

# Nutritional Comparison of Packed and School Lunches in Pre-Kindergarten and Kindergarten Children Following the Implementation of the 2012–2013 National School Lunch Program Standards

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## ABSTRACT

**Objective:** Approximately 40% of children bring a packed lunch to school. Little is known about the quality of these lunches. This study examined the nutritional quality of packed lunches compared with school lunches for pre-kindergarten and kindergarten children after the implementation of 2012–2013 National School Lunch Program standards.

**Methods:** The researchers collected observational data for packed and school lunches from 3 schools in rural Virginia for 5 consecutive school days and analyzed them for macro and micro nutrients.

**Results:** Of the 1,314 observations collected; 42.8% were packed lunches (n = 562) and 57.2% were school lunches (n = 752). Energy, fat, saturated fat, sugar, vitamin C, and iron were significantly higher whereas protein, sodium, fiber, vitamin A, and calcium were significantly lower for packed lunches than school lunches.

**Conclusions and Implications:** Packed lunches were of less nutritional quality than school lunches. Additional research is needed to explore factors related to choosing packed over school lunches.

**Key Words:** packed lunch, school lunch, children, NSLP, nutrition (*J Nutr Educ Behav.* 2014;46:621–626.)

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## INTRODUCTION

Over 50 million children attend elementary and secondary public schools in the US each day.<sup>1</sup> These children spend a substantial portion of their waking hours and consume a substantial portion of their daily calories at school.<sup>2,3</sup> For approximately 60% of children, these calories are derived from the National School Lunch Program (NSLP); the remaining 40% are from packed lunches.<sup>4</sup> During the past few years, there have been significant shifts in NSLP participation,

with decreases from 31.8 million average daily meals in 2011 to 31.6 million in 2012,<sup>5</sup> which translates into more children consuming packed lunches. Whereas the NSLP is mandated to meet nutrition standards aligned with the 2010 Healthy and Hunger-Free Kids Act,<sup>6,7</sup> packed lunches are not required to meet nutrition standards.

To date, relatively few studies have been published on the nutritional quality of packed lunches.<sup>2,4,8-13</sup> Existing studies used a variety of data collection methods and timeframes

such as 24-hour recalls and 1- to 3-day food observations and were conducted with a variety of ages ranging from kindergarten (K) to 12th grade.<sup>2,4,8-13</sup> No studies reported data over a full school week (5 days) with pre-K classes attending public school and compared with the new NSLP standards. The purpose of this study was to examine the nutritional quality of packed lunches compared with school lunches served to pre-K and K children attending public school over 5 consecutive school days after implementation of the 2012 NSLP standards.

## METHODS

### Recruitment of Schools

The researchers contacted 8 elementary schools in a rural area in Virginia via e-mail and telephone. Of the 8 schools contacted, 3 (37.5%) agreed to participate. The County Public School Research Office and each individual school administrator granted permission to enter each elementary school. The Institutional Review Board

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for Virginia Tech approved the study and did not require child or parental consent.

### Setting and Participants

The 3 elementary schools spanned 2 counties: Montgomery, with a population of 95,194 composed of white (87.9%), black (4.1%), and Hispanic/Latino (2.9%) individuals; and Giles, with a population of 16,928 composed of white (97%), black (1.5%), and Hispanic/Latino (1.3%) individuals.<sup>14</sup> The 3 schools had free and reduced price school lunch participation rates of 33.3%, 46.6%, and 52.7%, respectively. No identifying information for any student was collected. The authors selected pre-K and K students because young ages represent a malleable time to promote food acceptance.<sup>15-18</sup>

### Observational Protocol

National School Lunch Program menus need to meet nutritional requirements over the course of 1 week; therefore, observational data were collected in each elementary school for 5 consecutive school days.<sup>7</sup> All pre-K and K students in each school were served NSLP meals consisting of similar portion sizes. An observational checklist reflecting the meal components of the day's specific menu and commonly consumed items from packed lunches were used to record data on the presence of all food and drinks served as part of the NSLP and brought from home, with write-in sections for additional foods that may have not been part of the observational checklist. Each researcher was assigned a specific grouping of students to observe for a lunch period, approximately 10 students/researcher.

