

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

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## ARTICLE INFORMATION

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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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**H**IGH 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.<sup>1</sup> In a 2014 report, Harris and colleagues<sup>1</sup> 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.<sup>1</sup> Because many parents rely on package information to make their purchase decisions,<sup>2</sup> 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.<sup>2</sup> 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,<sup>3,4</sup> especially in light of evidence that food preferences and eating habits developed at this age track into the school years and beyond.<sup>5-7</sup> The variety of foods selected at this age are strong predictors of consumption when older.<sup>8,9</sup> In addition, the energy density of the foods consumed during early childhood have been associated with the energy density of adult diets,<sup>8,9</sup> and consumption of soft drinks during infancy is positively associated with consumption at age 6 years.<sup>10</sup> 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.<sup>5</sup> 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.<sup>11,12</sup> Conversely, providing young children with less-sweet foods, including a variety of vegetables and whole grains, is crucial to

## RESEARCH

developing acceptance of these foods for later life.<sup>13-16</sup> 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.<sup>17</sup> A recent AAP publication<sup>18</sup> 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.<sup>19</sup> Dietary patterns based on beverage consumption have been used to predict the quality of young children's diets.<sup>20</sup> 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.<sup>21</sup> 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<sup>22</sup> and fruit drinks are the main sources of added sugars.<sup>23</sup>

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.

## METHODS

Data from the Lunch Is in the Bag trial, collected in Texas between 2011 and 2013, were used.<sup>24-26</sup> 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.<sup>24-26</sup> 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

## 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.

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.<sup>27</sup>

**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<sup>26</sup> 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).<sup>26</sup>

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.

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