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IMPLEMENTATION OF VEGAN ENTRÉES IN A WASHINGTON, D.C. ELEMENTARY SCHOOL

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ABSTRACT

PURPOSE/OBJECTIVES

School lunch meals often provide students with the majority of daily calories and prime opportunities to develop healthful eating habits. Plant-based entrées may increase variety of foods served and appeal to students, but may not appear frequently on school menus. A Washington, D.C.-based school partnered with local organizations to add vegan entrées to school lunch menus through marketing initiatives and assessments of plate waste and nutrition composition when compared to standard school lunch entrées.

METHODS

Researchers introduced six plant-based entrées at Washington, D.C.-based Walker-Jones Education Campus daily for four months to approximately 450 Kindergarten through eighth grade students. Various marketing initiatives and nutrition education materials promoted the entrées to the student body. Research staff compared plate waste when at least 25% of the entrée was consumed and the total calories, cholesterol, vitamins, saturated fat, and macronutrients of vegan entrées to standard entrées via t-test comparisons.

RESULTS

Plate waste showed no difference between the vegan and standard entrées when at least 25% of the entrée was consumed. Nutrient comparisons showed that the vegan entrées contained more calories, sodium, fiber, and vitamins, while standard entrées contained more protein.

APPLICATIONS TO CHILD NUTRITION PROFESSIONALS

Students did select vegan menu options that provided comparable nutrition as standard entrées with no additional plate waste. School foodservice administrators could consider offering vegan menu entrées to maximize student participation in the meal program using information from this case study as a guide. This project involved multiple partners in an effort to demonstrate successful implementation of vegan entrées in a school meal setting.

KEYWORDS: School meals, vegan meals, food choice, nutritional standards, plate waste

INTRODUCTION

School meals provide students daily nutrients and opportunities to build healthful eating habits, but may not meet their specific nutrition needs based on socioeconomic status, geographic location, or other accessibility issues (Joyce, Rosenkranz, & Rosenkranz, 2018). The U. S. Department of Agriculture (USDA) Healthy Hunger-Free Kids Act (HHFKA) called for increased access to fruits and vegetables with reductions in saturated and trans fats and sodium in school meals as a result of the Food and Nutrition Board of the National Research Council recommendations (USDA 2012b). Despite access to competitive offerings outside the National School Lunch Program (NSLP), direct sampling of fruit and vegetable options before meal selection may increase federal food program participation and intake of fruits and vegetables, (Pope, Roche, Morgan, & Kolodinsky, 2018) which students often discard (Handforth, Gilboy, Harris, & Melia, 2016; Haas, Cunningham-Sabo, & Garry Auld, 2014). Acceptability of vegetarian entrées that meet NSLP requirement may increase fruit and vegetable consumption. Melina, Craig, & Levin (2016) stated in the Academy of Nutrition and Dietetics position paper on vegetarian diets that plant-based diets meet protein and calcium recommendations. Challenges facing school lunch administrators include serving a variety of foods that appeal to students and meet the federal nutrient requirements of the HHFKA.

Vegetarian Diets in the U.S.

An estimated 5% of the U.S. population, most of whom are aged 18-49, follow various types of vegetarian diets and cite ethical concerns, health benefits, environmental impact (Reinhart, 2018), religious observances, aversion to meat (Rosenfeld & Burrow, 2017), or improved athletic performance (Barnard et al., 2019) as their reasons. Plant-based diets may also prove effective for disease prevention (Le & Sabaté, 2014; Morin, Michaud-Létourneau, Couturier, & Roy, 2019).

The Obesity Epidemic and Child Health

Between 2011 and 2014, obesity affected 17 percent of children between the ages of 2 and 19, with higher prevalence among Hispanic and non-Hispanic black youth (Ogden et al., 2016; Centers for Disease Control and Prevention, 2017). In 2015, Type 2 diabetes affected over 132,000 children under the age of 18 (National Diabetes Statistics Report, 2017). Diet may increase this prevalence. The U.S. Department of Health and Human Services (2015a) reported all age groups fell below recommended fruit and vegetable intake. Sugar-sweetened beverages, candies, pizza, and similar foods provide considerable daily calories (Rhodes, Adler, Clemens, LaComb, & Moshfegh, 2014; Sebastian, Wilkinson Enns, Goldman, 2011). While school lunch program participants usually consume more fiber than non-participants, fiber intake was below guidelines (Condon et al, 2015).

