RESEARCH
Original Research

Contribution of Beverage Selection to the Dietary Quality of the Packed Lunches Eaten by Preschool-Aged Children

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ABSTRACT

Background Sweet drinks early in life could predispose to lifelong consumption, and the beverage industry does not clearly define fruit drinks as part of the sweet drink category.

Objectives To ascertain the relationship between beverage selection and dietary quality of the lunches packed for preschool-aged children evaluated using the Healthy Eating Index-2010.

Methods Foods packed by parents (n=607) were observed at 30 early care and education centers on two nonconsecutive days. Three-level regression models were used to examine the dietary quality of lunches by beverage selection and the dietary quality of the lunch controlling for the nutrient composition of the beverage by removing it from the analysis.

Results Fruit drinks were included in 25% of parent-packed lunches, followed by 100% fruit juice (14%), milk (14%), and flavored milk (3.7%). Lunches with plain milk had the highest Healthy Eating Index-2010 scores (59.3) followed by lunches with 100% fruit juice (56.9) and flavored milk (53.2). Lunches with fruit drinks had the lowest Healthy Eating Index-2010 scores at 48.6. After excluding the nutrient content of the beverage, the significant difference between lunches containing milk and flavored milk persisted (+5.5), whereas the difference between fruit drinks and 100% fruit juice did not.

Conclusions Dietary quality is associated with the type of beverage packed and these differences hold when the lunch is analyzed without the nutrient content of the beverage included.
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HIGH CONSUMPTION OF FRUIT DRINKS (IE, NOT 100% fruit juice) may in part be attributable to pervasive marketing by the beverage industry. In 2013, the beverage industry in the United States spent $140 million to advertise 100% fruit juice and $73 million to advertise fruit drinks. Fruit drink marketing often targets parents with messages that could lead them to believe that fruit drinks are healthy.[1] In a 2014 report, Harris and colleagues[1] found that 100% of children's fruit drink packages made nutrition-related and ingredient claims. Adding to the confusion, some brands offer both 100% fruit juice and fruit drinks with similar names and packaging.[1] Because many parents rely on package information to make their purchase decisions,[2] claims about nutrition or health may increase confusion and influence this decision process. Parents of preschool-aged children may have variable awareness and understanding that fruit drinks are a type of sugary beverage. For example, 97% of preschool-aged children's parents in a sample considered sugar-sweetened carbonated beverages to be unhealthy and only 69% believed the same about fruit drinks.[2] Consistent with these perceptions, 80% of parents offered their children aged 2 to 5 years fruit drinks and 40% offered regular sugar-sweetened carbonated beverages.

The preschool years represent a critical period for obesity prevention,[3,4] especially in light of evidence that food preferences and eating habits developed at this age track into the school years and beyond.[5-7] The variety of foods selected at this age are strong predictors of consumption when older.[8,9] In addition, the energy density of the foods consumed during early childhood have been associated with the energy density of adult diets,[8,9] and consumption of soft drinks during infancy is positively associated with consumption at age 6 years.[10] The food preferences of preschool-aged children also have been linked to nutrient intake. Strong correlations for carbohydrate and fat intake were found from ages 3 to 5 years to ages 7 to 8 years.[5] Children have an innate preference for sweet flavors; therefore, exposure to sweet food and drinks early in life could predispose children to lifelong consumption of these products.[11,12] Conversely, providing young children with less-sweet foods, including a variety of vegetables and whole grains, is crucial to

developing acceptance of these foods for later life.[13-16] The American Academy of Pediatrics (AAP) encourages serving preschoolers plain milk or water and avoiding sugary drinks (ie, beverages with added sugar), including fruit drinks.[17] A recent AAP publication[18] establishes that 100% fruit juice should be limited in diets of preschool-aged children and whole fruit should be offered instead, preschool-aged children should not consume more than 4 oz (118.3 mL) 100% fruit juice, and should not receive fruit drinks.

