Engaging Urban Youth in Healthy Dietary Habit Changes

Chris D’Adamo, Ph.D.
Assistant Professor
Department of Family & Community Medicine
Department of Epidemiology & Public Health
Director of Research
Center for Integrative Medicine

Partnership Essential to Engage Urban Youth!

“Spice MyPlate”: A Pilot Nutrition Education Intervention Focusing upon Spices and Herbs Improved Diet Quality and Healthy Eating Attitudes among Baltimore City High School Students

Baltimore high school students are 40% more likely to be obese than high school students statewide.

Centers for Disease Control Youth Risk Behavioral Surveillance System
“Spice MyPlate”: Motivation

- Nutritional literacy *modifiable* childhood obesity risk factor
- Socioeconomic status, environment, etc. not readily modifiable

- Dietary habits difficult to change...
  - Standard nutrition education limited effectiveness
    - Focus on health benefits ineffective habit change
    - Essential to enjoy food for sustainable change
    - Particularly among children and adolescents!

- **Spice MyPlate Goal**: Design & evaluate a nutrition education program focusing on spices & herbs to improve diet quality among high school students in accordance with USDA MyPlate and Dietary Guidelines for Americans
  - "Four E's": Exciting, Experiential, Engaging, Enjoyable
  - Focus on spices & herbs uniquely conducive to this guiding principle

**Spice MyPlate**: Research Question & Specific Aims

- **Research Question**: Can "Spice MyPlate", a nutritional education program focusing upon 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 nutritional education alone.

**Spice MyPlate: Intervention Content**

- 6 weekly, one-hour classes focusing on spices & herbs
- **Exciting, Experiential, Engaging, Enjoyable**
  - Colorful Spice MyPlate participant workbook
  - "Flavor profiles": spices & herbs didactic education
  - Sensory engagement with spices & herbs
  - Recipes using spices & herbs inspired by Dietary Guidelines for Americans
  - Creating healthier versions of foods students enjoy with spices & herbs
  - Cooking with spices & herbs

- **Focus on 12 core spices & herbs**
  - Black pepper, basil, garlic, oregano, cinnamon, thyme, nutmeg, red pepper, ginger, turmeric, rosemary, cumin

- Chosen on basis of:
  - Palatability, affordability, accessibility, versatility, health benefits, mix of familiarity & novelty

**Spice MyPlate: Intervention Content**

- **Flavor Profile: Thyme**
  - *History*: Thyme has been used for food and medicine for several centuries. Ancient Egyptians and Romans are known to have used thyme in their embalming practices while Ayurveda direct used thyme in their religious practices.
  - *Legend*: During the Middle Ages, people put thyme into their "palatable pasty" as a charm against evil spirits. Thyme was mentioned in the Bible during the birth of Jesus.
  - *Origin*: Thyme is a perennial shrub 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 use thyme fresh from the plant or in its dried form.
  - *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. Ayurveda directs to use thyme as a remedy for headaches, stomach upset, dental pain, and more. In the Caribbean, some cultures use thyme to assist with childbirth. In Europe, thyme is used as a remedy for cold and cough. In research studies thyme has been proven to help against skin disorders, bronchitis, cough, and dental plaque – all of these studies have not yet been found consistent evidence.
  - *Sensory*: The most common varieties of thyme tastes medicinal, grassy, balsamic, and a bit minty and is often used to impart a unique flavor to meat dishes or foods that require thyme. The different types can have different flavor, for instance, lemon thyme has a lemony flavor and lavender thyme tastes like lavender needs.
  - *Cooking*: Thyme flavors traditional dishes such as clam chowder and stuffing for Thanksgiving turkey. Thyme is a complement leaf to poultry and pork, and it is often used as a herb to flavor soups, stews, and stews. Rosemary, a traditional Mediterranean, also contains some of the same flavor and aroma from thyme.
Spice MyPlate: Intervention Content

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

**Real World Relevance**

It came from the Cinnamolus nest!

**ACTIVITIES**

1. **Apple Pie.**
   - Introduction:
     - Overview of apple pie ingredients and preparation.
   - Activity:
     - Small group discussion on the history of apple pie.

2. **Spice MyPlate.**
   - Introduction:
     - Overview of spice MyPlate ingredients and preparation.
   - Activity:
     - Lap dance activity to engage participants.

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

**ACTIVITIES**

1. **Chicken Box.**
   - Introduction:
     - Overview of the Chicken Box menu and nutrition.
   - Activity:
     - Group discussion on the benefits of eating a balanced diet.

2. **Spice MyPlate.**
   - Introduction:
     - Overview of spice MyPlate ingredients and preparation.
   - Activity:
     - Lap dance activity to engage participants.

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

**ACTIVITIES**

1. **Spice MyPlate.**
   - Introduction:
     - Overview of spice MyPlate ingredients and preparation.
   - Activity:
     - Lap dance activity to engage participants.