Recently, childhood obesity rates increased more among children when compared to adults worldwide (GBD 2015 Obesity Collaborators et al., 2017). A body of research suggests that diets including meat and dairy increase risk for diabetes (Barnard, Levin, & Trapp, 2014) and weight gain (Anderson et al., 2015; Barnard, 2010) due to increased saturated fat intake (Bethene Ervin, & Ogden, 2013; Zong et al., 2016; Parker et al., 2016).

Vegan entrées may increase availability of fruit, vegetable, legume, and whole grain options across all age groups and help schools meet reimbursable meal requirements. A District of Columbia Public Schools (DCPS) campus, with a focus on promotion of daily fruits and vegetables in accordance with the HHFKA and the DC Healthy Schools Act and Amendment

(District of Columbia Public Schools, n.d.), provided a location to assess acceptability and implementation of vegan lunch entrées.

Nutrition staff, in conjunction with a partner nonprofit organization, assessed plate waste, entrée selection, and nutrient comparisons in an intervention that introduced vegan entrées and assessed effectiveness of associated marketing materials. Vegan options that met NSLP nutritional standards were offered with the goal of maintaining student participation with no additional plate waste. This case study presents the methods used and can provide guidance for schools considering vegan options.

METHODS

INTERVENTIONS

School Setting

The Physicians Committee partnered with DC Central Kitchen (DCCK), a nonprofit social enterprise and community-based food provider in Washington, D.C. Physicians Committee staff had previously overseen similar vegan interventions (Eckart, Strong, Moppert, Barnard, 2010) in another K-8 grade lunch program. DCCK selected a K-8 school included in their healthy school food initiative that offered free and reduced price meals and participated in the NSLP. For school year 2014-2015, Walker-Jones enrolled 465 students aged 5-14 (District of Columbia Public Schools, 2018), with over 90 percent African-American and Hispanic students, 100 percent of whom were economically disadvantaged (District of Columbia Public Schools, 2019).

New Menu items

DCCK created six vegan, NSLP compliant entrées: Powered Up Pasta, Veg Out Chili, Southwest Energy Burger, BBQ Tofu Bites, On the Go Sloppy Joe, and Super Sesame Tofu. The Powered Up Pasta and Veg Out Chili recipes are available at https://p.widencdn.net/ieflmm/16239-NTR-Processed-Meat-Toolkit-Electronic and https://p.widencdn.net/kgbd2w/vegan-quantity-recipe-booklet-update, respectively.

Marketing

The I VEG OUT marketing intervention ran January through May of 2015. Physicians Committee staff notified parents, guardians, and school staff via letters and recipe postcards about each entrée before the intervention, and distributed incentives in the cafeteria with fruit and vegetable imagery, including apples on pencils with fruit-shaped erasers, stickers, wristbands, and campus-wide posters throughout the intervention. Physicians Committee dietitians and research staff prepared and sampled the BBQ Tofu with 7th grade students three times in March and April. School morning announcements highlighted daily lunch options. The school served each entrée between 5 to 15 times throughout the intervention, with the Powered Up Pasta and the Southwest Energy Burger entrées served most frequently.

Outreach and Taste Testing

Walker-Jones offered standard and vegetarian menus and first served the intervention meals on February 2, 2015 as an optional entrée. Four Physicians Committee staff distributed incentives and gathered feedback on Wednesdays during the three standard 45-minute lunch periods reaching nearly 500 students across all grade levels. DCPS requires a minimum of a 30-minute lunch period (District of Columbia Public Schools, 2017). On three occasions, a staff member engaged younger students with a carrot-mascot suit during the lunch period.

DATA COLLECTION

Plate Waste

The Veggie Project, a Brigham Young University program, demonstrated feasibility of non-invasive data collection via visual assessment with mobile apps (The Veggie Project, 2014). Price and Just (2015) demonstrated this in school settings with average inter-rater reliability rates of 0.781 (Just & Price, 2013). Hanks, Wansink, and Just showed accuracy of photographic and visual assessments of plate waste in measuring waste from unpackaged foods (2014). Physicians Committee staff visually assessed entrée consumption of each student's tray using a five-point scale of 0%, 25%, 50%, 75%, or 100% consumed via a customized survey report in the iOS app QuickTap Survey & Form Builder that generated spreadsheets for analysis. Physicians Committee staff recorded baseline data from sample trays on February 4, 2015 for both the standard and vegan entrées. Data collection also occurred on April 1 and May 20. Staff pairs assessed at least 10 trays for average entrée size before lunch. School monitors regulated student traffic as staff assessed student-presented trays for all in attendance after each lunch period across each grade level with trash bins positioned behind them to control disposal.

