

What's in Children's Backpacks: Foods Brought from Home

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ABSTRACT

Forty-one percent of elementary schoolchildren bring lunch to school on any given day. Forty-five percent bring snacks. Surprisingly, little is known about the foods and beverages they bring. This cross-sectional analysis of baseline data from the GREEN (Growing Right: Eco-friendly Eating and Nutrition) Project Lunch Box Study sought to characterize foods and beverages brought from home to school by elementary schoolchildren and compare the quality of packed lunches with National School Lunch Program standards and packed snacks with Child and Adult Care Food Program requirements. Lunches and snacks from 626 elementary schoolchildren were assessed and evaluated using digital photography and a supplemental food checklist. Food and beverage types most likely to be provided for lunch were sandwiches (59%), snack foods (42%), fruit (34%), desserts (28%), water (28%), and sugar-sweetened beverages (24%). Twenty-seven percent of lunches met at least three of five National School Lunch Program standards. At snack, snack foods (62%), desserts (35%), and sugar-sweetened beverages (35%) were more common than fruits (30%), dairy foods (10%), and vegetables (3%). Only 4% of snacks met two of four Child and Adult Care Food Program standards. Future research is needed to understand the multiple determinants of food-packing behavior, including constraints faced by families. School wellness policies should consider initiatives that work collaboratively with parents to improve the quality of foods brought from home.

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SCHOOLCHILDREN IN THE UNITED STATES DO not eat the recommended amounts of fruits, vegetables, whole grains, and low-fat dairy as defined by the 2010 Dietary Guidelines for Americans¹ and consume excessive calories from energy-dense, nutrient-poor foods and beverages.^{2,3} Potential consequences of these unhealthy dietary patterns in childhood include diminished academic performance,⁴ obesity,⁵ and chronic disease in adulthood.⁶

The obesity epidemic among US schoolchildren⁷ has resulted in both federal and state policies to improve school food environments.⁸ Substantial improvements to foods provided by the National School Lunch Program (NSLP) have occurred as a direct result of the Healthy, Hunger-Free Kids Act.⁹ Forty-one percent of US schoolchildren bring lunch to school on any given day¹⁰ and 45% bring snacks.¹¹ Few studies have evaluated the quality of packed lunches and, to the authors' knowledge, data that describe foods and beverages brought from home exclusively for snacks have not been published. Therefore, the aim of the current study was to characterize the types of lunch and snack foods and beverages brought from home to school by elementary schoolchildren and to compare the quality of packed lunches with NSLP¹² standards and snacks to Child and Adult Care Food Program (CACFP) requirements.¹³

METHODS

Setting and Participants

The analysis utilized baseline data from the GREEN (Growing Right: Eco-friendly Eating and Nutrition) Project Lunch Box Study, a school-based nutrition education and eco-friendly communication campaign designed to influence foods brought from home. Intervention elements included a 22-lesson curriculum, school-based activities, and parent materials. Participants in grades three and four were recruited in Spring 2011 from six Eastern Massachusetts public school districts. School districts were selected so that no more than 30% of students were eligible for free lunches and 10% for reduced price lunches, in order to ensure enrollment of adequate numbers of students who did not participate in NSLP. All schools selected for the study had a classroom snack period for third and fourth graders. Recruitment packets, available in English and Spanish, were sent home from classrooms in children's backpacks. To be eligible to participate in the study, children had to bring some food from home at least 3 days per week, either for lunch, snack, or both. Parents and participants provided written informed consent and assent, respectively. The study protocol was approved by the Tufts University Institutional Review Board.

Measures

Sociodemographic Data. Parent and child demographic data were obtained from a self-administered, 16-item pencil-and-paper survey that was included in the recruitment packet. Participants returned the demographic survey to classroom teachers in sealed envelopes; surveys were later collected from the school by trained research staff. Child race/ethnicity was parent-reported based on the categories of the National Institutes of Health¹⁴ and aggregated into four groups: non-Hispanic white/Caucasian, black/African American, Hispanic, and other/multiracial. Income was used as an indicator of socioeconomic status.

