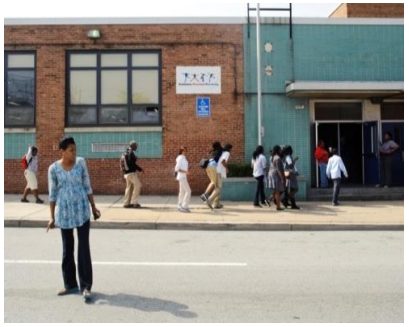
School-based Nutrition Interventions in Baltimore: Nutrition Education & Direct Intervention in High Schools



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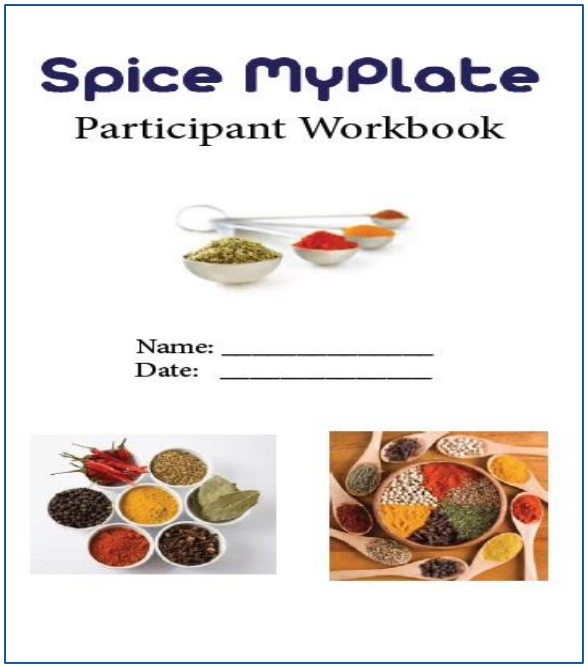
UNIVERSITY of MARYLAND
SCHOOL OF MEDICINE
CENTER FOR INTEGRATIVE MEDICINE

Barriers to Health for Youth in Baltimore

- Baltimore high school students 40% more likely to be obese than high school students statewide
  - Centers for Disease Control *Youth Risk Behavioral Surveillance System*

"Spice MyPlate": A Pilot Nutrition Education Intervention Focusing upon Spices and Herbs to Improve Diet Quality among Baltimore City High School Students



Spice MyPlate: Research Question & Specific Aims

- **Research Question:** Can "Spice MyPlate", a school-based nutrition education program focusing on spices and herbs, improve diet quality among high school students in Baltimore more effectively than standard nutritional education alone?
  - **Specific Aim I:** To determine whether the nutritional education program focusing upon spices and herbs improves **objective measures of diet quality (3 day food logs)** more than standard nutritional education alone.
  - **Specific Aim II:** To determine whether the nutritional education program focusing upon spices and herbs improves **subjective measures of diet quality (healthy eating attitudes questionnaires)** more than standard nutrition education alone.

Spice MyPlate: Intervention Content

- 6 weekly, school-based, classes focusing on spices & herbs
  - Community stakeholder engagement to develop ***engaging*** program
    - Colorful Spice MyPlate participant workbook
    - "Flavor profiles": spices & herbs didactic education
    - Sensory engagement with spices & herbs
    - *Creating healthier versions of foods students enjoy using spices & herbs*
    - *Cooking with spices & herbs*

- Focus on 12 core spices & herbs
  - Black pepper, basil, garlic, oregano, thyme, nutmeg, red pepper, ginger, turmeric, rosemary, cumin
  - Stakeholder engagement informed choice:
    - Palatability, affordability, accessibility, versatility, health benefits, mix of familiarity & novelty

Spice MyPlate: Intervention Content

Spice MyPlate

Participant Workbook

Name: _____

Date: _____

Flavor Profile: Thyme

Bundle of thyme

History: Thyme has been used for food and medicine for several centuries. Ancient Egyptians used thyme in their embalming practices while Ancient Greeks used thyme in their religious practices for courage. During the Middle Ages, people put thyme under their pillows to ward off nightmares in European countries. Thyme was mentioned in the Bible during the birth of Jesus.

Origin: Thyme is a perennial subshrub with small grey or green leaves. It comes from the Mediterranean region and is grown in many European countries, as well as Morocco and the United States. Thyme grows best in hot, sunny climates. You can eat thyme fresh from the plant or in its dried form.

Dried thyme

Medicinal: The leafy parts of thyme and its essential oil have been used in traditional medicine practices throughout the world. In African, thyme is used for its calming properties while in Chinese medicine, thyme is used for respiratory disorders. Ayurvedic medicine (from India) suggests thyme as a remedy for headaches, stomach upset, dental hygeine, and more. In the Carribbean, some cultures use thyme to assist with childbirth. In Europe, thyme is used as a remedy for cold and cough. In research studies thyme is being investigated for skin disorders, bronchitis/cough, and dental plaque – all of these studies have not yet found consistent evidence.

Thyme drawing, 1887

Sensory: The most common variety of thyme tastes medicinal, green (grassy), hay-like, and a little minty and bitter. There are many varieties of thyme and each tastes different: for instance, lemon thyme has a lemony flavor and caraway thyme tastes like caraway seeds.

Cooking: Thyme flavors traditional dishes such as clam chowder and stuffing for Thanksgiving turkey. Thyme also complements beef, poultry, pork, lamb, and fish dishes. *Bouquet garni*, a bundle of herbs tied with twine, contains sprigs of thyme and is used to add flavor to stews, soups, and stocks. Gumbo, a traditional Creole stew, obtains some of its flavor and aroma from thyme.

Spice MyPlate: Intervention Content

Session 3: *Food on the GO! Part II*

Real World Relevance

It came from the Cinnamologus nest!

In the Middle Ages, Arabs brought cinnamon and other spices from Asia to Egypt on caravan trade routes. They made up stories to hide the source of the cinnamon to make a bigger profit. One myth was the cinnamologus bird that guarded a nest of cinnamon sticks on top of a cliff. Traders claimed they didn't know where the bird found the rare sticks. They said to get the sticks, one had to lure the bird with heavy pieces of meat so the bird would carry the meat to its nest. The weight of the meat would then cause the nest to fall, so the valuable sticks could be harvested.

Session 2: *Food on the GO! Part I*

RECIPES

R2.1. Spiced Egg Scramble

Ingredients

3	Eggs
1/4 tsp	Oregano or Rosemary
1 tsp	Olive oil
1/2 c	Shredded reduced fat cheese

Directions

- Beat 3 eggs
- Mix in 1/4 teaspoon Oregano Leaves or Rosemary Leaves
- Sauté 1/2 cup chopped vegetables in 1 teaspoon hot olive oil
- Add egg mixture
- Cook until just set
- Sprinkle with 1/2 cup shredded reduced fat cheese
- Fold over

R2.2. Greek Tuna Salad Pocket

Ingredients

2 tbsp	Lemon juice
1 tbsp	Olive oil
1 1/2 tsp	Oregano leaves
1/2 tsp	Garlic powder
7 oz	Albacore tuna, packed in water
1/2 c	Chopped tomato
1/4 c	Finely chopped red onion
1/4 c	Crumbled reduced fat feta cheese
2	Whole wheat pita breads (6 1/2-inch)
1 c	Baby spinach leaves

Session 2: *Food on the GO! Part I*

ACTIVITIES

A2.1 Flavor Enhancement Stations

STATION 1: Spiced Egg Scrambles

Display: Flavor Profiles (Rosemary, Oregano), Spiced Egg Scramble Recipe

- Activity 1: Students will work in groups of five
  Follow the recipe to create Spiced Egg Scrambles

STATION 2: Pita Stuff It

Display: Flavor Profiles (Oregano, Curry, Garlic), Greek Tuna Salad Recipe, Twisted Chicken Salad Recipe, Caprese Pita Recipe

- Activity 1: Students will split into three groups (approximately 6 per group)
  Each group will follow the recipe to create one of the pita sandwhiches

STATION 3: Cinnamon Raisin Oatmeal

Display: Flavor Profiles (Cinammon), Cinnamon Raisin Oatmeal Recipe

- Activity 1: Students will follow the recipe to create a Cinnamon Raisin Oatmeal

Session 3: *Food on the GO! Part II*

ACTIVITIES

A3.1. Spice Taboo

Activity Takeaways:

- Apply spice knowledge
- Review spice information
- Provide opportunity to show where recalling spice knowledge is useful and fun!