Nutrient Comparison

T-test comparisons utilized nonparametric approaches across macro nutrient content between both entrée groups via SAS analytic software (Version 9.4). Our statistician averaged identical occurrences of standard meals together, given their consistent composition, as representative of standard options to avoid duplicates and to ensure comparison of each meal available. The analysis compared "lineups" or "menus" of different vegan and non-vegan meal options. Food service providers may serve different meals from each "lineup" according to institutional needs. To ensure interpretable results, our statistician established whether the different available meals (counting each different option once, regardless of frequency actually served) in the vegan and non-vegan "menus" differ regarding various nutrients. While providers can select from this "menu" and serve meal variants not listed, we compared "menus" to eliminate food provider's choice to serve identical meals on different days. Where the vegan entrée's value represented zero, analyses assumed a fixed value of zero and compared the distribution of meals in the standard group to zero using a one-sample t-test. Analyses treated zero as a fixed value for some of the factors analyzed in the vegan group because there was no variance in the data available, making a true two-sample t-test impossible. The vegan meals would contain none or trace non-zero amounts which would not change one-sample test results. Analyses included all iterations of vegan and standard entrées listed above and accommodated different ingredient options as the recipes developed over the intervention.

RESULTS AND DISCUSSION

Data from Plate Waste

Data from February 4, 2015 showed that 75% of 266 students who selected the standard entrée and 64% of students who chose the vegan entrée consumed 25% of their entrée. At the midpoint on April 1, 2015, 81% of the students who selected either of the entrée options consumed 25% or more. Final data collection on May 20, 2015 found that 82% and 67% of students consumed at least 25% of the standard and vegan entrées, respectively. According to a report submitted to the U.S. Congress, students waste approximately 12 percent of calories from school nutrition programs (Buzby & Guthrie, 2002). In one study, Cohen, Richardson, Austin, Economos, and Rimm reported that students wasted up to 26% of total food budgets (2013). Plant-based options in this study did not exceed reported national food waste averages.

Nutrient Content and Comparison

Physicians Committee staff compared averages of total calories, total cholesterol, sodium, fiber, iron, calcium, vitamin A, vitamin C, protein, carbohydrate, total fat, and trans fat from both entrées. Results are shown in Table 1.

Table 1: ***Mean Comparisons of Nutrient Averages Between Vegan (n = 6) and Standard Entrées (n = 32)***

Nutrients	Group	N	Mean	SD	p-value (per t-test)
Calories (kcal)	V	10	337.7	57.3	p<0.001
	S	32	235.2	81.8	
Sodium (mg)	V	10	678.3	195.3	0.10
	S	32	518.1	279.9	
Fiber (g)	V	10	9.54	5.08	0.003
	S	32	2.93	1.81	
Iron (mg)	V	10	4.37	0.60	<0.001
	S	32	1.97	1.03	
Calcium (mg)	V	10	164.2	99.9	0.40
	S	32	117.1	163.4	
Vitamin A (measured as beta-carotene) (mcg)	V	10	565.2	340.2	0.04
	S	32	346.2	268.1	
Vitamin C (mg)	V	10	12.96	14.05	0.16
	S	32	5.96	7.98	
Protein (g)	V	10	16.55	2.10	0.013
	S	32	19.79	6.01	
Carbohydrate (g)	V	10	57.23	15.68	<0.001
	S	32	21.36	13.44	
Total Fat (g)	V	10	6.68	3.39	0.25
	S	32	8.41	4.27	
Saturated Fat (g)	V	10	0.75	0.39	<0.001
	S	32	2.65	2.30	
Cholesterol (mg)	V	10	0 (assumed fixed)	-	
	S	32	52.22	28.52	<0.001 (one-sample test mean >0)
Trans Fat (g)	V	10	0 (assumed fixed)	-	
	S	32	0.053	0.144	0.048 (one-sample test mean >0)

