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Lunch is in the Bag: Increasing Fruits, Vegetables and Whole Grains in Sack Lunches of Preschool-age Children

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Abstract

Fruits, vegetables and whole grains are important sources of nutrients for healthy growth and development of young children. Recent evidence suggests that sack lunches packed by parents for children to consume at childcare centers do not regularly meet the goal of one serving of fruit, vegetables and whole grains. *Lunch is in the Bag* is a childcare center-based nutrition education program targeted to parents of preschool-age children to increase the number of servings of fruits, vegetables and whole grains in sack lunches sent from home that was pilot tested in fall of 2008. In a quasi-experimental design, six childcare centers were paired by size before being randomly

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assigned to intervention (n=3) and comparison (n=3) groups. The parents of caregivers with primary responsibility for preparing the sack lunches of the three to five year old children attending the centers were enrolled as parent-child dyads. The intervention included parent handouts, classroom activities, educational stations and teacher training. The contents of the lunch sacks for both the intervention group and comparison group were recorded for three non-consecutive days before and immediately after the intervention period to measure the number of servings of fruits, vegetables and whole grains. A total of 132 parent-child dyads completed the study, 81 in the intervention group and 51 in the comparison group. Direct observation of children's lunches from the intervention group showed an increase in predicted mean number of servings of vegetables, from 0.41 to 0.65 ($P < 0.001$) and whole grains, from 0.54 to 1.06 ($P < 0.001$). No significant difference was observed in the mean number of servings of fruit. *Lunch is in the Bag* which is designed to fit in the childcare environment and targets parents of three to five year old children is a feasible intervention for improving the nutritional quality of sack lunches.

Keywords

Sack lunches; Fruit, vegetable and whole grain; Childcare

Introduction

Fruits, vegetables and whole grains are key dietary components to maintain healthy body weight, protect against certain cancers, and reduce risk for diabetes and other chronic diseases (1,2,3,4). Recent development of MyPyramid for Preschoolers by the USDA has established the daily recommendations for fruit and vegetables at one to two cups each and three to five ounces of grains, half which should be whole (5). The Healthy Eating Index scores for the 2003-2004 National Health and Nutrition Examination Survey (NHANES) indicate that children ages two to five years old score 100/100 for total fruit, 44/100 for total vegetables, and 17/100 for whole grains (6).

Parents play an important role as their young child develops dietary habits (7,8). Parents influence children's familiarity with and preferences for fruits, vegetables and whole grains by controlling the availability, accessibility and exposure to those foods (9,10,11,12). The child's consumption of fruits vegetables and whole grains is in turn dictated by their developed food preferences, food availability and accessibility (11,13,14). As the primary caregiver, parents can influence all of the environments where their preschool children encounter meals and snacks.

Childcare centers represent an important dietary environment for reaching parents and children (15,16). Out-of-home childcare has become the norm in the U.S with over 56% of three to four year old children spending time each week in childcare centers (17). Although the majority of childcare centers prepare and serve lunch and snacks to the children in their care, many centers rely on parents to provide some or all of the child's meals and snacks (18). In a survey of 474 childcare centers in four western states, 41% of the directors indicated some or all of the lunch items were provided from home (18). A 2004 survey of childcare center directors in two Central Texas counties revealed that 89 (46%) of 194 had closed their food service in the previous year in favor of parents supplying lunches (19).

At centers that require children to bring daily sack lunch, lunch becomes an important opportunity for parents to increase their child's exposure to fruits, vegetables and whole grains. Observation of preschoolers' sack lunches indicates, however, that parents need guidance for packing healthy lunches. A study of 222 sack lunches for children ages three to five at childcare centers in Texas showed only 29% of the lunches provided adequate servings of fruits and

vegetables based on the age-appropriate standards for the Child and Adult Care Feeding Program (CACFP). Examples of CACFP requirements for three to five year old children are one half cup of fruit, 100% juice, or vegetables and one half slice of whole grain bread. Less than half (40%) of the children had lunches whose three-day average would meet the criterion of providing one-third of the Dietary Reference Intakes (DRI) for essential nutrients including energy, dietary fiber, vitamin A, calcium, iron and zinc (20). An earlier evaluation of 528 sack lunches packed for preschool children attending childcare programs in California showed only 16% contained a vegetable and substantially less than three-fourths (69%) contained a fruit or fruit juices whereas more than 80% contained low-nutrient foods (e.g. chips, cookies, fruit drinks) (21).

