olds, respectively, met two thirds of the grain recommendation. Although 73% of 3-year-olds met two thirds of the fruit recommendation, only 25% of 4- to 5-year-olds did. In addition, other studies have relied on menus to assess dietary intake in child care (9-13), but some evidence indicates that menus may not accurately reflect food served (14).

The purpose of this study was to determine whether food consumed by children while in center-based child care (measured by direct observation) meets half to two thirds of the new MyPyramid daily food group recommendations for children 2 to 5 years of age.
METHODS
Participants and Setting
Data were collected prior to a state-wide evaluation of the Nutrition and Physical Activity Self-Assessment for Child Care intervention. This is a nutrition and physical activity environmental intervention for child care (15) and was recently evaluated in 84 licensed child-care centers throughout North Carolina. The University of North Carolina Institutional Review Board approved this study.

As part of this study, children's dietary intake was measured in a subset of 20 centers randomly selected from the full sample of 84 centers. One preschool age classroom was chosen by the child-care center director for the two days of observation. Before breakfast, after the majority of children had arrived, each was assigned a number and three children, numbers 1, 3, and 5, were chosen for observation on day 1. On day 2, the same procedure took place, excluding the children observed on day 1, for a total of six children observed per center (n=120). For three children, one day of observation was dropped because the center held a holiday party, not representative of usual dietary intake. Therefore, the final sample for analysis included 117 children.

In addition, facilities were classified as child-care centers rather than family child-care homes. Centers may be publicly or privately owned, operate within a religious, work-based, or school setting, and may or may not be part of preschool education. The 20 centers were disbursed across North Carolina in each of the three regions of the state. Eighty percent of centers were Child and Adult Care Food Program (CACFP) (16) participants and 70% cooked meals on-site. CACFP is a US Department of Agriculture food assistance program that provides reimbursement to child-care providers for meals and snacks. Centers had been in operation a mean of 19 years and enrolled a mean of 36 children age 3 to 5 years. No personal information (age, sex, race) was collected about the children observed.

Assessment of Dietary Intake
Dietary intake in the child-care center was recorded through direct observation of children by trained and certified field staff in the fall and winter of 2005. A complete description of the Dietary Observation for Child Care system used can be found elsewhere (17). Briefly, the type and amount of food served was recorded for each child, as well as any food dropped, traded, or added. At the end of each meal, the type and amount of food remaining was observed and food consumed was calculated using the food consumption equation: amount consumed=amount served±amount added or wasted–amount remaining.

Dietary intake data were assessed using Nutrition Data System for Research (NDS-R) software (version 2005, Nutrition Coordinating Center, University of Minnesota, Minneapolis) by the Nutrition Epidemiology Core of the Clinical Nutrition Research Center at the University of North Carolina at Chapel Hill. Dietary intake data for each child and amount and type of food initially served to the children was entered. For quality control, each child's entered food record was compared with the submitted written food record for errors. Any questions about the detail of the food data were addressed by the project manager to ensure the accuracy and precision of the data among centers. NDS-R generated servings of food offered to and consumed by the children for each food group. Because NDS-R software version 2005 produces serving sizes based on the 1992 US Department of Agriculture Food Guide Pyramid, servings were then translated into cups and ounces for comparison with MyPyramid recommendations.

Data were assessed to determine the mean quantity of food served and consumed for each food group and compared with MyPyramid recommendations. In addition, the percentage of children served a specific food group (any amount) on that given day was calculated. All statistical analyses were done using SAS statistical software, (version 9.1, 2003, Statistical Analysis Systems, Cary, NC).

RESULTS AND DISCUSSION
Mean servings consumed for all 117 children were calculated for all main food groups and several subgroups. These values were then compared with the recommended MyPyramid daily amounts for each food group to assess whether half to two thirds of the recommended amounts were consumed.

For the five main food groups, 95% to 100% of the children were served something from that food group on any given weekday (Table). However, with the exception of milk, of which children consumed approximately 1.4 cups (70% of the MyPyramid recommendation), children consumed substantially less than the recommended amounts for grains, vegetables, fruits, and meat/beans. Each main food group was further broken down into more specific categories. Although children consumed adequate amounts of milk, more than 50% of milk consumed was whole milk and only 11% of milk consumed was the recommended 1% or nonfat (3). On average, children consumed less than 13% of the MyPyramid recommendation for whole grains (foods that included whole grains, not limited to 100% whole grain) and only 7% of the MyPyramid recommendation for dark vegetables (dark green and orange). Also noteworthy, 75% of the meat consumed was either high-fat or fried.