Instructions:

- Create spice taboo game cards
- Divide group in two teams
- Place the buzzer/timer and cards in the center of the table
- Choose one person from a team to be the first clue giver.
- The clue giver sits opposite to their team, draws a card from the pile/stack and starts the timer.
- The card should but hidden form the team but visible to at least a member of the opposing team.
- Opponent should hold the buzzer and buzz when a taboo list word is used
- Give clues, as the clue giver, to the players on your team, clues can be single words or sentences. Remember the clue giver cannot use any word from the Taboo list printed on the card.
- Any part of those words or forms of those words are also forbidden for example of the forbidden word is "birthday" on the taboo list, the clue giver cannot use the word "birth"
- Teams score one point when they guess a clue correctly from their clue giver.
- There is no penalty for wrong answers
- Award one point to the clue giver's opponents for each time a Taboo word is used, and for each time the clue giver passes on a word.
- Hit the buzzer when a taboo word is used and have clue giver move on to next word.

Spice MyPlate: Intervention Content

Grocery Store Tour

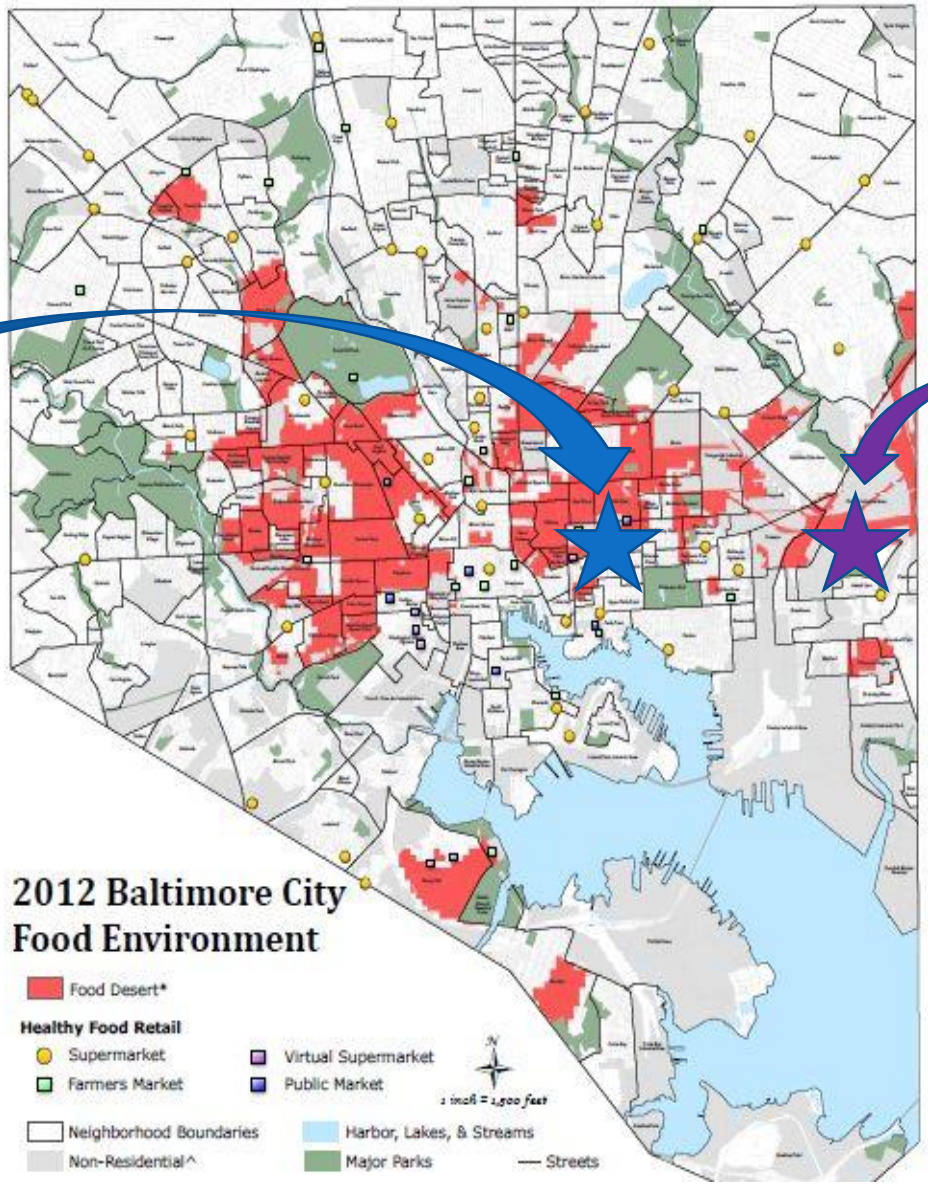
Cooking Class with Chef Len King

Spice MyPlate: Intervention Content

Baltimore "Chicken Box"

Spice MyPlate "Chicken out of the Box"

Spice MyPlate: Study Sample



Baltimore Freedom Academy

564 students
99% racial minority
74% school lunch program
Spice MyPlate Group **(n=55)**

Patterson High School

1,069 students
88% racial minority
75% school lunch program
Control Group **(n=55)**

Spice MyPlate: Two-Arm Community Trial

Control Arm

1 hour standard nutrition education

(“Real world” control)

Outcomes

Baseline
(pre-intervention)

Week 3
(intervention mid-point)

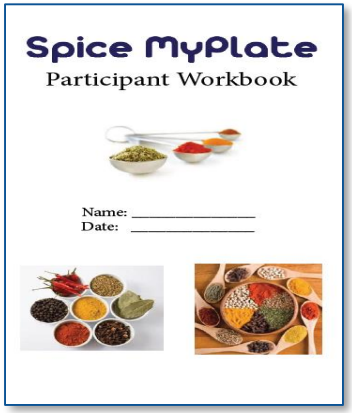
Week 6
(end of intervention)

Week 10
(follow-up)