The current study was a pilot-test of a center-based program to encourage parents of preschool age children to pack one serving each of fruits, vegetables, and whole grains every day in sack lunches sent from home. The Intervention Mapping™ process was used to revise an existing series of handouts for parents (24) and incorporate an emphasis on increasing fruits, vegetables and whole grains in children's sack lunches. Behaviorally-based activities for parents and children as well as teacher training were added. The hypothesis of this study was that at five week follow-up, parents of children in childcare centers with the five-week multi-component *Lunch Is In The Bag* program would pack significantly more servings of fruit, vegetable and whole grain products compared to parents of children in childcare centers without the program.

Methods

Participants

Six licensed childcare centers in and near a metropolitan city in central Texas participated in the pilot study in fall of 2008. Enrollment criteria were: (1) licensed by the state agency that oversees childcare centers, (2) provided care for a minimum of 20 children ages three to five enrolled and participating in daily care at the center, (3) provided care for children during the hours when children eat their lunch, and (4) required children to bring their lunches from home. All families of three to five year old children (n=368) attending the childcare centers were invited to participate. Directors of the centers were provided a letter of explanation including a draft statement of their endorsement of the program to distribute to parents the week before recruitment. The enrollment criterion for families was one parent-child dyad per family, with the caveat that the parent/caregiver in the dyad was the primary preparer of the child's lunch. Parents received \$10 and \$30 gift cards for participating in written survey and group interviews. Teachers received \$50 gift cards for group interview participation. The Institutional Review Boards of The University of Texas at Austin and the University of Texas Health Science Center at Houston approved the study in accord with guidelines for human participants in research. Parents provided written consent for themselves and their children in advance of lunch observations, survey, and group interview.

Study Design

In a quasi-experimental design, the six centers were paired by size before being randomly assigned to an intervention (n=3) or comparison (n=3) group. The eleven week timeline at each center included one week of recruitment and collection of demographic information, two weeks of lunch observations, five weeks of either intervention or no intervention, two weeks of follow-up lunch observation and one week of debriefing. Process evaluation included (1) implementation activity logs, (2) written surveys, and (3) group interviews. All of the parents and children at the intervention centers received the entire program while only enrolled parent-child dyads participated in study.

Intervention components

Lunch Is In The Bag was adapted from the parent education handouts, the *Lunch Box Program (LBP)* (24). Intervention Mapping guided the program adaptation (25). Intervention Mapping (25) provides a framework to develop theory and evidenced-based health education program. The six steps with related tasks are designed to ensure that educators incorporate literature, theory, and information about the target audience's needs and environmental influences into effective program. The theory of planned behavior and social cognitive theory were selected to guide the activity and message development. Formative data from previous group interviews with parents and teachers at other childcare centers, and consultation with an Advisory Panel that included the *LBP* author, childcare directors, parents of preschool children, and representatives from childcare licensing and the food industry provided insight into the needs and influences of the target audience. Table 1 presents the four components of *Lunch Is In The Bag* program. The program development team used a Dissemination Planning Template (26) to identify feasibility issues, outline the adaptability plan (e.g., tailoring materials for cultural differences), and anticipate elements of programmed support for implementation. The research plan included evaluation of input, process, and outcomes.