* **Standard entrées ("S")** *consisted of the following meals: Buffalo Chicken Wrap, Turkey Meatballs & Sauce, Turkey Ham & Cheddar Melt, Buffalo Chicken Strips, Turkey Ham & Cheese on Whole Wheat Bun, Turkey & Cheese on Whole Wheat Bun, Turkey Sloppy Joe on Whole Wheat Bun, Crispy Chicken Sandwich, Crispy Fish Sandwich, All Beef Hotdog on a Whole Wheat Bun, Whole Wheat Mac & Cheese, Beef Tacos in Whole Wheat Tortilla, Whole Grain French Bread Pizza, BBQ Chicken Tenders in Whole Wheat Wrap, Oven Fried Chicken, BBQ Chicken Tenders in Whole Wheat Wrap, Two Waffles, Pulled BBQ Chicken on Whole Wheat Bun, Chicken Filet Baked w/Tomato, Chicken Alfredo over Whole Wheat Pasta, Turkey Bolognese, Zesty Beef & Pasta Bake, Sesame Chicken, Peruvian Chicken Strips, Cajun Catfish, Crispy Chicken Tenders, Chicken & Bean Chili, Whole Grain Waffle (1), Herb Roasted Chicken Drum, Haitian Style Chicken, Beef Burger on Whole Wheat Bun, Beef Tacos*

** **Vegan entrées ("V")** *included BBQ tofu bites total with Whole Wheat Roll, BBQ Tofu on a Whole Wheat Bun, Veg Out Chili with Spanish Rice, Veg Out Chili with Brown Rice (larger serving of rice), Southwest Energy Burger, Super Sesame Tofu with Brown Rice, On the Go Sloppy Joe: Tofu, On the Go Sloppy Joe: Lentil, Powered Up Pasta with Chickpeas*

The guidelines proposed by the HHFKA at the time of the study required school lunches to have no trans fats, all grains be whole-grain rich, and meal components (fruits, vegetables, including dark green and red/orange varieties, legumes, starchy, and other varieties, meat/meat alternates, fluid milk, grains) were available at least the minimum required number of times per week, as specified in the NSLP meal pattern (USDA, 2012a; USDA, 2012b). The BBQ Tofu Bites, Veg Out Chili, and Powered Up Pasta were the vegan entrées that best satisfied HHFKA guidelines with less than 10% of the calories from saturated fat (3%, 1.34%, and 1.41%, respectively).

Calories, iron, and carbohydrates increased and saturated fat, cholesterol, and trans fat were lower for mean nutrient intake of the six vegan entrées compared to means for the 32 standard entrées. Vegan entrées in this study contained no dietary cholesterol and offered more fiber, vitamin A, and vitamin C, when compared to standard entrées. Mean protein levels showed 19 g vs 16 g for the standard entrées and vegan entrées, respectively. Means for caloric density were higher for the vegan entrées due to increased calories from carbohydrate and fiber rich ingredients such as tofu, legumes, and pasta, yet fewer calories were from saturated fat. The BBQ Tofu Bites, Veg Out Chili, and Powered Up Pasta offered options for the meat alternate category with a two-ounce equivalent (USDA, 2012). All vegan entrées met zero trans-fat requirements.

HHFKA requires that school lunches meet the weekly target 1 sodium restriction level of less than or equal to 1,230 mg for K-5 students and 1,360 mg for students in grades 6-8 for an average week of lunches (USDA, 2012b). Target 1 sodium requirements for school year 2014-2015 were implemented on July 1, 2014, which DCCK and the Physicians Committee followed for the menus used in this pilot program for K-8 students. Vegan entrées ranged between 385-942 mg sodium with an average of 648.9 mg, compared to the average of 475.9 mg for a standard entrée. The Veg Out Chili and Powered Up Pasta met the requirement at 523 mg and 385.40 mg, respectively. The vegan entrées contained more beta-carotene levels, measured as vitamin A, due to ingredients such as tomato sauce, other tomato products, and peppers.

Fiber ranged from 2.6-16 g with an average of 9.5 g for vegan entrées compared to 2.79 g for standard entrées. The Veg Out Chili contained 12 g of dietary fiber per serving while the highest standard fiber levels in the Turkey Sloppy Joe or Crispy Chicken Sandwich measured at 4.9 g. Carbohydrates in pasta, bread, and vegetable ingredients increased the soluble fiber in the vegan options. The American Heart Association recommends consumption of 26 g to 31 g of daily fiber for ages 9 to 13 (2016). The 2015 Dietary Guidelines recommended more varied, nutrient-dense protein sources and suggested reduced intake of animal protein via plant-based foods (U.S. Department of Health and Human Services and USDA, 2015b).

APPLICATIONS TO CHILD NUTRITION PROFESSIONALS

Conclusions

Vegan entrées in a school lunch program showed student acceptability and favorable nutrient composition when compared to standard offerings. Marketing efforts maintained participation with no additional plate waste. Adjustability among intervention materials, including recipe content and participation incentives, was useful during the sustained intervention period of four

months. Vegan entrées provided increased availability of fruits and vegetables and maintained NSLP requirements.