Understanding the dietary patterns of preschool-aged children, and determining whether they are in line with current guidance, is necessary to inform recommendations that improve dietary quality among preschool-aged children.[19] Dietary patterns based on beverage consumption have been used to predict the quality of young children's diets.[20] Five-year-old girls who consumed sugary beverages consumed more added sugars and had lower dietary quality when compared with girls who were not consuming sugary beverages.[21] Research indicates fluid milk (both whole and reduced-fat) and 100% fruit juice are the main sources of calories in the diets of preschool-aged children's diets[22] and fruit drinks are the main sources of added sugars.[23]

The objective of this study was to ascertain the relationship of beverage selection and the dietary quality of the packed lunches eaten by preschool-aged children evaluated using the Healthy Eating Index-2010 (HEI-2010) total and component scores. To our knowledge this is the first study to examine beverage selection of parent-packed lunches in preschool settings. This study assesses the contribution of beverages to the dietary quality for the meal for which the nutrient composition of beverage was included in the analysis and to determine whether beverage selection can serve as a marker of dietary patterns for which the nutrient composition of the beverage was not included in the analysis. We hypothesized that beverage selection contributes to the dietary quality of the lunch and can serve as a marker of dietary patterns.

RESEARCH SNAPSHOT

Research Question: Is the dietary quality of the beverage packed by parents in their preschool-aged children's lunches consistent with the dietary quality of the rest of the food items packed?

Key Findings: Lunches differed in dietary quality by the type of beverage packed, and these differences held even when the lunch was analyzed without the nutrient content of the beverage. More research is warranted to examine whether packing milk may be a marker food for a healthier lunch. Contrary to research on beverage patterns and dietary quality, parents who packed fruit drinks did not pack lunch items with significantly less dietary quality than parents who packed 100% fruit juice.

METHODS

Data from the Lunch Is in the Bag trial, collected in Texas between 2011 and 2013, were used.[24-26] Lunch Is in the Bag was a multilevel behavior-based intervention intended for implementation at early care and education (ECE) centers where parents sent lunches from home. The aim of the intervention was to increase the servings of fruits, vegetables, and whole grains that parents pack in their preschool-aged children's lunch.[24-26] The following factors were observed at baseline on two randomly selected nonconsecutive weekdays: self-reported demographic information, measured child anthropometric characteristics, direct observations of food items present in parent-packed lunches, and portion consumed by the child. The pertinent institutional review boards approved all measurements and procedures.

Participants

A total of 1,396 ECE centers that were licensed by the State Department of Family and Protective Services were contacted via telephone survey. ECE centers were eligible for the study (n=104) in the case that they cared for at least 15 preschool-aged children who ate lunch at the ECE center daily and required parents to send meals from home. A total of 30 ECEs were enrolled. Parent–child dyads (ie, the adult who was primarily responsible for packing lunch and their 3- to 5-year-old child) from ECE centers in three central Texas cities were invited to participate in the trial. Parents provided written consent for themselves and their child to participate in the study.

Measures

Demographic and Weight Information. Surveys were distributed to parents to report their height, weight, race/ethnicity, gender, age, and marital status. Child height and weight were obtained using anthropometric measurements taken at the ECE center by trained research team members using standardized methods and equipment.[27]

Lunchbox Observations. Observers were trained by a registered dietitian nutritionist to visually classify and estimate amounts of food and beverages present in packed lunches. This observational methodology was established by Sweitzer and colleagues[26] and is briefly described below. Based on previous research from parent-packed lunches at ECE centers, observers were trained to recognize and visually estimate amounts of 41 foods. After training, researchers assembled 10 test lunches (every ingredient was weighed and measured) and observers recorded food descriptions and visually estimated amounts. Based on results from the test lunches, the method proved to be highly valid (intraclass correlation 0.951, 95% CI 0.91 to 0.97) and reliable (intraclass correlation 0.979, 95% CI 0.957 to 0.993).[26]

Before lunch, at the ECE center, trained observers recorded the foods and beverages packed by parents using standard measuring units (eg, cups, pieces, or ounces). Two lunchbox observations on nonconsecutive weekdays were completed for each participating child. Observers were trained to include as much detail as possible (eg, milk in an insulated container was recorded as "milk, fat not specified," milk packaged for individual sale included fat percent). During lunch the trained observers recorded the amount of food consumed by each participating child. Observers were trained to record food spilled, dropped, shared, or taken away. Quality control checks were completed for 10% of all dietary measurements in the field.