Intervention Arm

1 hour standard nutrition education

+

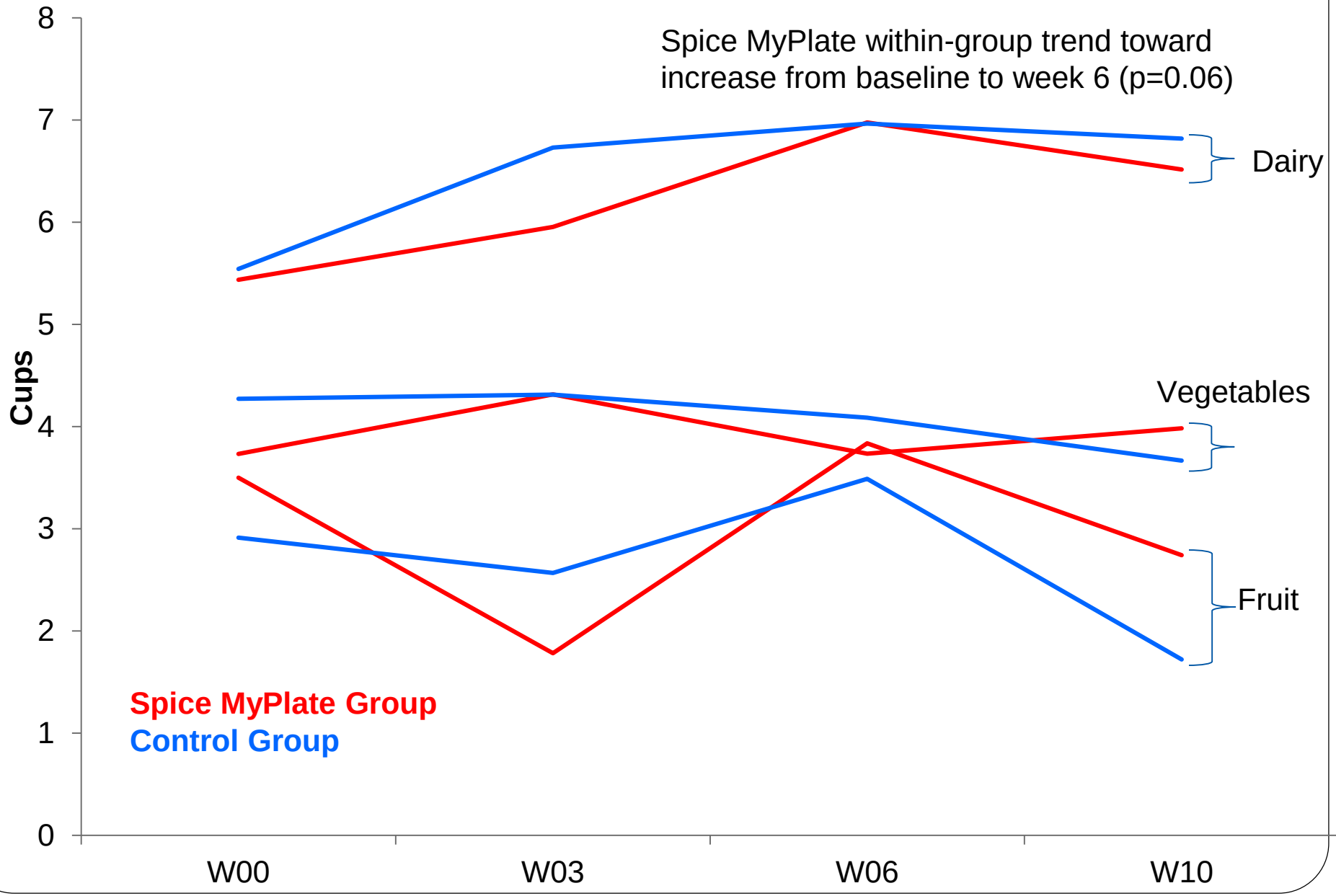


6 hours *Spice MyPlate* nutrition education

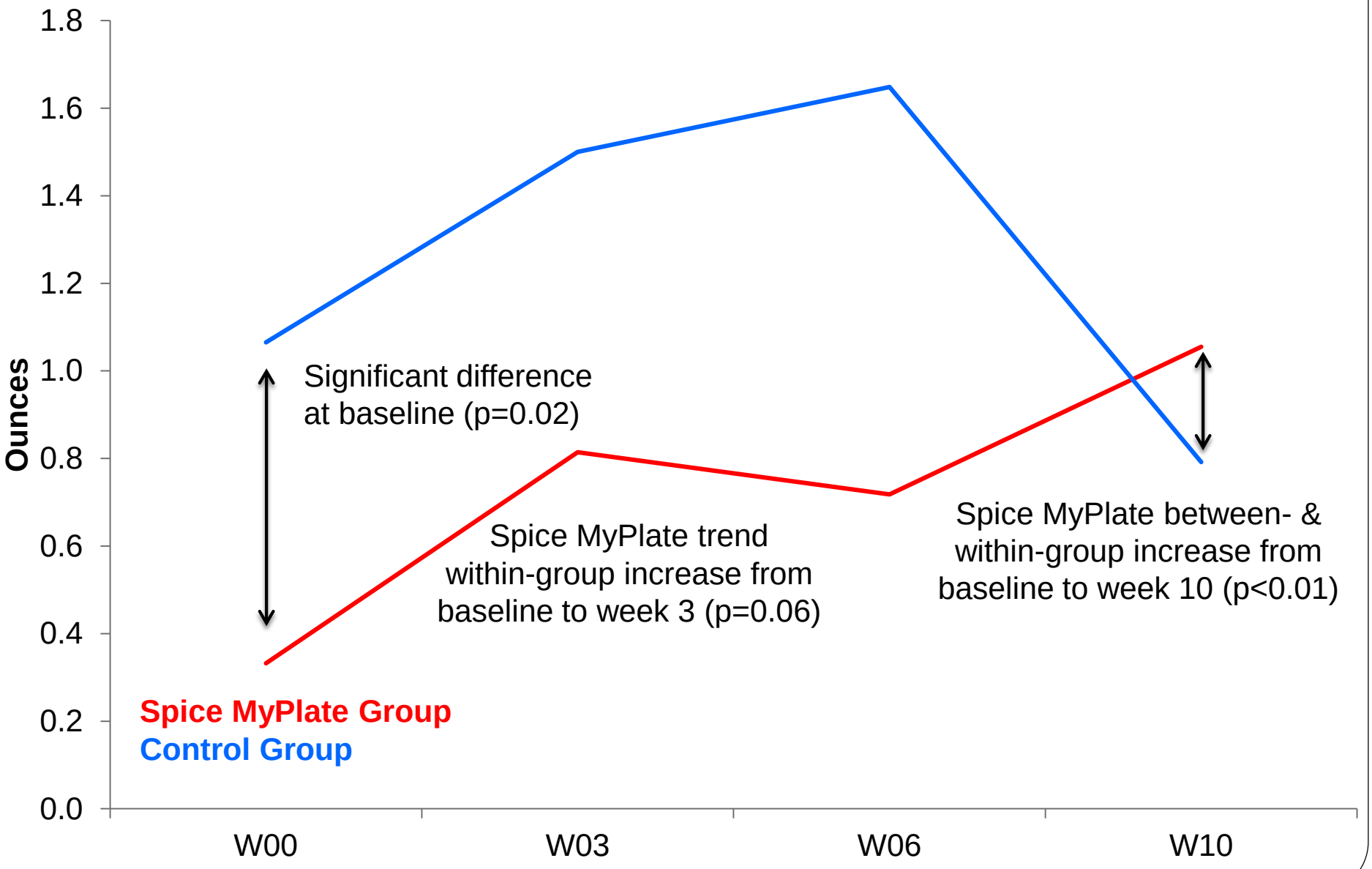
2 hours cooking sessions

1 hour grocery store tour

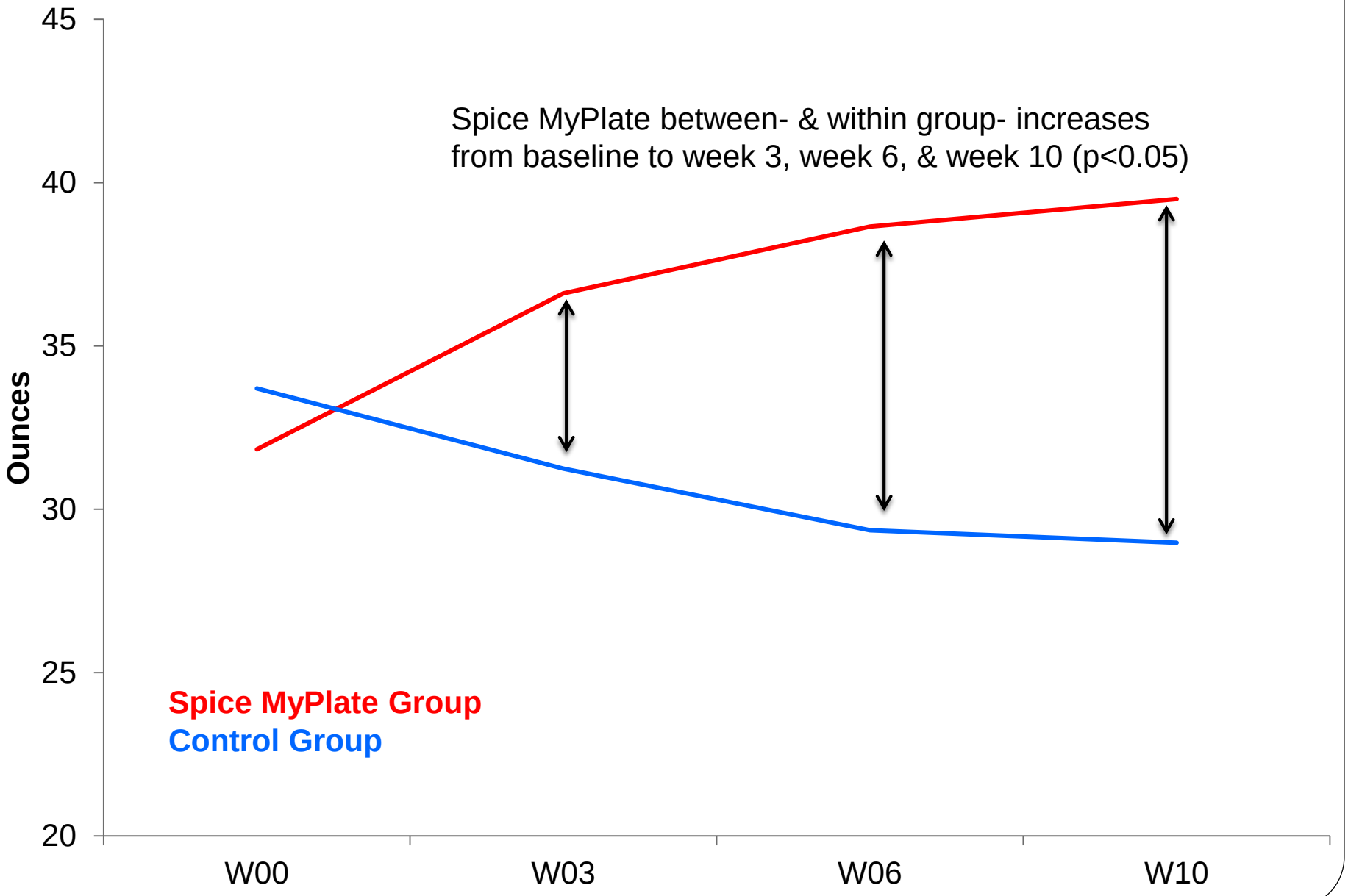
No Difference in Vegetables, Fruits, Dairy



Increased Whole Grains in Spice MyPlate



Increased Protein in Spice MyPlate



Healthy Eating Attitudes Improved in Spice MyPlate

How likely are you to eat _____	*Baseline to Week 3*		*Baseline to Week 6*		*Baseline to Follow-up*	
	Spice MyPlate	Control	Spice MyPlate	Control	Spice MyPlate	Control
Vegetables	0	+	0	0	+	0
Fruit	0	0	0	0	0	0
Whole grains	0	0	0	0	0	0
Protein	+	0	+	0	+	0
Dairy	0	0	+	+	+	0

+ Indicates more likely to consume than at baseline ($p \leq 0.05$)
+ Indicates trend toward more likely to consume than at baseline ($0.05 < p \leq 0.10$)
0 Indicates no difference in likelihood of consuming than at baseline
- Indicates less likely to consume than at baseline

Healthy Eating Attitudes Improved in Spice MyPlate

Would using spices & herbs make you more likely to eat…	*Baseline to Week 3*		*Baseline to Week 6*		*Baseline to Follow-up*	
	Spice MyPlate	Control	Spice MyPlate	Control	Spice MyPlate	Control
Vegetables	+	0	+	0	+	0
Fruit	0	0	0	0	0	0
Whole grains	0	+	+	0	+	0
Lean protein	+	0	0	0	0	0
Dairy	0	0	0	0	0	0

\+ Indicates more likely to consume than at baseline ($p \leq 0.05$)
\+ Indicates trend toward more likely to consume than at baseline ($0.05 < p \leq 0.10$)
0 Indicates no difference in likelihood of consuming than at baseline
\- Indicates less likely to consume than at baseline

Spice MyPlate: Peer-Reviewed Publication

AMERICAN JOURNAL of

Health Promotion

Volume 30, Number 5
May/June 2016

THE SCIENCE OF LIFESTYLE CHANGE

THE ART OF HEALTH PROMOTION

Spice MyPlate: Nutrition Education Focusing Upon Spices and Herbs Improved Diet Quality and Attitudes Among Urban High School Students

