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Impact of Vegetable Integration and Consumption in the National School Lunch Program

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Introduction:

During school year 2012-2013, the U.S. Department of Agriculture (USDA) made substantial changes to the National School Lunch Program (NSLP) with specific attention to food group consumption patterns (USDA, 2012). These guidelines mandate that all reimbursable lunches include at least one fruit or vegetable item (USDA, 2012). To examine the impact of these changes on meal selection, food consumption, and waste, Cohen et. al. (2014) conducted a plate waste study of 1030 elementary children. Results from this study indicate that after these changes went into effect, vegetable selection by students remained unchanged, although vegetable consumption among students increased by 16.2% (Cohen, Richardson, Parker, Catalano, & Brimm, 2014). However, results from the same study show that regardless of increases in vegetable consumption, overall waste of vegetable items remained high, with approximately 60%-75% of vegetables discarded based on plate waste (Cohen et. al., 2014).

While low consumption of vegetable items remains an issue among children participating in the NSLP, research has shown that incorporating vegetables into entree items can increase vegetable consumption in both children and adults with no significant impact on overall food intake (Spill, Birch, Roe, & Rolls, 2011; Blatt, Roe, & Rolls, 2011). Both Spill et. al. (2011) and Blatt et. al. (2011) found that incorporating pureed vegetables into entree items could both decrease the energy density of meals for both children and adults and increase the amount of vegetable servings consumed throughout the interventions. Although both studies highlighted the ease of increasing vegetable consumption through incorporation into entree items, research has yet to examine the impact of incorporating whole vegetable items into entrees and the potential impact on vegetable consumption.

The overall goal of this project was to examine the impact of a small, inexpensive change in the way vegetables are served in the school cafeteria, bundled with main dish items, on the vegetable consumption and waste of children participating in the National School Lunch Program. Additional aims included determining if a difference existed in the impact of incorporating vegetable side items into main dish items on consumption when comparing young children (grades 3-5) and adolescent children (grades 6-8), and assessing the financial impact of vegetable bundling on vegetable purchasing and waste. Researchers hypothesized that incorporating vegetable side items into main dish items to create a combination main dish would increase consumption of the vegetable(s) when compared to baseline consumption data, follow-up consumption data, and control school data. Researchers also hypothesized that there will be a more significant increase in vegetable consumption among adolescent children (grades 6-8) than among young children (grades 3-5).

Methodology:

Site and item selection

This randomized controlled trial was approved by the University of Florida IRB, the Alachua County School Board, and Alachua County Food and Nutrition Service in Gainesville, Fl. Two elementary and two middle schools with greater than 50% free and reduced lunch participation were selected to participate in the study. Each pair of schools was selected to match enrollment, demographics, menu and participation in the NSLP as closely as possible. For the purposes of this study design, menu paired indicated that the school pairs chosen had identical menu choices from a three-week cycle lunch menu.

With the help of ACFNS, researchers selected two days out of the existing cycle menu where a main dish item was paired with a vegetable side dish item that can be easily combined to

create a logical combination item. Pairs chosen were beef tacos originally served with a lettuce and tomato “cup” as a side item and a teriyaki chicken and brown rice bowl served with a side of steamed broccoli. One school from each pair was randomly selected to be the intervention site and one as a control site.

Baseline, intervention, and follow-up

Researchers conducted six observations at each school to determine consumption patterns for food items: twice (one day for each menu item) for each baseline, intervention, and follow-up. During baseline and follow-up, menu items were served in their original state, with vegetable side items served as one option to accompany the main dish item. On intervention days, cafeteria managers instructed servers to incorporate the vegetable side item into all main dish items served, leaving students with no choice than to take the bundled item that included the selected vegetable. Baseline and follow-up assessments were conducted at intervention schools as an internal measure of control to determine any potential trends that could impact validity of outcomes.

To ensure that vegetable servings for each student met USDA standards, cafeteria staff measured vegetable items for individual students in a manner similar to current practice before incorporating them into the main dish.

To assess vegetable consumption, the Quarter-Waste method was utilized (Hanks, Wansink, Just, 2014). Research staff participating in the assessment will either had prior experience or underwent training for the selected method. A series of tables for research purposes were set up in the cafeteria of each selected school. Trained University of Florida students and research faculty placed an identifier clip on the tray of each student who selects one of the intervention food items. At the end of the lunch, an announcement was made instructing all students who have a clip to deliver their tray to the research tables. After a tray had been delivered to the table, a research assistant separated vegetable items from other main dish components. A second researcher was provided with a visual reference for the selected vegetable serving, and then estimated the amount of vegetable waste (none, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, or all) and recorded this estimation next to the tray identifier number on a record sheet.

Data Manipulation:

Following data collection, a test of proportions was conducted to estimate the increase in consumption between the 3 trial days. For each individual school and middle school and elementary schools clustered, the proportion of any students eating any amount of vegetable was compared in three scenarios: baseline to intervention, intervention to post, and baseline to post. A test of proportions allowed for an accurate representation of the change in students consuming vegetables. A test of the average consumption in weight was also conducted however, the large difference in the amount of students choosing a vegetable on baseline and post dates with the amount of students taking the vegetable on intervention days did not provide pertinent information.

Along with testing the proportion of students who consumed vegetables in each of the scenarios, a test of the average waste in the same scenarios were also tested. Vegetable portions were converted to weights. Each portion had 10 ounces of vegetables. In this case a test of means was appropriate because there were no major discrepancies in the amount of waste given the number of students participating in the lunch option for that day. Additionally, it was assumed that on non-intervention days, each cafeteria prepared portions for half of the students that chose the free lunch option for the day. Within the data, additional students were marked as having

chosen a vegetable, but had a 100% waste. These students represent those total portions prepared by cafeteria staff. Alternatively, students who received school lunch beyond the prepared portions but opted out of the vegetable were counted as having 0% waste and 0% consumption. Data could not be collected on the actual portion amount prepared in each participating school.