Table 1. Parent and child demographic characteristics[a] from the Lunch Is in the Bag trial

Characteristic	Result
	mean±standard deviation
Child	
Age (y)	3.51±0.69
Calculated BMI[b] percentile	56.79±29.99
	n (%)
BMI category	
Underweight[c]	32 (5.54)
Healthy weight[d]	416 (71.97)
Overweight[e]	75 (12.98)
Obese[f]	55 (9.52)
Race	
White	367 (66.01)
Hispanic	105 (18.88)
Other	84 (15.11)
Sex	
Male	315 (52.33)
	mean±standard deviation
Parent	
Age (y)	36.51±5.42
Calculated BMI	24.76±5.07
	n (%)
Parent BMI categories	
Underweight[g]	15 (2.75)
Healthy weight[h]	327 (60.00)
Overweight[i]	127 (23.30)
Obese[j]	76 (13.94)
Gender	
Female	499 (89.75)
Race	
White	396 (71.74)
Hispanic	98 (17.75)
Other	58 (10.51)
Annual family income	
<$59,999	92 (17.43)
$60,000-$79,999	52 (9.85)
$80,000-$99,999	83 (15.72)
>$100,000	301 (57.01)
Highest level of education	
Some college or less	96 (13.30)
Associate or bachelor's degree	274 (49.37)
Master's or doctorate degree	185 (33.33)
Marital status	
With partner	503 (91.12)

[a]Numbers for different outcome measures may vary due to missing values.
[b]BMI=body mass index (calculated as kg/m^2).
[c]<5th BMI percentile.
[d]≥5th to <85th BMI percentile.
[e]≥85th to <95th BMI percentile.
[f]≥95th BMI percentile.
[g]BMI >18.5.
[h]BMI 18.5 to 24.9.
[i]BMI 25 to 29.9.
[j]BMI ≥30.

Beverage Selection. Categorical variables were defined as follows: plain water, 100% fruit juice, fruit drink, plain milk (any fat level), and flavored milk (any fat level). Plain water: in the observed ECE centers, teachers poured plain water when no beverage was present in the parent-packed lunch and observers did not record whether the plain water was packed or offered by the center. Fruit drink vs 100% fruit juice: per the Food and Drug Administration, juice can be labeled as 100% in the case that it contains juices directly expressed from fruits or reconstituted concentrate with Brix levels equivalent to juices directly expressed from fruits. Milk and flavored milk: cow's milk and nondairy milks (eg, soy, almond, or coconut) were coded as milk or flavored milk depending on their flavor characteristics. Meals that included more than one beverage were coded as ">1 beverage."

Energy, Macronutrients, and HEI-2010. Dietary data were analyzed with the Food Intake Analysis System to provide weight or volume (in grams or milliliters), energy, and macronutrient content of individual food items.[28] The My Pyramid Equivalent coding system was used to calculate HEI-2010 components and total scores, measuring dietary quality on a scale of one to 100.[29,30] More details on the HEI-2010 scores for this sample have been published elsewhere.[31]

Data Analysis

Statistical Analysis System software[32] was used to analyze all data. Descriptive statistics were computed to determine the mean volume of beverages packed. Statistical modeling was used to examine the difference in dietary quality of lunches by beverage selection (whole meal), and to examine whether this difference was sustained when the nutrient composition of the beverage was dropped from the analysis. Multivariate analyses were used to estimate the mean dietary quality (represented by HEI-2010 scores and nutrient content) across beverage categories. To account for nonindependence and potential clustering of observations, three-level regression models with random intercepts at the child and ECE levels were employed to model outcomes. Regressions were also adjusted for possible confounding from child sex, age, and body mass index percentile. Regression-adjusted means for each HEI-2010 component score by beverage selection for packed lunches were derived from two models: including the

nutrient content of beverages and without the nutrient content of beverages.