American Journal of Health Promotion
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Abstract

Purpose: To determine whether an experiential nutrition education intervention focusing on spices and herbs ("Spice MyPlate") is feasible and improves diet quality and healthy eating attitudes among an urban and predominantly African-American sample of adolescents more than standard nutrition education alone.

Design: A nonrandomized controlled trial compared standard nutrition education in U.S. Department of Agriculture MyPlate guidelines (control group) with standard nutrition education plus adjuvant Spice MyPlate curriculum (intervention group). Data were collected at baseline and after 3, 6, and 10 weeks.

Setting: Study setting was two public high schools in Baltimore, Maryland.

Subjects: A total of 110 students in grades 9 to 12 participated.

Intervention: The 6-week school-based intervention conducted during health class focused on cooking using spices and herbs to eat healthier diets according to MyPlate.

Measures: Dietary intake reported on 3-day food records and healthy eating attitudes questionnaires was analyzed.

Analysis: Differences in diet quality and healthy eating attitudes between study groups were estimated by *t*-tests, Wilcoxon-Mann-Whitney tests, and covariate-adjusted regression models.

Results: Spice MyPlate was feasible and there were modest but significant improvements ($p \leq .05$) in the Spice MyPlate group compared with control in whole grains (31.2 g/wk) and protein foods (13.2 ounces per week) intake, and attitudes toward eating vegetables, whole grains, lean protein, and low-fat dairy.

Conclusions: Although randomized trials are needed, experiential nutrition education focusing on spices and herbs may help urban and predominantly African-American adolescent populations eat healthier diets.