2. **Grocery Store Tour.**
   - Introduction:
     - Overview of the grocery store and healthy food options.
   - Activity:
     - Group discussion on the importance of choosing healthy foods.

3. **Cooking Class with Chef Len King.**
   - Introduction:
     - Overview of the cooking class and menu.
   - Activity:
     - Group cooking activity to make a healthy dish.

**Spice MyPlate: Intervention Delivery**

- **The Institute for Integrative Health**
  - "TIIH" - Baltimore-based 501(c)(3)
  - **Goals:** Promoting community health and wellness, catalyst for improving health, influencing health policy

- **Partnership:** TIIH "Mission Thrive" community health program
  - Relationships in Baltimore high schools expedited implementation
    - Support from administration, faculty, students, families & caregivers, etc.
  - Intervention sessions led during school by TIIH staff
  - Study enrollment & data collection coordinated by University of Maryland Center for Integrative Medicine research faculty & staff
Spice MyPlate: Two-Arm Community Trial

**Outcomes**

**Control Arm**
- 1 hour standard nutrition education

**Intervention Arm**
- 1 hour standard nutrition education
- 6 hours Spice MyPlate nutrition education
- 2 hours cooking sessions
- 1 hour grocery store tour

**Baseline** (pre-intervention)

**Week 3** (intervention mid-point)

**Week 6** (end of intervention)

**Week 10** (follow-up)

**Primary outcome**: objective changes in diet quality
- 5 components of USDA MyPlate:
  1.) vegetables, 2.) fruits, 3.) whole grains,
  4.) protein foods, 5.) dairy
- Utilized 3-day food logs
  - Included a weekend day
  - Validated for usual dietary intake
  - Considered other dietary assessments
    - FFQ: interviewers [cost] & missing ethnic food
    - 24-hour recall: interviewers [cost] & need multiple assessments to capture usual intake

**Secondary outcomes**: subjective changes in diet quality
- 8 questions assessing attitudes towards healthy eating
- Scored on 1-3 Likert scale

**Erin Peisach, RD, LDN**

**Converted food log data into amounts of each of 5 USDA MyPlate components with “USDA Super Tracker”**
- [https://www.supertracker.usda.gov/](https://www.supertracker.usda.gov/)

<table>
<thead>
<tr>
<th></th>
<th>Not at all likely</th>
<th>Somewhat likely</th>
<th>Highly likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
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<td></td>
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<tr>
<td>Whole Grains</td>
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<td></td>
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<tr>
<td>Low Fat Dairy</td>
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</tr>
</tbody>
</table>

1. How likely are you to consume each of the following foods? (Please place an X in one box for each category).
2. Do you think you would be more likely to eat more of the following foods if they were flavored with spices and herbs? (Please place an X in one box for each category).
Spice MyPlate: Study Sample

Baltimore Freedom Academy
- 564 students
- 99% racial minority
- 74% school lunch program
- Spice MyPlate Group

Patterson High School
- 1,069 students
- 88% racial minority
- 75% school lunch program
- Spice MyPlate Group

2012 Baltimore City Food Environment
- Healthy Food Retail
- Other Food Retail
- Non-Retail Food

No Difference in Vegetables, Fruits, Dairy

Spice MyPlate within-group trend toward increase from baseline to week 6 (p=0.06)

No Difference in Vegetables, Fruits, Dairy

Spice MyPlate within-group trend toward increase from baseline to week 6 (p=0.06)

Increased Whole Grains in Spice MyPlate

Spice MyPlate trend within-group increase from baseline to week 3 (p=0.06)

Spice MyPlate between- & within-group increase from baseline to week 10 (p<0.01)

Increased Protein Foods in Spice MyPlate

Spice MyPlate between- & within group- increases from baseline to week 3, week 6, & week 10 (p<0.05)
Regression Modeling

- Adjust for differences between groups in dietary intake and covariates at baseline
- Utilized Generalized Estimating Equations (GEE) for adjusted longitudinal comparisons of Spice MyPlate and control groups
  - GEE account for longitudinal within-subject correlation in dietary intake
  - No parametric assumptions about shape of curves
  - Adjusted for baseline dietary intake, age, race
- Difference in improvement in protein intake in Spice MyPlate group stronger after adjustment
  - $\beta = 0.92$, $p = 0.0007$

Healthy Eating Attitudes Improved in Spice MyPlate

<table>
<thead>
<tr>
<th>How likely are you to eat...</th>
<th>Baseline to Week 3</th>
<th>Baseline to Week 6</th>
<th>Baseline to Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spice MyPlate</td>
<td>Control</td>
<td>Spice MyPlate</td>
</tr>
<tr>
<td>Vegetables</td>
<td>0</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Fruit</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Whole grains</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>Lean protein</td>
<td>+</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Low-fat dairy</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

+ 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

Results: Executive Summary

- Spice MyPlate nutrition education program and data collection feasible in urban public high school setting
  - Food log compliance: Baseline = 96%, Intervention Mid-Point = 96%, Intervention End = 95%, Intervention Follow-Up = 85%

- Spice MyPlate improved diet quality on 3 day food logs more than standard nutrition education alone
  - Modest but significant increases in whole grains & protein foods

- Spice MyPlate improved healthy eating attitudes more than standard nutrition education alone
  - More likely to eat... vegetables, protein, dairy
  - Using spices & herbs, more likely to eat... vegetables, whole grains
  - Healthy eating attitude improvements persisted at follow-up
    - *Improvement in vegetable intake limited by low access in "food deserts"!