It should be noted that on average children consumed almost 50% of the daily maximum recommended amount of 100% fruit juice while in child care. Also, almost 7% were served a sweetened beverage (eg, lemonade, fruit punch), 59% a sweet snack (eg., cookies, donut), and 96% a high-sugar or high-fat condiment (eg., butter, dressing, syrup, jelly).

Although the diet quality of young children in the United States has improved marginally over the past few decades (18), in general, reports suggest that preschool-age children consume excessive amounts of added sugars, fruit juices, and dairy, while consuming inadequate amounts of fruits, vegetables, and whole grains (19,20). Because 57% of young children spend time in child-care centers, foods provided by these facilities have a significant effect on children's overall diet quality.

Our data suggest that children are not consuming recommended amounts of whole grains, fruits, or vegetables while attending full-time child care. Instead, children are consuming excessive amounts of added sugars from sweet
snacks and condiments, and saturated fat from whole milk and high-fat or fried meats. Similar results were noted by Padget and colleagues (8) in a sample of Texas child-care centers and Mier and colleagues (21) in a sample of Texas, Mexican-American preschoolers. Although it is possible to make up for these dietary deficiencies through intake at home, researchers have found that a child’s diet at home often does not compensate for poor daytime intake of vegetables and grains (8) and may also contain large quantities of added fats and sugar (10, 21).

Several studies (8-10, 12-25) have attempted to look at the nutrient content of child-care facility meals; unfortunately, most looked at the nutrient content of food served, not consumed. Although most children were served something from the main food groups, amounts are much less than recommended levels for all groups but milk (Table). In general, children are consuming between 50% to 100% of all foods served, suggesting that the problem is not with child behavior or quantity of food consumed, but with quality—children are not being served enough nutrient-rich foods and may be filling up on calorie-dense, nutrient-poor foods.

Many researchers have assessed children’s diets by evaluating child-care center menus. In our study, we used a researcher-based, observation system to collect data, ensuring the most accurate representation of dietary intake by children at the child-care center. Additional strengths of this study include a geographically representative sample across North Carolina, a representation of mean intake at centers on any given weekday, and a random selection of centers and children. Also, this is the first study to assess children’s intake using the new 2005 MyPyramid recommendations, and our sample size was reasonable with 117 children at a total of 20 child-care centers.

This study, however, is not without limitations, and results should be interpreted with some caution. The sample included child-care centers only, not family child-care homes, which also provide care to a substantial number of US children (7). Future studies may want to assess dietary intake in this population. In addition, we chose only one classroom for observation and, although no data exist stating that children are differentially served by classroom, future studies may want to assess multiple classrooms per facility. Also, while direct observation is a commonly used method to assess dietary intake, it may not be as valid and reliable as plate waste techniques. However, in many child-care settings, access to food after it is plated but prior to consumption is not permitted. However, these limitations can be overcome with proper training and due diligence.

**CONCLUSIONS**

Although more research is needed, this study lends evidence to the need for more and improved dietary recommendations and regulations in child-care facilities. One program that currently provides structure for meals and snacks is CACFP (16). There is, however, a great deal of flexibility in eligible foods, and foods are required to meet only minimal nutrition standards. In fact, child-care centers can be in compliance with CACFP guidelines and still not provide half to two thirds of the recommended daily MyPyramid food groups to children in