RESULTS

Sample Characteristics

Eligible ECE centers (n=104) were invited to participate in the study, resulting in a sample of 30 ECE centers in three central Texas cities. Lunch observation data were available for 607 preschool-aged children ages 3 to 5 years (mean age=3.5 years) and their parents (mean age=36.5 years) (Table 1). Almost all parent participants were mothers and 66% were white and 19% were Hispanic. The sexes were equally represented in the children (52% boys). More than half of households (57%) had an annual income >$100,000.

Frequency of Beverages Packed in Child Lunches

The majority (62.1%) of meals (n=1,195) in this sample included a beverage other than plain water and there were no sugar-sweetened carbonated beverages in any of the lunches examined. Fruit drinks were included in 25% of lunches, followed by 100% fruit juice (14%), milk (14%), and flavored milk (3.7%). In addition, 5.2% of meals included more than 1 beverage. One-third (37%) of parents packed the same beverage on both days, 15% only packed a beverage in one of the two observed lunches, and 17% packed different beverages on each day.

Amount and Nutrient Content of Beverages

The mean serving of beverages differed by type of beverage and ranged from 198 to 250 mL for one beverage and 438 mL when the lunch included more than one beverage. The mean serving consumed by preschool-aged children ranged from 190 mL flavored milk to 127 mL whole milk. Preschool-aged children with more than one beverage in their lunch consumed, on average, 181 mL total from both beverages. The energy content ranged from 171 kcal for flavored milk to 92 kcal for fruit drinks (Table 2). The mean serving of fruit drinks had an average of 21 g sugars, 78% from added sugars. Flavored milk contained an average of 26 g sugars, 50% from added sugars. One hundred percent fruit juices included 20 g sugars with minimal added sugars (0.4%). None of the sugars from nonflavored milk (11.17 g) were added sugars.

Dietary Quality of Whole Meals per Type of Accompanying Beverage

Additional analyses examined the association of beverage packed with dietary quality of the lunches measured using the HEI-2010 (Table 3). Higher HEI-2010 scores reflect higher dietary quality of the meal. When the full lunch was analyzed, HEI-2010 total scores (0 to 100 points) differed significantly depending on beverage type. Meals that contained milk had the highest average HEI score (59.3), followed by meals with flavored milk (53.2) and meals containing >1 beverage (51.2). Meals that contained a fruit drink showed the lowest average HEI-2010 total score (48.6). The average HEI-2010 score for meals containing a fruit drink (48.6) were significantly lower when compared with meals with plain water (53.3), 100% fruit juice (56.9), and milk (59.3). Conversely, meals that contained milk had higher (+6.1) HEI-2010 total sores than flavored milk. The component scores that differed significantly by beverage packed were total vegetables, total fruit, dairy, fatty acids, sodium, refined grains, and empty calories.

Dietary Quality of Food Items per Type of Accompanying Beverage

After excluding the nutrient content of the beverages, HEI-2010 total scores for lunches differed significantly by beverage type. HEI-2010 total score for the food items of lunches packed with fruit drink (50.6) were significantly lower than the HEI-2010 total score for the food items in lunches packed with milk (56.5), and those that included plain water (53.2). Similarly, after removing the nutrient content of the beverages, the food items of lunches that contained milk had significantly higher HEI-2010 scores (5.5 point increase) than those that contained flavored milk. After

Table 2. Nutrient composition of average serving for each type of beverage packed by parents for their preschool child participating in the Lunch Is in the Bag intervention

	100% Fruit juice	Plain milk	Fruit drink	Flavored milk	>1 Beverage
	← *mean±standard deviation* →				
Volume (mL)	198±47	218±71	224±66	250±31	438±116
Energy (kcal)	99±23	106±37	92±34	171±32	214±74
Total fat (g)	0±0	4±2	0±0	3±2	4±3
Protein (g)	0±0	7±2	0±0	8±1	7±5
Carbohydrate (g)	25±6	11±3	23±9	28±5	40±15
Dietary fiber (g)	0±0	0±0	0±0	1±1	1±1
Total sugars (g)	20±5	11±4	21±8	26±4	36±13
Added sugars (g)	0±0	0±0	17±7	13±3	14±14
Calcium (mg)	97±46	277±109	18±17	287±33	315±214
Vitamin C (μg)	114±38	0±0	28±33	1±1	62±67
Percent consumed	82±34	58±38	74±37	76±35	41±25