Measures of Input

Characteristics of the participating childcare centers and families were measured with written questionnaires and interviews. Interviews with childcare directors provided size and constituency of the childcare centers as well as background information about childcare program philosophy and nutrition policies and practices at the center. Questionnaires for parents provided self-report on familial factors that have been shown to affect children's dietary intake such as parent Body Mass Index (BMI), household size, parent ethnicity, household income and parent education level (7,27,28,29,30).

Process Evaluation Methods

Multiple methods were used to measure implementation and acceptability of the program components. Mailing lists and documentation by the center director tracked dissemination of the parent handouts. Teachers documented classroom activities in a weekly log. Research team members staffed the educational stations and documented parent and child participation with pre-coded checklists. Documented teacher training occurred at intervention centers prior to parent recruitment. Intervention group parents, teachers and directors completed written evaluation forms and participated in group interviews after the follow-up lunch observations.

Primary Outcome Measurement

The primary outcome measure was the number of servings of fruits, vegetables and whole grains in lunches children brought from home. Direct observation of packed food items were recorded by trained observers at both intervention and comparison centers. In accord with reliability for food records (31,32) lunches were observed on three random non-consecutive days. Food observers (n=5) were trained with a research-based protocol (33) modified by training the observers to recognize foods and servings sizes commonly seen in lunches of preschool children (20). Individual components of composite foods were recorded in separate amounts. The observers used a priori scales and checklists to document on a Food Observation Record each food item, the amount, and how the food was packed, prepared and presented to the child. This tool has been used in previous research observing meals served by childcare centers and sack lunches sent by parents in childcare settings (30,34). The food items were classified by food group and age appropriate serving sizes based on CACFP guidelines (35).

Statistical Analysis

A three-level regression model was used to test the hypotheses that the lunches for the children in the intervention group would contain more servings of fruits, vegetables and whole grains than those in the comparison group. The model was fitted to the data by the method of maximum likelihood using the Stata software package (Stata Version 10.1, 2009, StataCorp, College Station, TX). Parent BMI, household size, and parent ethnicity were used as covariates. The Statistical Package for Social Sciences for Windows (SPSS, version 13.0, 2005, SPSS Inc, Chicago, IL) was used for the descriptive analyses of the input and process data.

Results

Demographic characteristics of participants

Of a total of 368 parent/child dyads in the six centers, 132 (35.9%) enrolled in the study. The family participation rates in the two groups of centers were not significantly different, but because the population of families eligible to participate in the study was slightly larger in the intervention group (Table 2) the absolute numbers of parents was larger for the intervention group (n=81) than for the comparison group (n=55). The centers ranged in size from 24 to 125 three -five year old children.

There were no significant differences between the intervention and comparison groups in demographic characteristics of the participating families. The majority were currently married mothers with a mean age of 36.7 years. Average BMI (24.1 based on self-reported height and weight) was considered within a healthy range. With over 80% married and more than 60% reporting annual household income greater than \$ 80,000, the group was of higher SES compared to census figures for Texas as a whole, In the state of Texas 57% of children under six years old in childcare come from two parent families with a median income of \$66,653 (36).

Results from Process Evaluation

Mailing lists documented handouts were mailed to 100% of participating parents. Center staff verified that handouts were sent home to all parents of three to five year old children through each intervention center's communication system (e.g. Friday folders). Based on post-program parent survey, 97% of the respondents had received all five handouts through at least one method of dissemination and 100% indicated reading from some to all of the handouts. All lead teachers at intervention centers received training. Classroom Activity Logs indicated 100% compliance with implementation of classroom activities. Educational stations were held for 98% of the scheduled days. Both parents and children appeared to be appreciative of the educational station activities with the aggregate rating being a 4.4 out of 5 (5 = appreciative, 1 = denigrating). The majority of parents that participated in group interviews reported enjoying the program and it fit well within their family routine. The teacher surveys indicated 75% felt the program fit well in both curriculum and environment. Teachers that participated in group interviews indicated an appreciation for developed curriculum and noted increased conversations between parent and child about nutrition.