<table>
<thead>
<tr>
<th>Food group and subgroup</th>
<th>Daily MyPyramid recommendation</th>
<th>Amount Served</th>
<th>% of recommendation</th>
<th>Amount Consumed</th>
<th>% of recommendation</th>
<th>% of children served food item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains, total</td>
<td>5 oz</td>
<td>2.09 oz</td>
<td>41.8</td>
<td>1.76 oz</td>
<td>35.0</td>
<td>100</td>
</tr>
<tr>
<td>All or some whole grain</td>
<td>2.5 oz</td>
<td>0.36 oz</td>
<td>14.4</td>
<td>0.32 oz</td>
<td>12.8</td>
<td>33.3</td>
</tr>
<tr>
<td>Vegetables, total</td>
<td>1.5 c</td>
<td>0.37 c</td>
<td>24.7</td>
<td>0.25 c</td>
<td>16.7</td>
<td>94.9</td>
</tr>
<tr>
<td>Vegetables, darkb</td>
<td>0.5 c</td>
<td>0.07 c</td>
<td>14.0</td>
<td>0.04 c</td>
<td>7.0</td>
<td>47.9</td>
</tr>
<tr>
<td>Vegetables, potatoes (not fried)</td>
<td>0.3 c</td>
<td>0.07 c</td>
<td>23.3</td>
<td>0.06 c</td>
<td>20.0</td>
<td>23.1</td>
</tr>
<tr>
<td>Vegetables, other</td>
<td>0.7 c</td>
<td>0.19 c</td>
<td>27.1</td>
<td>0.13 c</td>
<td>18.6</td>
<td>63.3</td>
</tr>
<tr>
<td>Vegetables, fried</td>
<td></td>
<td>0.05 c</td>
<td></td>
<td>0.04 c</td>
<td></td>
<td>15.4</td>
</tr>
<tr>
<td>Fruit (not 100% juice)</td>
<td>1.5 c</td>
<td>0.48 c</td>
<td>32.0</td>
<td>0.32 c</td>
<td>21.3</td>
<td>96.6</td>
</tr>
<tr>
<td>Meats/alternatives, total</td>
<td>4 oz</td>
<td>1.26 oz</td>
<td>31.5</td>
<td>1.07 oz</td>
<td>26.8</td>
<td>97.4</td>
</tr>
<tr>
<td>Meat, high-fat/fried</td>
<td></td>
<td>0.74 oz</td>
<td></td>
<td>0.70 oz</td>
<td></td>
<td>64.1</td>
</tr>
<tr>
<td>Meat, low-fat</td>
<td></td>
<td>0.32 oz</td>
<td></td>
<td>0.21 oz</td>
<td></td>
<td>25.6</td>
</tr>
<tr>
<td>Meat alternatives</td>
<td></td>
<td>0.19 oz</td>
<td></td>
<td>0.16 oz</td>
<td></td>
<td>29.1</td>
</tr>
<tr>
<td>Milk, totalc</td>
<td>2 c</td>
<td>1.6 c</td>
<td>80.0</td>
<td>1.4 c</td>
<td>70.0</td>
<td>99.2</td>
</tr>
<tr>
<td>Milk, whole</td>
<td></td>
<td>0.72 c</td>
<td></td>
<td>0.65 c</td>
<td></td>
<td>58.1</td>
</tr>
<tr>
<td>Milk, reduced-fat</td>
<td></td>
<td>0.56 c</td>
<td></td>
<td>0.47 c</td>
<td></td>
<td>51.3</td>
</tr>
<tr>
<td>Milk, 1% or nonfat</td>
<td></td>
<td>0.24 c</td>
<td></td>
<td>0.14 c</td>
<td></td>
<td>16.2</td>
</tr>
<tr>
<td>100% fruit juice</td>
<td>=6 oz</td>
<td>3.48 oz</td>
<td>58.0</td>
<td>2.80 oz</td>
<td>46.0</td>
<td>61.5</td>
</tr>
<tr>
<td>Sweetened fruit drinks</td>
<td></td>
<td>0.4 oz</td>
<td></td>
<td>0.40 oz</td>
<td></td>
<td>6.8</td>
</tr>
</tbody>
</table>

*Based on a 1,400-kcal diet as recommended by MyPyramid for a 4-year-old girl, active 30 to 60 minutes per day.

bBased on amounts recommended weekly by MyPyramid (1). Dark vegetable recommendation combines green vegetables and orange vegetables.

cBased on amounts recommended weekly by MyPyramid. Total milk recommendation includes yogurt and cheese.
their care. The impact of CACFP on children’s diets has not been extensively examined, but a few studies that have evaluated the program have found mixed results (9,11,13,22,24,25). CACFP food component guidelines have not been updated in recent years. Policymakers should take evidence from studies such as this one to recommend program revision. Based on this and similar data, we would recommend substituting whole fruit or vegetables for 100% fruit juice and substituting whole-grain items such as crackers and other bread products for sweet snacks like cookies.

This study also speaks to the need for more dietary education of child-care staff and increased nutrition intervention to improve the quality of food served. Programs that address this need, specifically through environmental change strategies and staff education (15,26), should be more widespread.

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References