excluding the nutrient content of the beverages, there was no significant difference between the HEI-2010 total scores of lunches that contained fruit drinks compared with those that contained 100% fruit juice. After omitting the nutrient contribution of the beverage to each lunch, the effect of beverage type based on an *F* test of overall significance persisted for total vegetables and empty calories only. Food items in lunches packed with a fruit drink had significantly lower scores for the HEI-2010 total vegetable component (1.5 out of 5) compared with lunches packed with milk (2.0 out of 5) or plain water (1.9 out of 5).

DISCUSSION

The objective of this study was to quantify the influence that beverage selection has on the dietary quality of parent-packed preschool lunches, evaluated using HEI-2010 total and component scores. More than half of the meals packed included a beverage other than plain water. The mean volume of 100% fruit juice packed was 9 mL over the AAP recommendation of 127 mL/day,[18] which could be appropriate assuming that these preschool-aged children only consume 100% fruit juice at the ECE center.

Making a simple change of beverages with added sugar for healthier alternatives (eg, plain milk instead of flavored milk) could have decreased the added sugar content of at least one-third of the lunches analyzed. At a mean serving of 225 mL, fruit drinks had 21 g sugars, 78% of which were added sugars. One hundred percent fruit juice, found in 14% of meals, included 20 g sugars, 99% of which are naturally occurring in fruit. The same comparison could be made with milk and flavored milk, although only 4% of lunches included the latter. Moreover, the substitution of beverages with healthier alternatives would increase the dietary quality (HEI-2010 total scores) of the meal by 8.3% when substituting fruit drinks with 100% fruit juice and by 6.1% when substituting flavored milk with plain milk. As many as 12 million children (61%) spend an average of 33 hours per week in out-of-the-home care[33,34] where they consume two or more meals and snacks and receive 50% to 67% of their daily energy requirements.[35] Therefore, the type of food sent from home has an influence on preschool-age children's overall diets regardless of the meals offered at home.

Beverage selection was associated with the overall dietary quality of the lunches that parents packed for their preschool-aged child. Without taking into account the nutrient composition of the beverages, foods in lunches packed with plain milk as a beverage had an HEI-2010 score that was 5.5% higher compared with lunches packed with flavored milk. There was no significant difference between the HEI-2010 total scores of meals packed with fruit drinks compared with those packed with 100% fruit juice. It is noteworthy that parents who packed plain milk also packed lunches that were 4.7% and 5.9% higher in dietary quality measured with the HEI-2010 (without taking into account the nutrient composition of drinks) than those who packed 100% fruit juice and fruit drinks, respectively.

Findings from the present study suggest that parents who packed flavored milk provided foods with lower dietary quality compared with those who packed plain milk, whereas the dietary quality of foods packed by parents who packed fruit drinks did not differ from those packed by parents who offered 100% fruit juice. One potential explanation for this finding is that parents are confused about the dietary advantages of 100% fruit juice, or that they bought fruit drinks thinking they were 100% fruit juice. Beverages may be indicators of differences in sweet preference, where 100% fruit juice would be like fruit drinks, but flavored milk is sweeter than plain milk. This would suggest that 100% fruit juice consumption contributes to preferences for sweet flavors. Because these questions were beyond the scope of this study to assess, more research is necessary to determine whether parents of preschool-aged children can differentiate between fruit drinks and 100% fruit juice while grocery shopping, and to examine the factors influencing their purchasing decisions.