### Observer Training and Reliability

Undergraduate and graduate nutrition students were recruited and trained as observers in direct observation to assess lunch contents, specifically visual item identification and portion size estimation. The training was conducted by a doctoral-level registered dietitian. For checklist reliability testing, the researchers conducted observations of 5 premeasured sample packed lunches,

for a total of 24 items. Food and beverage items selected represented commonly found items in elementary packed lunches. School lunches were not chosen because of their uniformity and ease of recording. Accuracy was determined by dividing the number of items accurately recorded by the total number of items (item identification = 93.8%; portion estimation = 92.1%). Interobserver reliability was assessed with average pairwise percent agreement tests (JMP, version 11, SAS Institute, Inc, Cary, NC, 2013). Observers demonstrated 90.7% agreement for item identification and 86.8% agreement for portion estimation. This was consistent with previous research showing that trained observers with prior nutrition knowledge can accurately and reliably assess packed lunch contents and intake by direct observation in an elementary school setting.<sup>19</sup>

### Data Analysis

The school foodservice director for the region or the cafeteria manager for the elementary schools provided nutrient analyses for school lunches per food item. Packed lunch items were analyzed (Nutritionist Pro Diet Analysis software, version 5.1, Axxya Systems, Stafford, TX, 2009) based on serving sizes recorded at the time of observation. If an item was unavailable in the Nutritionist Pro database, the nutrition facts label per product brand and type were used for analysis. US Department of Agriculture reference items were recorded when available. Students who brought a packed lunch and purchased milk from the cafeteria were classified as a packed lunch observation. Students who participated in the NSLP but also brought food from home ( $n = 5$ ; 0.007% of total observations) were excluded.

Descriptive statistics were used to describe the nutritional quality of packed vs school lunches. Shapiro-Wilk test was used to determine whether the data were parametric. The researchers carried out comparisons of mean quantities of macronutrients and micronutrients (calories, protein, fat, saturated fat, carbohydrates, sugar, fiber, vitamin A, vitamin C, calcium, and iron) using the Mann-Whitney-Wilcoxon test. Multiple comparison and *post hoc* comparison

tests were carried out with Bonferroni adjustment of  $P < .004$ . Tukey's Honest Significant Difference test was used to detect differences between groups.

## RESULTS

### Nutritional Profile of Packed and School Lunches

A total of 1,314 lunches were observed, 42.8% of which were from packed lunches ( $n = 562$ ) and 57.2% from NSLP ( $n = 752$ ). Energy, carbohydrate, fat, saturated fat, sugar, vitamin C, and iron were significantly higher for packed lunches compared with school lunches whereas protein, sodium, fiber, vitamin A, and calcium were significantly lower for packed lunches compared with school lunches (Table 1). The nutrient availability for children in both packed and school lunch groups almost entirely met the nutrition standards of the NSLP except that school lunches being 38 calories below energy and 0.4 mg below iron recommendations whereas packed lunches were 1.5 g higher than fat and 0.3 g higher than saturated fat recommendations.

### Nutritional Profile of Packed Lunches by School

Differences among schools for the nutritional profile of packed lunches for protein, fat, saturated fat, sodium, vitamin A, and calcium were not statistically significant (Table 2). Energy was significantly higher for packed lunches of students at the moderate (46.6%) free and reduced eligibility level compared with both other schools. Packed lunches of students at the school with the low (33.3%) free and reduced eligibility level were significantly lower for carbohydrate, sugar, and vitamin C and significantly higher for iron and fiber than packed lunches at both other schools.

### Food Categories in Packed and School Lunches

Packed lunches were less likely to contain fruits (54% vs 67%), vegetables (17% vs 61%), juice with no sugar (10% vs 22%), and milk (20% vs 96%) than NSLP meals. They also contained

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