Results and Analysis:

The results across schools and age groups were similar. In each school, the proportion of students consuming vegetables in each of the three situations were statistically different. As expected, the low cost implementation technique has a positive outcome for vegetable consumption among students.

Looking more closely at consumption levels among elementary school and middle school children for both menu items: chicken and broccoli and tacos show that the intervention was effective. Testing if the proportion of students consuming some amount vegetable varied among baseline and intervention date, it is clearly seen there is a difference in the proportion students consuming vegetables. At a significance level of .05, a greater proportion of students consumed vegetables on the intervention day then did on the baseline day. However, a smaller proportion of students consumed vegetables on the post day then did on the intervention. This result is expected because once again when students were given the option to take the vegetable a majority of students did not take the vegetable. A key finding is when comparing the baseline day to the post intervention day. There was a greater proportion of students consuming vegetables on the post intervention day, then there was on the baseline day. This is a clear indication that one day of intervention had a positive impact on vegetable consumption for children. Following intervention, a greater proportion of students consumed vegetables than they did prior to intervention. While there is a significant change in the amount of students consuming vegetables from baseline to post intervention, the change is still not as great as the that observed when comparing intervention days to either of the other test days. This is expected because of the greater frequency that students were given the vegetable. It is proven by integrating the vegetable into menu items, the children were more likely to consume some portion of their vegetable side. The findings were consistent for both menu items.

While consumption has clearly been impacted by the integration of vegetables into menu items, the amount of waste has also been effective. In order the integration technique to be implemented, the increase in consumption but justify any change in waste. When analyzing waste, a test comparing means between test days. For elementary schools on days that chicken and broccoli was served, there is no difference in waste between baseline and intervention days, However, there is more waste on the intervention day than there is post intervention. Again, these findings were operating under the assumption that cafeterias prepared a vegetable side for half of the students who took the free lunch option. However, there were fewer students purchasing the free lunch option, then there were on taco days. On days where tacos were served in the cafeteria, the waste among the intervention and baseline and post- days were the statistically insignificant. Like with chicken and broccoli, there was significance difference in waste between the baseline and post intervention days. The waste found on the baseline observation was greater than that found in the post intervention observation. Operating under the same assumption of 50% prepared portions, this result indicates that among the students that chose the free lunch option for that day, there was less waste indicating a spill over positive effect of the intervention. While this result is what was hoped for only have one intervention day

does not fully explain this phenomenon. Further research will be needed to include more than one intervention day to develop a consistent pattern.

Consumption in middle school students followed similar patterns to those of elementary school children. The proportion of students consuming vegetables in each of the three scenarios is statistically different. The amount students consuming some amount of vegetables increased during the intervention period. There was a greater amount of students consuming vegetables in relation to the amount of students that were given the vegetable. Again this is attributed to the fact when the option of refusing the vegetable is taken away, students are more apt to eat a vegetable already mixed in with their main dish. Similar to elementary school children, there is a difference in proportion of students who consumed vegetables in the baseline day to the post intervention observation. Following intervention, a greater proportion of students consumed vegetables than were found in the baseline observation. This indicates that after one week of intervention there was a positive response to integration.

The amount of vegetable waste observed in the middle schools also followed similar trends. On the days that chicken and broccoli and tacos were served, there was no significant difference in the average amount of waste observed between the baseline and intervention days. However, comparing the two other scenarios: intervention to post intervention and baseline and post intervention there were differences in results. Looking at the chicken and broccoli, there was a higher average waste on intervention days then compared to post intervention, but the amount of waste was not significantly different between baseline and post intervention. On days when tacos were served, there was no difference in average waste from intervention to baseline days. There was a difference in average waste between baseline and post intervention.

Conclusion:

The integration of vegetables into the main entrée item is an easy inexpensive way to increase vegetable consumption among school children. Integrating vegetables into the the main entrée has increased increased vegetable consumption with little impact to the amount of waste. Although in some scenarios, there is a difference in the average waste among investigative days, the increase in consumption justifies the change in waste. The increase in consumption is greater than the increase in waste. Further research must be conducted to understand the full effects of integration. Allowing for a longer intervention period should have a greater impact on children's decision post intervention.

Works Cited

- Blatt, A.D., Roe, L.S., Rolls, B.J. (2011). Hidden vegetables: an effective strategy to reduce energy intake and increase vegetable intake in adults. *American Journal of Clinical Nutrition*, 93; 756-763.
- Cohen, J.F.W., Richardson, S., Parker, E., Catalano, P., Rimm, E.B. (2014). Impact of the new U.S. Department of Agriculture School Meal Standards on food selection, consumption, and waste. *American Journal of Preventative Medicine*. 46(4); 388-394.
- Hanks, A. S., Wansink, B., & Just, D. R. (2013). Reliability and Accuracy of Real-Time Visualization Techniques for Measuring School Cafeteria Tray Waste: Validating the Quarter-Waste Method. *Journal of the Academy of Nutrition and Dietetics*, 114(3); 470-474.
- Spill, M.K., Birch, L.L., Roe, L.S., Rolls, B.J. (2011). Hiding vegetables to reduce energy density: an effective strategy to increase children's vegetable intake and reduce energy intake. *The American Journal of Clinical Nutrition*, 94; 735-741.
- U.S. Department of Agriculture. (2012). Nutrition standards in the national school lunch and school breakfast programs. *Federal Register* 2012;77 (17):4088–167. Available online at: <http://www.gpo.gov/fdsys/pkg/FR-2012-01-26/pdf/2012-1010.pdf>