Dietary Data Collection. Baseline dietary data were collected from late October to early December 2011 by trained graduate student research assistants before the start of the intervention. The date of the data-collection visit was arranged in advance with teachers; participants and parents were not informed of the date to prevent biases in packing behaviors. Data collection took place in each school cafeteria and was scheduled for the morning, before any eating events.^{15,16} All packed lunches and snacks of participants in the same class were examined on a single day unless the participant was absent. In cases of absences, data collectors returned to the school on a subsequent, prearranged date, again without informing participants or parents. Justification for the collection of 1 day of dietary data for each participant was supported by a pilot study of 55 participants in three schools conducted during Spring 2011 over 5 random days. Day-to-day consistency with which participants brought either a snack or lunch and snack was moderate (intraclass correlation coefficient [ICC]=0.51). Median number of food items brought from home was 2, ranging from 1 to 8 (ICC=0.66). The day-to-day variability in servings was moderate (ICC=0.59) with some variability by food type.

Digital photography and a supplemental food inventory checklist were used as the dietary assessment method. The development of the food inventory checklist used in this study was informed by checklists used in previous studies that support their use in school settings as an efficient and accurate alternative to traditional direct observation.¹⁷⁻¹⁹ The protocol did not permit the data collectors to touch participants' foods and beverages. Participants emptied the contents of their lunch boxes or bags on to an 11- by 17-inch placemat that had a unique study ID and a 1-inch square grid background. Participants placed foods and beverages intended to be consumed at snack on the left side of the placemat (labeled "1") and those intended to be consumed at lunch on the right side of the placemat (labeled "2") (Figure 1). Participants were instructed to take lids off of containers, unwrap opaque packaging (aluminum foil, paper towels), and orient brand names of packaged food forward. Angle (35 degrees) and aerial (20.5 inches) photographs were taken of each participant's placemat. Separate snack and lunch photos were taken when the number of items brought from home exceeded the space available on one placemat.

The photograph was considered the primary source of data. To supplement these data, research assistants recorded detailed information regarding eight major food and beverage categories (ie, beverages, fruits, vegetables, sandwiches, leftovers, snackfoods, desserts, and condiments) on the food inventory checklist. Participants were asked

whether beverages in reusable containers were 100% juice and whether they planned to purchase other beverages (eg, milk) or eat other foods at school. Data collectors recorded this information on the food inventory checklist, along with sandwich fillings. Each participant repacked their lunch and snack after the photographs and checklist were complete.

Photo Coding. The first step in the analysis of packed items was to identify foods and beverages in the photographs. The portion sizes of commercially packaged foods and beverages were obtained directly from the packaging and entered by weight. For foods and beverages not in commercial packaging, estimation of portion sizes involved a comparison of the item in the photograph with standard reference photos in a reference manual developed for the study. The manual included 1,200 food and beverage photographs, divided into the eight major food and beverage categories corresponding to the food inventory checklist. Each page of the manual contained six reference photos of the food or beverage; two photos (one angle and one aerial view) for each small, medium, and large portion size. Angle and aerial photos were taken at the same specifications used for data collection to allow for an exact comparison of the photo data to the standard reference photos. Reference photos of foods were taken in plastic sandwich bags and different container shapes because foods that were not commercially packaged were packed in this manner. Small, medium, and large portions were based on reference weights (grams) provided by the Nutrition Data System for Research (University of Minnesota). For cases in which Nutrition Data System for Research did not provide guidelines for portions, one half of the US Food and Drug Administration (FDA) serving size defined small, the FDA serving size defined medium, and 1.5 times the FDA serving size defined large.

Two independent coders classified portion sizes as small, medium, and large. Discrepancies of one category (eg, small vs medium, medium vs large) were considered disagreements. Discrepancies of two categories (eg, small vs large) were assumed to be errors and were re-evaluated by the coders. A certainty rating (ie, pretty sure, quite sure) was used to expand the 3-point scale to a 5-point scale (ie, small, small/medium, medium, medium/large, large). The method met validity and inter-rater reliability criteria, with coders correctly ranking the portion sizes >80% of the time.

Dietary Assessment. Portion size estimates for all foods and beverages were linked to gram weights corresponding to those represented by each photo in the reference manual. The gram weight for the portion size of each item was divided by the FDA serving size to determine number of servings. Gram weights were anchored by the small, medium, and large portion sizes. The mean gram weight between small and medium or medium and large was used for the two estimates between the anchors—small/medium and medium/large.

The characterization of foods and beverages packed for lunches and snacks involved aggregating items within each of the major original groups on the food inventory checklist (ie, beverages, sandwiches, leftovers, snackfoods, desserts, fruits, vegetables, and condiments) based on typology. The final major food and beverage categories and subcategories are defined in Figure 2. Condiments were excluded from the analyses.

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