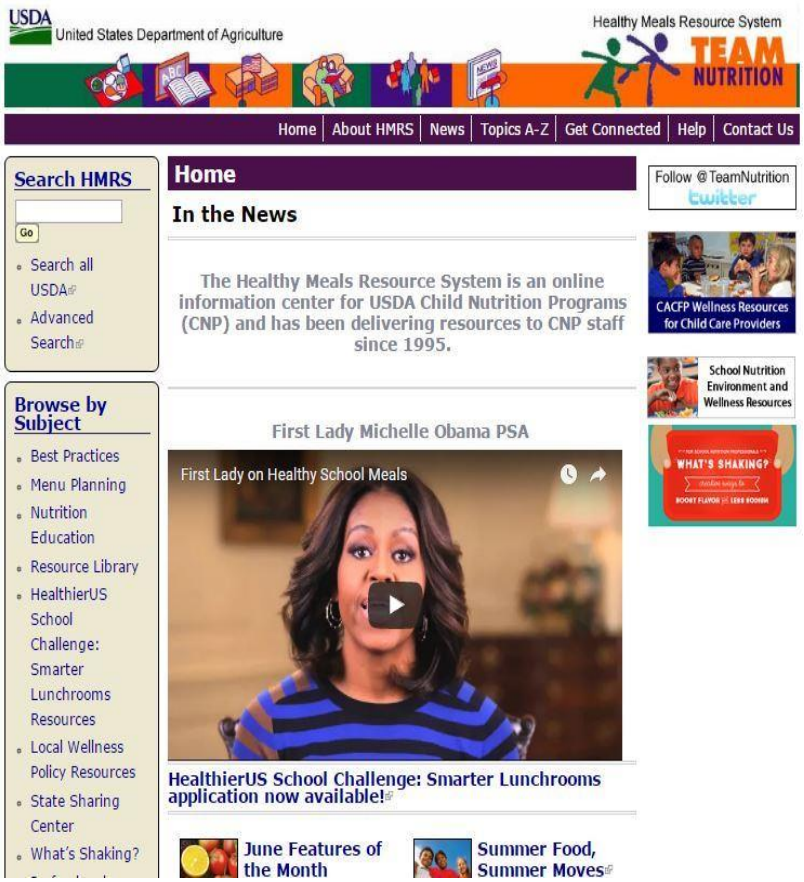
Keywords

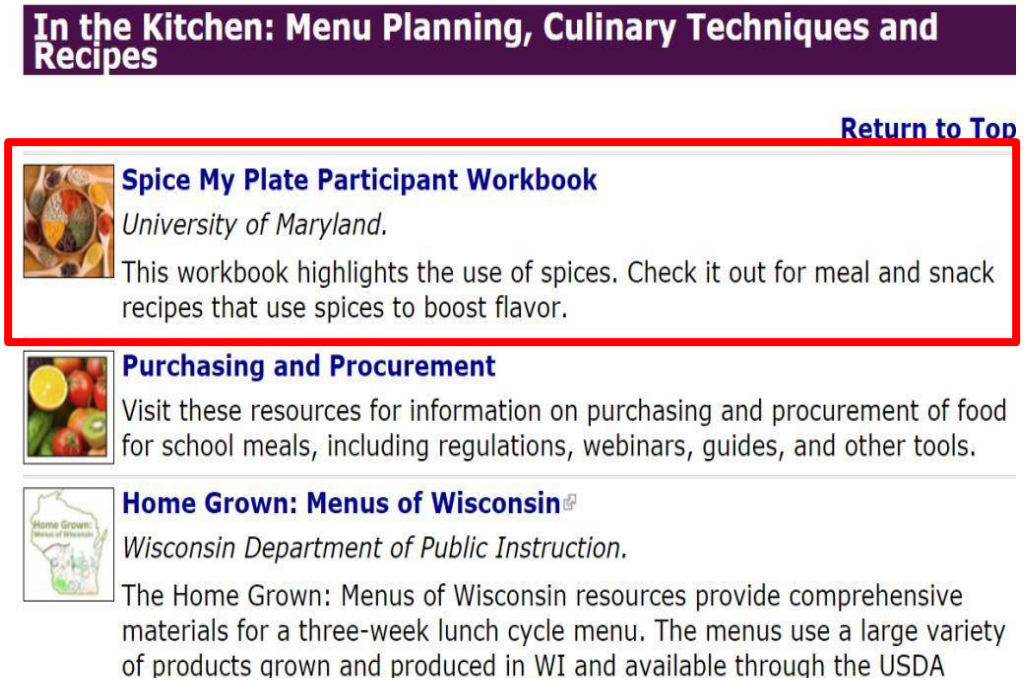
nutrition education, diet quality, usda myplate, spices and herbs, low-income population, adolescents, prevention research

D'Adamo CR., McArdle PF., Balick L., Peisach E., Ferguson T., Diehl A., Bowden B., Pierce B., Berman BM. (2016). Spice MyPlate: Nutrition Education focusing upon Spices and Herbs May Improve Diet Quality and Attitudes among Urban High School Students. *Am J Health Promot.* 30(5) 346-356

Spice MyPlate: USDA Endorsement

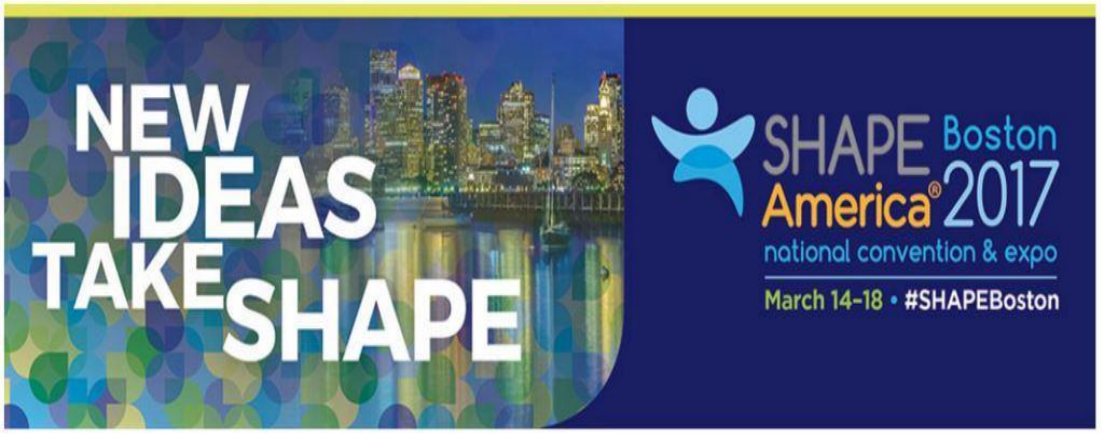
USDA Food & Nutrition Service





Spice MyPlate: USDA Collaboration

USDA Food & Nutrition Service



"Youth Engagement Strategies for Healthy School Nutrition Environments"

Cheryl Lewis-Jackson, MPA, RD, LDN; National Director, Nutrition Education, Training, & Technical Assistance Division; Child Nutrition Programs, USDA Food & Nutrition Service

Erika Pijai, MS, RD; Senior Nutrition Technical Advisor; Child Nutrition Programs, USDA Food & Nutrition Service

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Using Spices and Herbs to Increase Vegetable Intake Among Underserved Urban High School Students in the National School Lunch Program

