Research Brief

Impact of a Pilot School-Based Nutrition Intervention on Fruit and Vegetable Waste at School Lunches

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ABSTRACT

Objective: To determine the preliminary impact of the *Brighter Bites* nutrition intervention on decreasing fruit and vegetable (F&V) waste at school lunches among fourth- and fifth-grade children.

Method: This was a nonrandomized pre−post-controlled study in Houston and Dallas, TX. Two schools received the *Brighter Bites* intervention ($n = 76$), and 1 comparison school ($n = 39$), during the 2017-2018 school year. *Brighter Bites* is a 16-week school-based nutrition intervention providing weekly distribution of fresh F&V plus nutrition education. Main outcome measures were direct observation and weights to measure the number of F&V dishes selected at school lunches, amount of F&V wasted (gm), and related nutrient waste (4 time points/child). Mixed-effects linear regression analysis was used to determine change in F&V selection and waste over time.

Results: There was a significant decrease over time in proportion of F&V selected among those in the comparison school, but not the intervention schools ($P < .001$). Compared with children in the comparison group, those receiving *Brighter Bites* showed a significant decrease in the amount of F&V wasted at each meal ($P < .001$) and per item ($P < .05$) at the end of both 8 and 16 weeks of intervention. There were significant decreases in waste of energy (kcal); dietary fiber (gm); vitamins B_1, B_3, and B_6 (mg); total folate (μg); and B_{12} (μg) among those receiving *Brighter Bites* ($P < .05$).

Conclusions and Implications: Although absolute food or nutrient changes were small even when significant, programs such as *Brighter Bites* may contribute to a healthy intake. Future studies are warranted that include a larger sample size with a stringent, cluster-randomized control trial design and consideration for other covariates.

Key Words: child dietary intake, fruit and vegetable consumption, nutrient waste, plate waste, school lunch (*J Nutr Educ Behav.* 2019;000:1−9.)

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INTRODUCTION

Despite widespread national and international efforts to increase fruit and vegetable (F&V) consumption, children of all ages consume less F&V than recommended.[1,2] Children from lower income households are more likely to consume inadequate amounts of F&V compared with their higher-income counterparts,[3] which exacerbates health disparities through the life course. Sufficient F&V consumption is critical for healthy physical and psychosocial development and functioning, especially during periods of rapid growth in childhood and adolescence.[1] In children, higher F&V intake is associated with reduced risks for chronic diseases and risk factors such as obesity, diabetes, hypertension, high cholesterol, and nutrient

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deficiency.[4] Thus, promoting adequate intake of F&V among children, especially those from lower-income families, remains important.[3,4]

Over 30 million children rely on the *National School Lunch Program* (NSLP) for nutrient and energy intake during the school day, 20 million meals of which are free lunches to low-income children.[5] Students are required to select at least 1 fruit or vegetable per lunch meal under current regulations.[6] Unfortunately, previous plate waste studies demonstrated that children often do not consume the F&V selected from the lunch lines.[7–11] Plate waste during school lunch results in nutrient loss and unnecessary costs for schools and the NSLP.[8,10,12] *Brighter Bites* is an evidence-based school health promotion program that combines access to fresh F&V with nutrition education in school and at home to increase preference and intake of F&V among children. The current study tested the preliminary impact of *Brighter Bites* on (1) increasing the number of F&V dishes selected by children at school lunch, (2) decreasing the amount of F&V wasted during school lunch by weight and percentage (proportion of F&V wasted), and (3) decreasing F&V-related nutrient waste per lunch meal among elementary schoolchildren in Houston and Dallas, TX.

METHODS

Plate Waste Study Design

A nonrandomized pre–post-controlled trial design was employed for this study. Trained data collectors measured participating students' school lunch in the cafeteria at 4 1-week time points per child (Monday through Friday) during the 2017–2018 school year. A convenience sample of 3 schools participated in the study: 2 schools receiving the *Brighter Bites* program and 1 comparison school (not participating in *Brighter Bites*). At each time point, data were collected every day of the week (Monday through Friday). The *Brighter Bites* program is implemented over 16 weeks in the school year: 8 weeks in the fall semester and 8 in the spring, respectively. The 4 time points of data collection included the start of the school year before the beginning of *Brighter Bites* programming (baseline, wave 1), the midpoint of the program (end of 8 weeks in the fall, wave 2), before the beginning of the spring programming (wave 3), and the end of the 16 weeks of the *Brighter Bites* program (end of spring, wave 4). All fourth- and fifth-grade children in participating intervention schools were exposed to *Brighter Bites*, but only those who consented to participate in the study were measured. This study was approved by the University of Texas Health Science Center Committee for the Protection of Human Subjects.

Description of *Brighter Bites* Intervention

Brighter Bites is an evidence-based program[13] currently being disseminated nationwide through the Brighter Bites 501c3 nonprofit organization. A detailed description of the program is available elsewhere;[13] briefly, *Brighter Bites* is a 16-week school-based nutrition program grounded in Social Cognitive Theory constructs.[14] It consists of 3 main components: (1) weekly distributions of 50 servings of fresh donated F&V sourced from local food banks sent home with parents; (2) nutrition education, which includes the evidence-based *Coordinated Approach to Child Health* program in schools,[15,16] and parent education through bilingual nutrition handbooks and recipe cards; and (3) weekly recipe demonstrations at produce pickup time. Results of *Brighter Bites* evaluation demonstrated significant improvements in the intake of F&V among participating children and parents and improvements in the home nutrition environment.[13]

Recruitment and Participants

A convenience sample of 3 schools from 2 public school districts, 1 in Dallas, TX (district A) and another in Houston, TX (district B), was recruited to participate in the study. The schools were selected based on comparable racial and ethnic composition and the percentage of the student population eligible for the free or reduced-priced lunch program. Two elementary schools (1 in district A and 1 in district B) received *Brighter Bites* programming for the first time in the 2017–2018 school year; concurrently, the comparison school (in district B) was not receiving *Brighter Bites* and had never participated in it. Inclusion criteria for students included (1) being enrolled in *Brighter Bites* in the 2017–2018 school year for the first time (for intervention schools), (2) participating in the NSLP at the school, and (3) being enrolled in fourth or fifth grade in the 2017–2018 school year.

A total of 115 students were recruited and provided consent at the 3 schools (intervention school 1: n = 44; intervention school 2: n = 32; comparison school: n = 39). Two classrooms per grade were targeted for recruitment. Recruitment strategies consisted of presentation to school leadership and a parent invitation letter sent home for participation in the study. Of those in the participating grades, recruitment rates were 19.1%, 17.5%, and 39% in intervention schools 1 and 2 and the comparison school, respectively. Written informed consent was obtained from parents, and verbal assent obtained from children. At each time point, all children were measured for 5 days (the entire school week). Children who had <3 days of school lunch measurements at baseline were excluded from subsequent measurements. Finally, parent–child attendance to *Brighter Bites* distributions was obtained from *Brighter Bites*.

Data Collection Measures

A total of 15 data collectors, who were university graduate students, were trained by study investigators to conduct plate waste measures for the study. Before lunch, cafeteria staff provided data collectors with samples of all available choices of F&V options for that day. Across all 3 schools, 30 minutes was allocated for the lunch period. For each day of measurement, before the lunch period, trained data collectors recorded the type and number of F&V items offered, as indicated in production records provided by the school food and nutrition service staff, obtained 3 sample portions of each selection,