Several methodologic limitations should be noted. Water consumption was not recorded consistently because ECE centers provided water when no beverage was packed; therefore, packing of water was not part of the analysis. Although observers were thoroughly trained to accurately categorize and record foods and data were cleaned meticulously, there is likely a small amount of nonsystematic error in the coding of fat content due to beverages in these analyses. Refrigerator access at ECE centers was not evaluated; therefore, results were not adjusted for refrigeration, which could influence provision of dairy. Due to the nature of this study, the sample is highly educated with high income; nevertheless, the most frequently packed beverages were sugary drinks and the dietary quality of the lunches was subpar. Finally, some ECE center policies banned sugary drinks as beverage selections but those policies were not consistently applied to fruit drinks. We hypothesize that teachers were not aware of the differences between fruit drinks and 100% fruit juice.

Strengths of the study include the use of the HEI-2010 to provide a consistent measure of dietary quality, the large sample size, and the use of a validated observation methodology. The use of the HEI-2010 provided advantages for evaluating the dietary quality of packed lunches eaten by preschool-aged children.[33] The HEI-2010 controls for energy of packed lunches because all components are scored in terms of 1,000 kcal and the HEI-2010 provides an objective measurement of dietary quality with a score from zero to 100 with 100 indicating the highest dietary quality. The sample size for this analysis was robust, with a final sample of 607 children. Finally, the observation methodology used has been validated[26] and research staff were trained and certified before the observations of packed lunches took place.

CONCLUSIONS

Lunches sent with preschool-aged children to ECE centers differ in dietary quality by the type of beverage packed, and these differences hold even when the lunch is analyzed without the nutrient content of the beverage included. ECE providers who wish to improve the dietary quality of parent-packed lunches can educate parents about the difference and health consequences of drinks with added sugars. More research is warranted to examine whether packing milk as a beverage may be a marker food for a healthier lunch. It will be informative for future work to examine whether parents who select plain milk as a beverage for their child's packed lunches have increased knowledge and/or skills to select more nutritious foods for their preschool-aged children.

Table 3. Regressed means for Healthy Eating Index 2010 component and total scores for lunches packed by parents from the Lunch Is in the Bag trial for their preschool-aged child (n=607)

HEI-2010 component	Maximum points	Standard for maximum score	With or without beverage	Fruit drink	100% Fruit juice	Plain milk	Flavored milk	>1 Beverage	Plain water
				←mean[a]±standard error→					
Total vegetables[b]	5	≥1.1 c equivalent/1,000 kcal	With beverage*	1.3±0.1	1.5±0.2	1.8±0.2	1.5±0.3	1.4±0.3	1.9±0.1
			Without beverage*	1.5±0.1	1.2±0.2	2.0±0.2	1.7±0.3	1.5±0.3	1.9±0.1
Greens and beans[b]	5	≥0.2 c equivalent/1,000 kcal	With beverage	0.4±0.1	0.1±0.1	0.4±0.1	0.3±0.2	0.1±0.2	0.5±0.1
			Without beverage	0.4±0.1	0.1±0.1	0.5±0.1	0.3±0.2	0.1±0.2	0.5±0.1
Total fruit[c]	5	≥0.8 c equivalent/1,000 kcal	With beverage****	4.2±0.1	4.9±0.2	3.7±0.2	3.6±0.3	4.1±0.2	3.9±0.1
			Without beverage	3.9±0.2	4.2±0.2	3.7±0.2	3.7±0.3	3.8±0.3	3.9±0.2
Whole fruit[d]	5	≥0.4 c equivalent/1,000 kcal	With beverage	4.1±0.2	4.2±0.2	3.8±0.2	3.8±0.3	3.9±0.3	4.0±0.2
			Without beverage	4.1±0.2	4.3±0.2	3.9±0.2	3.8±0.3	4.0±0.3	4.0±0.2
Whole grains[d]	10	≥1.5 oz equivalent/1,000 kcal	With beverage	3.5±0.3	3.9±0.4	4.4±0.4	3.5±0.7	3.0±0.6	3.9±0.3
			Without beverage	3.7±0.4	4.1±0.4	4.6±0.4	3.8±0.7	3.3±0.6	3.9±0.3
Dairy[e]	10	≥1.3 c equivalent/1,000 kcal	With beverage****	5.0±0.3	5.7±0.3	9.7±0.3	10.0±0.6	8.2±0.5	5.4±0.2
			Without beverage	5.5±0.3	6.0±0.4	5.5±0.4	5.5±0.7	5.8±0.6	5.3±0.3
Total protein foods[f]	5	≥2.5 oz equivalent/1,000 kcal	With beverage	3.9±0.1	3.7±0.2	4.0±0.2	3.7±0.3	3.6±0.3	3.9±0.1
			Without beverage	4.0±0.1	3.8±0.2	4.1±0.2	3.9±0.3	3.8±0.3	3.9±0.1
Seafood and plant proteins[fg]	5	≥0.8 oz equivalent/1,000 kcal	With beverage	1.4±0.2	1.7±0.2	1.8±0.2	1.3±0.4	1.3±0.3	1.8±0.2
			Without beverage	1.4±0.2	1.7±0.2	1.9±0.2	1.4±0.4	1.4±0.3	1.8±0.2
Fatty acids[h]	10	(PUFAs+MUFAs)/SFAs>2.5	With beverage****	4.5±0.3	4.1±0.3	3.0±0.3	2.8±0.6	3.1±0.5	5.0±0.2
			Without beverage	4.5±0.3	4.2±0.4	5.2±0.4	4.5±0.7	4.7±0.6	5.0±0.2
Moderation									
Sodium	10	≤1.1 g/1,000 kcal	With beverage*	5.2±0.3	5.7±0.4	5.5±0.4	4.8±0.6	6.0±0.6	4.7±0.3
			Without beverage	4.2±0.3	4.6±0.4	4.8±0.4	3.8±0.6	3.8±0.6	4.6±0.3
Refined grains	10	0≤1.8 oz equivalents/1,000 kcal	With beverage****	6.1±0.3	6.5±0.3	7.1±0.3	7.3±0.6	7.0±0.5	5.2±0.2
			Without beverage	5.0±0.3	5.3±0.4	6.0±0.4	5.7±0.7	5.2±0.6	5.2±0.2