Current Study Rationale

- Spice MyPlate: improved attitudes towards eating vegetables
  - More likely to eat vegetables flavored with spices & herbs at all time points
- No improvement in student vegetable intake
  - Numerous barriers to purchasing & eating vegetables at home in Baltimore
    - Lack of access - food deserts with no availability, prohibitive cost, etc.
- Potential solution: all Baltimore high school students have free access to vegetables in National School Lunch Program

National School Lunch Program (NSLP)

- Federally-assisted USDA meal program offered in > 100,000 public & non-profit private schools across the United States
  - Serves free/reduced-price lunches in 92% of American schools to over 30 million students each school day… 5 billion meals per year
  - Program has $9 billion annual budget

- Offered since 1946, major changes in 2012-2013 school year
  - School meals aligned with 2010 *Dietary Guidelines for Americans*
  - Provide healthier options

USDA Food & Nutrition Service

NSLP Challenges & Research Opportunity

- Historically: low vegetable intake in NSLP
  - 2008 *Institute of Medicine* report: vegetable intake lowest in high school
    - 14-18 year olds: consumed 43% of recommended vegetables (overall), 18% of dark green & orange vegetables

- Vegetable waste persists after 2012-2013 NSLP changes
  - Findings mixed, data still emerging… call for novel interventions
    - Gase et al (2014) *Prev Med.* 67(1):S28-33; Byker et al (2014). *J Nutr Educ Behav.* 46(5):406-11; Just et al (2014). *Appetite* 83:242-7.

Study Overview

- **Research Question:** Can using spices & herbs increase NSLP vegetable intake among urban high school students?
  - **Specific Aim I:** To determine *modifiable barriers* to NSLP vegetable intake at a high school in Baltimore
    - Potential barriers: taste, appearance, odor of NSLP vegetables; lack of familiarity with vegetables; social stigma; etc.
  - **Specific Aim II:** To assess *how spices & herbs can be used to overcome modifiable barriers* to NSLP vegetable intake
    - Student sensory testing of new vegetable recipes using spices & herbs (taste, appearance, odor, etc.)
  - **Specific Aim III:** To incorporate knowledge from Aims I & II to evaluate *whether adding spices & herbs to NSLP will increase vegetable intake*
    - Vegetable plate waste (primary outcome)

Registration on ClinicalTrials.gov

ClinicalTrials.gov
A service of the U.S. National Institutes of Health

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Home > Study Record Detail

Using Spices and Herbs to Increase Vegetable Intake Among Urban High School Students

This study is ongoing, but not recruiting participants.

Sponsor:
University of Maryland

Information provided by (Responsible Party):
Chris D'Adamo, University of Maryland

ClinicalTrials.gov Identifier:
NCT02908854

First received: September 7, 2016
Last updated: September 17, 2016
Last verified: September 2016
History of Changes

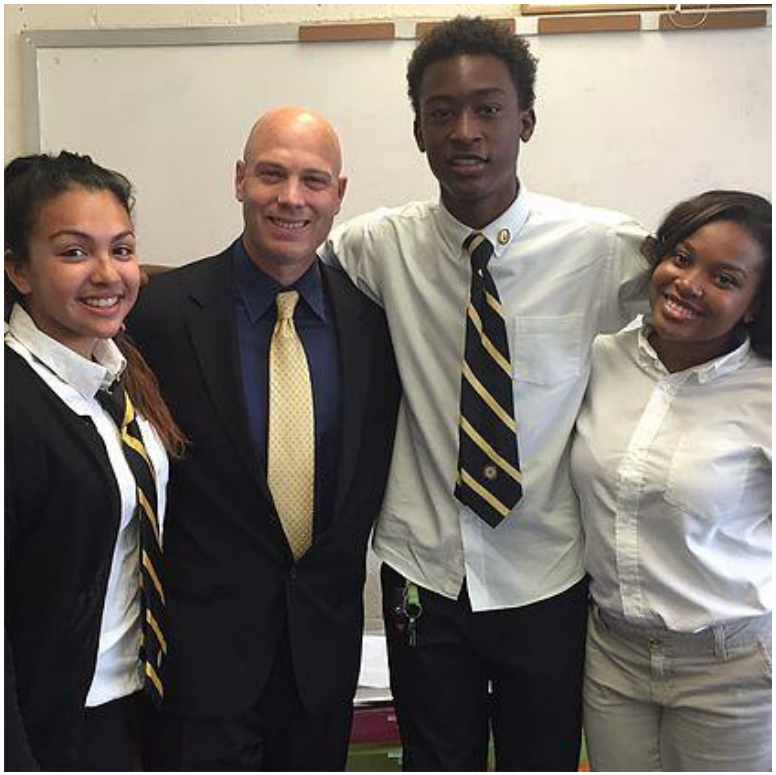
Full Text View | Tabular View | No Study Results Posted | Disclaimer | How to Read a Study Record

Purpose

A two-phase, school-based intervention will be conducted at a high school in Baltimore to evaluate whether the addition of spices and herbs to vegetable dishes in the National School Lunch Program (NSLP) can increase vegetable intake among students in an urban and predominantly African-American high school.

Research Team: Chris D'Adamo, PhD (PI); Elizabeth Parker, PhD, RD; Patrick McArdle, PhD; Brandin Bowden, MS; Brian Berman, MD

Key Partnerships in Baltimore Schools



Dr. Bill Heiser

President

Cristo Rey Jesuit High School of Baltimore

Cristo Rey High Schools

- Network of 30 high schools in United States
  - Enrollment limited to underserved youth
  - 97% students of color

- Over 10,000 students in cities across the United States
  - Cities include: New York, Los Angeles, Chicago, Seattle, Boston, Houston, Miami, Oakland, St. Louis, Detroit, Birmingham, etc.
  - Centralized leadership w/ Presidents, Principals, etc. at each site
    - *Opportunity for future expansion into other schools in network*

- Cristo Rey High School - Baltimore
  - 350 students
  - Predominantly African-American
  - Pre-intervention vegetable intake “very, very low”

Aim I: Barriers to NSLP Vegetable Intake

- Student surveys administered during 2015-16 school year
  - Favorite & least favorite vegetables?
  - What meal characteristics are most important?
    - Flavor, variety, appearance, aroma, texture, familiarity, satiety (“fullness”)
  - How do you feel about eating vegetables in school lunch?
    - Likert scale NSLP vegetable “liking” survey, social judgment, etc.
  - How could school lunch vegetables be improved?
    - Flavor, more exciting, increased variety, etc.