Food Observation Results

The children's sack lunches were observed at six centers at baseline and six weeks later, immediately following the intervention, for a total of 769 observations. The variability as determined by the three-level regression models in the number of servings of fruits, vegetables and whole grains associated with centers, subjects and observations are presented in Table 3. For all three food groups the largest proportion of variance occurred between observations or individual lunches: 58% for fruits, 71% for vegetables and 88% for whole grains. Less than

2% of the total variance was attributable to variation between centers, so in subsequent analyses, only level 1 (within children) and level 2 (between children) were used in the models. It was also determined that neither BMI, number of persons in household nor ethnic status were significant covariates for the servings of fruit, vegetables and whole grains.

Graphical analysis showed that the level 1 and level 2 residuals for fruits were approximately normally distributed. The level 1 residuals for vegetables were fairly normal, but the level 2 residuals showed some evidence of non-normality. For whole grains, the level 1 residuals showed somewhat non-normal, while the level 2 residuals were almost normal in distribution.

Two-level regression models with level 1 (within children) and level 2 (between children) were used in the final analyses. To partially compensate for the biases due to non-normality of the residuals, a robust (Huber/White or sandwich) estimator of the covariance matrix was used.

Table 3 also presents the difference in Intervention and Comparison groups at follow-up in number of servings of fruits, vegetables and whole grains, corrected for difference at baseline derived from the interaction term for time and intervention group in the regression models. The interactive effect of intervention and time for number of servings of fruits was not significant ($p = 0.600$); however, there was a significant effect due to the intervention ($p = 0.009$). Both vegetables and whole grains showed a significant interactive effect of intervention and time ($p = 0.001$ and $p = 0.001$, respectively).

The mean number of servings of fruits, vegetables and whole grains, standard errors and 95% confidence intervals for the intervention and control groups are displayed in Table 3. Both the intervention and comparison groups showed a slight decrease in mean number of servings of fruits between baseline and follow up, -0.05 servings for intervention and -0.12 for the comparison. The mean numbers of servings of vegetables for the intervention group increased (0.24) while the mean number of servings for the control decreased (-0.10). The number of servings of whole grains increased in both groups; strongly in the intervention group (0.52) and just marginally in the control (0.04).

Discussion

The results of this study show that implementing *Lunch Is In The Bag* at the childcare center is a feasible strategy for improving the nutritional content of parent-packed preschool sack lunches. Follow-up lunch observations after intervention showed a significant increase in servings of vegetables and whole grains at intervention centers compared to comparison centers. Regular classroom teachers were able to implement weekly activities as planned and provided positive feedback about the fit of the program into the childcare center. The majority of parents received and used the handouts. Parents and children were seen to enjoy their interaction with the educational stations.

Fruit exceeded the targeted outcome of one serving at both baseline and follow-up for both the intervention and comparison groups. This result may be due to a parental norm of providing fruit for children's lunch, the availability of fruit in a form easy to pack, or children readily consume fruit. For example, busy parents have a varied selection of individually portioned fruit and 100% fruit juice items are available at grocery stores that are easy and safe to pack. Children have demonstrated a preference for fruit and fruit juice over vegetables (14) which may suggest that parents perceive the children's preference for fruit and fruit juice so are more likely to pack those foods in their child's sack lunch.

Vegetables were included less often in children's sack lunches. The mean number of servings of vegetables increased significantly post-intervention to slightly more than half a serving, but remained less than the goal of one serving. While small (about two tablespoons) this increase

can provide key nutrients as well as model vegetables as an important part of a healthy lunch for a child. As noted above, parents may be less likely to pack vegetables based on their perceptions of the child's food preference. Other barriers may include parents consider vegetables too costly both in time and money to pack regularly for a child that may not eat them, (37,38,39).