(*continued on next page*)

Table 3. Regressed means for Healthy Eating Index 2010 component and total scores for lunches packed by parents from the Lunch Is in the Bag trial for their preschool-aged child (n=607) (*continued*)

HEI-2010 component	Maximum points	Standard for maximum score	With or without beverage	Fruit drink	100% Fruit juice	Plain milk	Flavored milk	>1 Beverage	Plain water
Empty calories[i]	20	≤19% of energy	With beverage****	8.9±0.4	14.8±0.5	14.2±0.5	10.5±0.9	9.9±0.8	13.2±0.3
			Without beverage*	12.3±0.4	12.2±0.5	14.6±0.5	12.8±1	11.3±0.8	13.2±0.3
Total score (100)			With beverage****	48.6±1.2	56.9±1.4	59.3±1.4	53.2±2.4	51.9±2.1	53.3±1.1
			Without beverage*	50.6±1.3	51.8±1.5	56.5±1.5	51.0±2.5	49.1±2.1	53.2±1.1

[a]Regressed mean±standard error adjusted to control for cluster effect at the school and child level as well as child age, sex, and body mass index.
[b]Includes any beans and peas not counted as total protein foods.
[c]Includes fruit juice.
[d]Includes all forms except juice.
[e]Includes all milk products and derivatives.
[f]Beans and peas included when the total protein foods standards was not met.
[g]Includes seafood, nuts, seeds, and soy products; also beans and peas counted as total protein foods.
[h]Ratio of polyunsaturated fatty acids (PUFAs) and monounsaturated fatty acids (MUFAs) to saturated fatty acids (SFAs).
[i]Calories from solid fats and added sugars.
*$P<0.05$.
****$P<0.0001$.

Contrary to research on beverage patterns and dietary quality, parents who packed fruit drinks did not pack lunch items with significantly less dietary quality than parents who packed 100% fruit juice. ECE center directors, teachers, and parents could benefit from knowledge on how to differentiate fruit drinks from 100% fruit juice, and advocates and policy makers could aid by establishing guidance to industry on how to identify and market these two different products. Additional research is warranted to increase the understanding of parental beverage selections for their young children and to develop strategies to help parents pack healthier lunches.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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