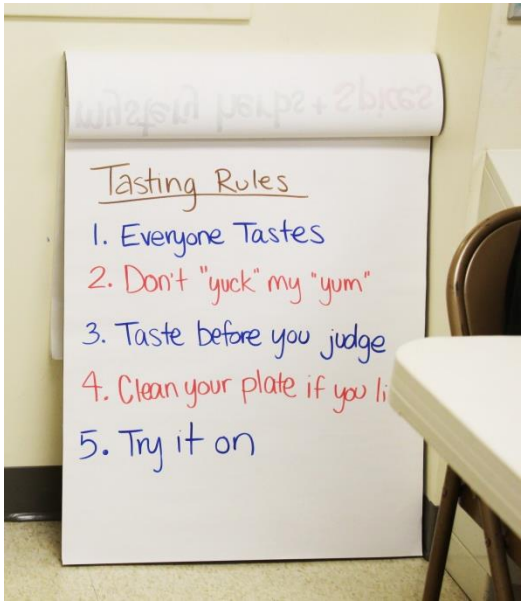
- *NSLP vegetable intake barriers identified:*
  - **Flavor**
  - Texture
  - Aroma
  - Unfamiliarity

Aim II: Using Spices & Herbs to Overcome Barriers to NSLP Vegetable Intake

- Hypothesis: spices & herbs well-accepted… may surmount barriers of flavor, aroma, appearance of vegetables

- Tested **vegetable recipes with spices & herbs** among Cristo Rey students during 2015-2016 school year
  - Sensory-tested: flavor, aroma, appearance, texture
    - Recipes ranked, Likert-scale surveys, qualitative feedback collected
  - Simple: vegetables steamed or raw
    - Allows for reproducibility in other schools
  - Only readily accessible spices & herbs
    - Allows for reproducibility in other schools

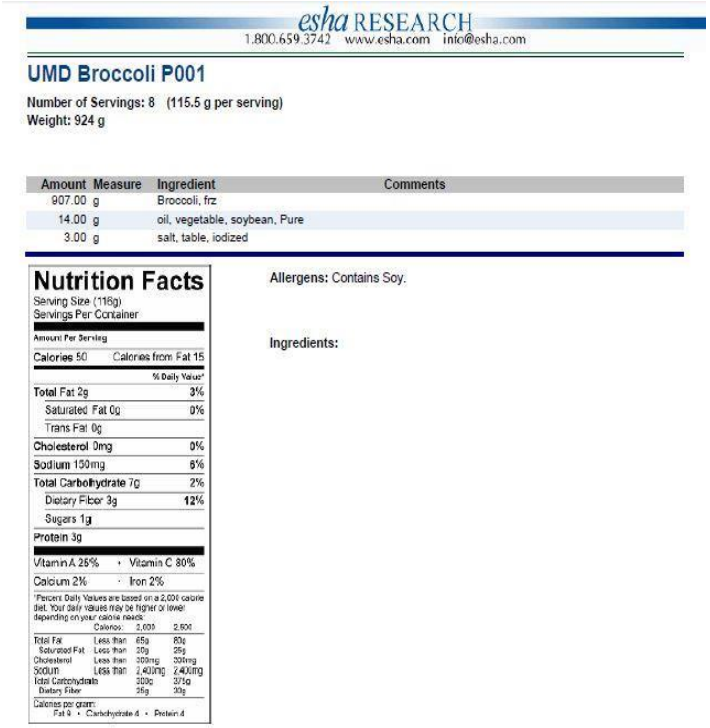

CRISTO REY
JESUIT HIGH SCHOOL


Tasting Rules
1. Everyone Tastes
2. Don't "yuck" my "yum"
3. Taste before you judge
4. Clean your plate if you li
5. Try it on


Salty
Sweet
bitter
Sour
acidic
bland
burnt
earthy
fresh
flavorful
fruity
garlicky
juicy
peppery
spicy
Strong
tangy
tart
zesty
hard
Soft
crunchy
creamy
tough
tender
dry

Aim II: Using Spices & Herbs to Overcome Barriers to NSLP Vegetable Intake

- *All spiced vegetable recipes met USDA NSLP guidelines*
  - Calories, macronutrients, sugar, sodium, etc.
  - Vegetable recipes publicly-available
  - Goal: reproducibility in other high school settings



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UMD Broccoli P001

Number of Servings: 8 (115.5 g per serving)
Weight: 924 g

Amount	Measure	Ingredient	Comments
907.00	g	Broccoli, frz	
14.00	g	oil, vegetable, soybean, Pure	
3.00	g	salt, table, iodized	

Nutrition Facts
Serving Size (116g)
Servings Per Container

Amount Per Serving	
Calories 50	Calories from Fat 15
	% Daily Value*
Total Fat 2g	3%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 150mg	6%
Total Carbohydrate 7g	2%
Dietary Fiber 3g	12%
Sugars 1g	
Protein 3g	

Vitamin A 25% • Vitamin C 80%
Calcium 2% • Iron 2%

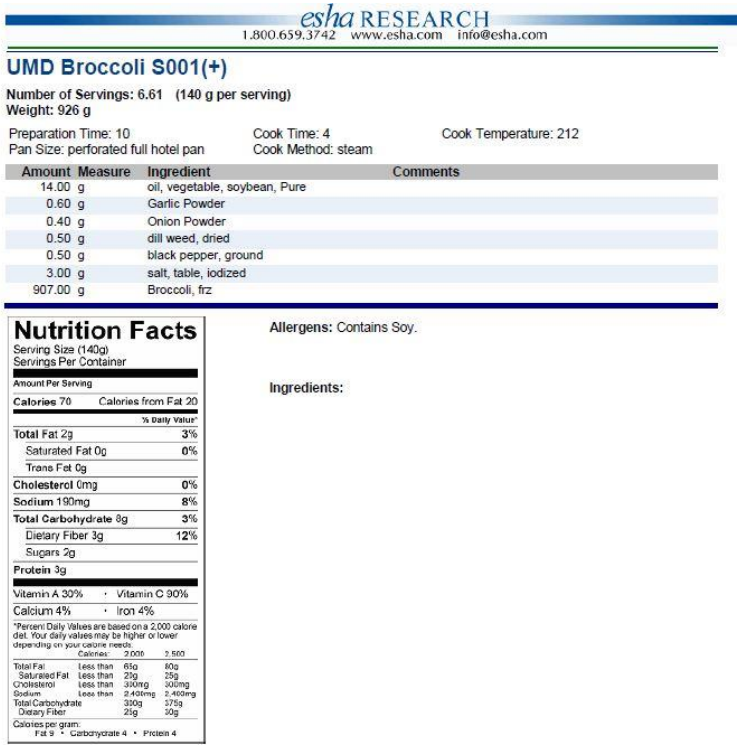
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Allergens: Contains Soy.

Ingredients:



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UMD Broccoli S001(+)

Number of Servings: 6.61 (140 g per serving)
Weight: 926 g

Preparation Time: 10 Cook Time: 4 Cook Temperature: 212
Pan Size: perforated full hotel pan Cook Method: steam

Amount	Measure	Ingredient	Comments
14.00	g	oil, vegetable, soybean, Pure	
0.60	g	Garlic Powder	
0.40	g	Onion Powder	
0.50	g	dill weed, dried	
0.50	g	black pepper, ground	
3.00	g	salt, table, iodized	
907.00	g	Broccoli, frz	

Nutrition Facts
Serving Size (140g)
Servings Per Container

Amount Per Serving	
Calories 70	Calories from Fat 20
	% Daily Value*
Total Fat 2g	3%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 190mg	8%
Total Carbohydrate 8g	3%
Dietary Fiber 3g	12%
Sugars 2g	
Protein 3g	

Vitamin A 30% • Vitamin C 90%
Calcium 4% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Allergens: Contains Soy.