Strengths

On-site collaboration with partnering organizations and individual face time during samplings and data collection ensured sustained, engaged relationships with staff and students. There were positive attitudes toward promotional materials, use of the carrot costume, other incentives, and the entrées. Vegan options were served without special menu requests as was previously the case at this school, which increased their visibility. Several of the vegan entrées, including Powered Up Pasta, BBQ Tofu Bites, Veg Out Chili, and the Super Sesame Tofu, still appear on the school lunch menu (DC Central Kitchen, 2019). Plate waste did not exceed that of standard entrées or surpass national food waste averages. Vegan entrées satisfied nutrient requirements without nutritional deficiencies, specialty items, or aggressive menu modifications. Ingredients are easily sourced and recipes can be replicated by food service providers as a strategy to offer more fruits and vegetables and increase fiber consumption via familiar dishes, including chili and pasta.

Challenges

DCCK and Physicians Committee staff developed quantity recipes for six vegan entrées. While acceptable to students at the pilot school, some entrées exceeded nutrient limits. The Southwest Energy Burger, Veg Out Chili, and BBQ Tofu Bites exceeded HHFKA sodium regulations. Food service providers could reduce sodium by substituting fresh ingredients (i.e. fresh diced tomatoes rather than canned), but consideration of additional costs for product and labor should be taken into account.

Additionally, vegan entrées may require additional staff time that might exceed school resources. Programmatic success depends on student engagement and involvement (Alaimo et al., 2013); nutrition program administrators should determine popularity of these options with their client base. This study showed relative acceptance, particularly with inclusion of intervention efforts such as demonstrations, sampling, and cafeteria incentives.

Lunchtime behavior issues hindered engagement with all students, and disciplinary measures or other time constraints did not allow for total consumption of entrées or samples, which possibly disrupted data collection. School administrators discontinued pencil and eraser distribution after a few weeks, as they proved distracting. School administrators scheduled three extended lunch periods for the demonstrations and sampling. The additional time was helpful in introducing vegan items as other research has supported the concept that familiarity influences acceptance and plate-waste (Strohbehn, Strohbehn, Lanningham Foster, Scheidel, & Delger, 2016; Abe & Akamatsu, 2013). Practitioners considering interventions should consider which marketing techniques and incentives would likely influence selection and consumption.

Human error and staff communication may have influenced plate waste data collection and proper recipe implementation. We compared nutrient means for all menu items rather than compare for specific menu items. Despite no significant differences in waste, the authors suspect direct comparisons between a specific vegan and standard entrée may limit taste and preference variables. The Sloppy Joe changed midway during the intervention from use of lentils to tofu. While the entrée appeared throughout the intervention, the change in ingredients negated promotional efforts and potentially skewed results. Limited line space for the vegan options possibly biased selection due to insufficient display. We observed that the intervention entrée did not always appear on the line unless project staff was present with incentives.

U.S. schools show increased acceptability of vegan options, with 42 percent more all-vegan dining stations in higher-education schools since 2014 (Starostinetskaya, 2017). A D.C.-area school incorporated a student-grown salad bar that was very popular (Nania, 2017). In a recent study, Ickovics et al. showed nutrition interventions decreased unhealthful food consumption among students (2019). Santa Barbara, California's school district removed processed meats as a way to decrease health risks (Court, 2018), and public elementary schools in Portland, Maine increased vegan offerings at breakfast and lunch in an effort to improve health and inclusivity among culturally diverse students (Blanchard & Mills, 2019). School districts may consider this case study when making the decision to offer vegan options as part of the NSLP. Grants and partnerships may facilitate implementation; as noted, this project involved several partners. For example, a California bill proposed funds for recipes and training on student engagement to ensure programmatic success (Healthy, Climate-Friendly School Lunch Act, 2019).

In this case study, we found vegan entrées provided comparable nutrition and maintained student participation with no additional plate waste. These results may encourage food service providers to implement similar programs in their schools. Considerations of local students' taste preferences, entrée familiarity, and participation fluctuations should be part of the decision process, in addition to potential costs. Engagement with community partners and other staff within the district could minimize impact and may reduce costs. Food service administrators should examine sales trends and acceptability of vegan entrées by students in their districts. Vegan options that meet NSLP requirements could potentially increase student meal participation.

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