The mean number of servings of whole grains increased to the goal of one serving per day at intervention centers. As with fruit, whole grain items can now be readily purchased in prepackaged forms, such as granola bars, or can be placed in a plastic bag and kept safely at room temperature such as ready-to-eat cereal or crackers. Parents of primary school-aged children have suggested that their knowledge of how to identify whole grain products in the grocery store is limited (40). Parents at the intervention centers may have recognized through the Handouts, Educational Stations, and/or conversation with their child that they had convenient and acceptable options to regularly pack whole grains in the child's lunches.

Conclusions

Other studies of multi-component programs focused on changing what the preschool child eats for lunch at the childcare center are *Healthy Start* and *5-A-Day Preschool Power Plus* (41, 42), both of which included a component focused on changing the menus/preparation methods of meals prepared at the childcare center. *Healthy Start*, designed to reduce dietary fat, resulted in a significant decrease in the total serum cholesterol among the intervention group compared to the control group. The *5-A-Day Preschool Power Plus* program demonstrated a significant increase in consumption of servings of fruit and vegetables as well as dietary fiber. While both of these programs demonstrated a change in children's consumption, it was primarily based on changes at the center not as a direct result of parents' behavior as in this study.

The components used in this study were designed for centers without meal preparation and were both effective and easily introduced into the curriculum and operations of intervention centers. Parents have indicated a willingness to receive nutrition information, such as handouts, from childcare centers (15). In this study each center's current communication methods were successfully employed to disseminate the handouts. Research has also shown that children can affect the home food environment through asking behaviors (43,44). Simple classroom activities that engage the child by designating a favorite fruit day or highlighting colored vegetables in lunches prompt both the child to ask for specific foods and the parents to respond through packing behaviors. Classroom activities and educational materials work together to change parent behavior that can be directly measured by the contents of the sack lunch. While *Lunch Is In The Bag* has demonstrated positive changes in observed lunch sacks, further study is needed to determine which specific program strategies had the greatest effect on parent's behavior.

The current study had several limitations which are offset by its several strengths. A major strength of this study was the use of direct observation of lunches as a direct objective measure of change in parent behavior. Another strength was the use of childcare centers that varied in both size and philosophy. Each intervention center was able to incorporate the program into their current practices with minimal disruption or change. Limitations for this study include the small number of centers in this pilot study and the resulting high SES, mostly Caucasian study population. The data presented here show the feasibility of the program and demonstrate its readiness for an efficacy trial. The current study focused on the change in the contents of the sack lunches without determining if there was a corresponding change in the child's intake or in the nutrition environment in the home. Further implementation of the program should include investigation of both of those aspects.

The multi-component program *Lunch Is In The Bag* program which is designed to fit the environment of childcare centers as a portal for reaching parents is a feasible intervention for improving the nutritional content of lunches parents pack for their preschool children. In view of current public health concerns for childhood obesity, dietetic professionals would find a receptive audience among parents of young children and an environment within the childcare center that allows access to groups of parents. An opportunity also exists to work with the food industry to develop more individually portioned vegetable choices for packing in sack lunches. A behaviorally-based intervention such as *Lunch Is In The Bag* allows linkage of nutrition information with strategies that encourage practice of the healthy behaviors. The increases in number of servings of vegetables and whole grains were shown to be significant and preliminary process evaluations indicate the program was compatible with childcare settings. It is reasonable to assume that establishment of standards for inclusion of one serving of fruits, vegetables and whole grains each day in a child's sack lunch can have a major impact on the health and well being of America's young children.

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Table 1

Lunch is in the Bag program components

Component	Description
Parent Handouts	Five weekly topical handouts with nutrition information, menu and recipe suggestions, goal-setting activities, and social references.
Classroom Activities	Age appropriate activities that utilize arts and crafts, books, games, discussion and request for foods from home.
Educational Stations	Weekly stations that followed the topic handouts provided both parent and child activities as well as further information to reinforce messages from classroom activities and handouts.
Teacher Training	Training and information for the teachers about the other components to enable and encourage high fidelity implementation and endorsement of the program.