Ingredients:

Aim III: Comparing Intake of Plain and Spiced Vegetables

- Vegetable intake comparison:
  "plain" (oil/salt) *vs.* "spiced" (oil/salt + spices & herbs)
  - Important - only difference addition of spices & herbs

- Vegetable intake assessed by weighed plate waste
  - "Gold standard" of dietary intake in cafeteria settings
  - Vegetables served in containers & weighed for served weight
    - Mean weight of 10 served scoops = estimated daily served weight
  - Intake = estimated daily served weight - returned container weight
  - 7 IRB-approved research staff in cafeteria every day
    - 3 by trash cans to collect lunch trays, 2 floaters/runners to bring vegetable cups for weighing, 2 weighers
    - Data collection relatively seamless

Aim III: Comparing Intake of Plain and Spiced Vegetables

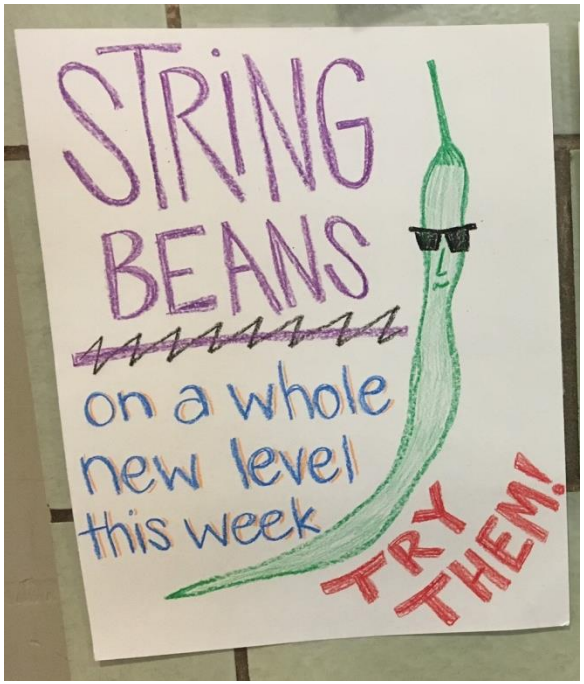
- Two month-long vegetable intake assessment periods during 2016-2017 school year (November & April)
  - Each month assessment period: 2 weeks plain, 2 weeks spiced
    - Account for changes in vegetable intake due to novelty
  - Evaluated effect of accompanying student-led advocacy
    - Phase I (November): "Naïve" - no accompanying student advocacy
    - Phase II (April): Student-led advocacy (displays, signage, etc.)
      - Minimal investment of resources
      - Goal: allow for reproducibility in other settings

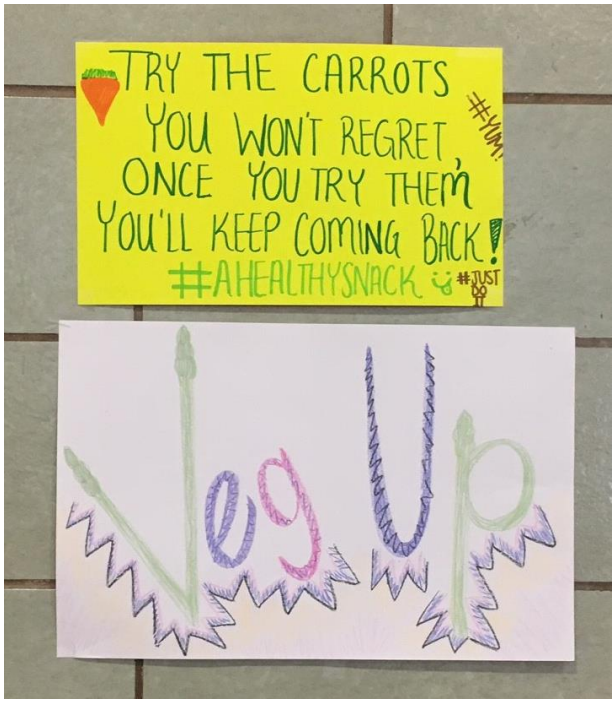
Aim III: Comparing Intake of Plain and Spiced Vegetables

- Student-led advocacy: spice & herb displays

Aim III: Comparing Intake of Plain and Spiced Vegetables

- Student-led advocacy: signage





"Bae," Urban Dictionary says, is an acronym that stands for "before anyone else," or a shortened version of baby or babe.

Aim III: Comparing Intake of Plain and Spiced Vegetables

- Vegetables tested
  - Both phases – steamed carrots, broccoli, vegetable medley (broccoli, carrots, cauliflower)
  - Phase I only – black beans & corn (inconsistent preparation), peas (recipe problem)
  - Phase II only – green beans, raw carrots

- Statistical methods
  - Mean vegetable intake (plain vs. spiced) compared overall & for each vegetable via t-tests or Wilcoxon Rank Sum test
  - Assessed effect of student advocacy as interaction term in generalized linear model

Results: All Vegetables

- ***Primary Outcome (both phases)***

- Total sample: n = 4,285 plates
  - Plain: n = 2,160
  - Spiced: n = 2,125

- Mean total vegetable intake
  - Plain = 1.58 ounces, Spiced = 1.90 ounces
  - Difference = 0.32 ounce, $p < 0.0001$
  - 20.7% increase in total vegetable intake when spiced

Results: All Vegetables – Naïve

- Total sample: n = 2,397 plates
  - Plain: n = 1,169
  - Spiced: n = 1,228

- Mean total vegetable intake
  - Plain = 1.63 ounces, Spiced = 1.88 ounces
  - Difference = 0.25 ounce, $p < 0.0001$
  - 15.4% increase in total vegetable intake when spiced

Results: All Vegetables – Student Advocacy

- Total sample: n = 1,888 plates
  - Plain: n = 991
  - Spiced: n = 897
- Mean total vegetable intake
  - Plain = 1.52 ounces, Spiced = 1.93 ounces
  - Difference = 0.41 ounce, $p < 0.0001$
  - 27.2% increase in total vegetable intake when spiced
- Regression modeling – effect of student advocacy
  - Interaction term: student advocacy x intake, $p = 0.08$

Challenges

- Low baseline: vegetable intake, knowledge, attitudes; spice & herb knowledge, attitudes
  - Plain vegetable intake = 1.58 ounces… similar to our Spice MyPlate, Mission Thrive Summer publications
  - ≈ 20% of plates did not try vegetables at all
    - Did not try: plate waste ≥ mean served weight
    - Subgroup analysis of plates that tried at least some vegetables underway
- Variability in high school kitchen and cafeteria
  - Serving scoop sizes vary, consistency varies (black beans & corn)
- Suboptimal food pairings & vegetable recipes
  - Ex.) black beans & corn with tacos one day… fish sticks the next
  - Many vegetable recipes mixed poorly, uneven flavor

Conclusions

- Adding spices & herbs to NSLP vegetables and evaluating intake feasible in urban high school
  - Large study
  - Cooperation from school – administration, faculty, kitchen, students
- Modest increases in both overall vegetable intake & most individual vegetables tested
  - 20.7% overall increase, 27.2% increase with student-led advocacy
    - Consistent across two semesters, ≈ 5,000 plates collected
    - 5 of 7 spiced vegetable dishes increased intake compared to plain
    - Relatively small absolute change
  - Increase: Carrots (steamed & raw), broccoli, vegetable medley, green beans
  - Decrease: Black beans & corn, peas (problems with both recipes)

Conclusions

- Minimal resources for increased vegetable intake
  - *Any* vegetable intake increase worthwhile in this demographic
    - ≈ .75 ounce mean intake increase among vegetables that increased
    - > 40% mean intake increase among vegetables that increased
  - Adding spices & herbs: low-cost, low time investment
  - Student-led advocacy: no cost, student ownership in process, generates increased health behavior awareness
  - Recipe flexibility for kitchen staff: demographic-tailored, kitchen ownership in process

Thank you! Questions?

USDA Food & Nutrition Service

The Association of Baltimore Area Grantmakers

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Spice For Health

NIH

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