Table 2Characteristics of study population for *Lunch is in the Bag*^a

	Comparison	Intervention	Total
	n	n	N
Number of centers	3	3	6
Number of children in centers	155	218	373
Number of children in study	51	81	132
Number of observations	298	471	769
Average number in household ± SD	3.96 ± 1.03	3.71 ± 1.1	3.9 ± 1.1
Average children/household ± SD	1.94 ± 0.8	1.75 ± 0.8	1.9 ± 0.8
Average age of caregiver ± SD	36.69 ± 8.2	36.56 ± 8.2	36.7 ± 8.1
Average BMI of caregiver ± SD	23.79 ± 4.9	24.62 ± 5.7	24.1 ± 5.2
Caregiver Demographic Information	Comparison	Intervention	
	n	%	n %
Relationship to child			
Mother	39	76.5	62 76.5
Father	8	15.7	16 19.8
Grandparent	0	0.0	2 2.5
Education level			
High school or less	1	2.0	0 0.0
Some college or post high school	4	7.8	5 6.2
College graduate	24	47.1	29 35.8
Some graduate/professional school	8	15.7	4 4.9
Graduate/professional degree	9	17.6	43 53.1
Annual household income			
\$20,000 - \$40,000	2	3.9	0 0.0
\$40,000 - \$60,000	3	5.9	2 2.5
\$60,000 - \$80,000	7	13.7	12 14.8
\$80,000 - \$100,000	5	9.8	11 13.6
> \$100,000	29	56.9	48 59.3
Ethnic Background			
Asian or Asian American	2	3.9	23 28.4
Other	6	11.8	8 9.9
White European American, non-Hispanic	38	74.5	47 58.0
Marital Status			
Married	43	84.3	74 91.4
Not married	4	7.8	6 7.4

^aNumbers for different outcome measures may vary due to missing values

Table 3

Mean number of servings for fruits, vegetables and whole grains for Comparison and Intervention groups^{ab} (769 observations on 131 subjects at 6 centers)

	Comparison					
	Baseline		Follow-up			
	n ^c	Mean (SE) ^d	CI ^e	n	Mean (SE)	CI
Fruit	148	1.25 (0.157)	(0.939- 1.553)	150	1.13 (0.156)	(0.821 – 1.435)
Vegetable	148	0.68 (0.085)	(0.516 – 0.850)	150	0.58 (0.085)	(0.413 – 0.746)
Whole Grain	148	0.48 (0.177)	(0.133 – 0.825)	150	0.52 (0.176)	(0.171 – 0.862)
Intervention						
	n	Mean (SE)	CI	n	Mean (SE)	CI
Fruit	240	1.80 (0.145)	(1.521 – 2.088)	231	1.75 (0.145)	(1.466 – 2.036)
Vegetables	240	0.41 (0.070)	(0.276 – 0.5490)	231	0.65 (0.070)	(0.515 – 0.790)
Whole Grains	240	0.54 (0.170)	(0.209 – 0.874)	231	1.07 (0.170)	(0.732 – 1.400)
Mean Intervention – Comparison at Follow-up						
	Mean (SE)	p – value	CI			
Fruit	0.065 (0.124)	0.600	(–0.177; –0.307)			
Vegetables	0.344 (0.100)	0.001	(0.148; –0.540)			
Whole Grains	0.487 (0.152)	0.001	(0.188; –0.786)			
Variance (proportion)	centers	children	observations	total		
Fruit	0.002 (0.002)	0.495 (0.419)	0.686 (0.578)	1.183 (1.000)		
Vegetables	0.000 (0.000)	0.187 (0.293)	0.451 (0.707)	0.683 (1.000)		
Whole Grains	0.023 (0.019)	0.123 (0.102)	1.052 (0.879)	1.198 (1.000)		

^a number of servings are presented for baseline and follow-up and are corrected for differences at baseline.

^b amount and proportion of variance are reported for centers, children and observations.

^c n = number of observations

^d SE = Standard Error

^e CI = 95% Confidence Intervals