Using Spices and Herbs to Increase Vegetable Intake among Baltimore High School Students in the National School Lunch Program

Rationale: Vegetables with Spices & Herbs in the National School Lunch Program

- 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 or reduced-price lunches in 92% of American schools to over 30 million students each school day... 5 billion meals per year

- Offered since 1946, major changes in 2012-2013 school year
  - School meals aligned with 2010 *Dietary Guidelines for Americans*
  - Provide healthier options
**Research Question:** Can using spices and herbs increase NSLP vegetable intake among urban high school students?

**Specific Aim 1:** To determine modifiable barriers to NSLP vegetable intake at an urban high school in Baltimore

- Potential barriers: taste, appearance, odor of NSLP vegetables; lack of familiarity with vegetables; social stigma, etc.

**Specific Aim 2:** To assess how spices and herbs can be used to overcome modifiable barriers to NSLP vegetable intake

- Student testing of new vegetable recipes using spices & herbs (taste, appearance, aroma, texture, etc.)

**Specific Aim 3:** To incorporate knowledge obtained from Specific Aims 1 & 2 to evaluate whether adding spices and herbs to NSLP will increase vegetable intake

- Plate waste (primary outcome) & production waste (secondary outcome)

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**NSLP Challenges & Research Opportunity**

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

- Increased vegetable waste after 2012-2013 NSLP changes
  - Plate waste & production waste... call for novel interventions

**Study Overview**

- **Research Question:** Can using spices and herbs increase NSLP vegetable intake among urban high school students?

  - **Specific Aim 1:** To determine modifiable barriers to NSLP vegetable intake at an urban high school in Baltimore
    - Potential barriers: taste, appearance, odor of NSLP vegetables; lack of familiarity with vegetables; social stigma, etc.

  - **Specific Aim 2:** To assess how spices and herbs can be used to overcome modifiable barriers to NSLP vegetable intake
    - Student testing of new vegetable recipes using spices & herbs (taste, appearance, aroma, texture, etc.)

  - **Specific Aim 3:** To incorporate knowledge obtained from Specific Aims 1 & 2 to evaluate whether adding spices and herbs to NSLP will increase vegetable intake
    - Plate waste (primary outcome) & production waste (secondary outcome)

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**Key Partnerships in Baltimore Schools**

- Dr. Bill Heiser
  - President
  - Cristo Rey Jesuit High School of Baltimore

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**NSLP in Baltimore: Unique Opportunity**

- Historically: most Baltimore high school students eligible
  - 84% eligible for NSLP in 2014

- 2015 Hunger-Free Schools Act: provides free lunch to all Baltimore high school students

- No economic barriers to NSLP participation in Baltimore schools

- Plate waste (primary outcome) & production waste (secondary outcome)
Cristo Rey High Schools

- Network of 30 Jesuit 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 of study into other schools in network!

- Cristo Rey High School - Baltimore
  - 350 students
  - Predominantly African-American
  - 100% college acceptance rate since school opened in 2007

Barriers to Vegetable Intake

- Known barriers to vegetable intake among urban students
  - 1.) Limited access
  - 2.) Cost
  - 3.) Preparation time
  - 4.) Lack of familiarity
  - 5.) Taste

- Some barriers to vegetable intake overcome by NSLP
  - 1.) Limited access  Readily accessible at school
  - 2.) Cost  Free
  - 3.) Preparation time  Pre-prepared

Barriers to NSLP Vegetable Intake

- No studies on barriers specific to NSLP vegetable intake among urban high school students

- Hypothesized modifiable barriers: flavor, appearance, aroma, bad previous experiences with school vegetables, lack of familiarity with vegetables, social stigma, etc.

- Identifying modifiable barriers in stakeholder engagement
  - Surveys, focus groups, one-on-one interviews
    - Students
    - Food services personnel
    - Cafeteria staff
    - School administration

Barriers to NSLP Vegetable Intake

- Student surveys
  - 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, aroma, texture, unfamiliarity, lack of variety
Using Spices & Herbs to Overcome Barriers to NSLP Vegetable Intake

- Hypothesis: Spices & herbs well-accepted... improve flavor, aroma, appearance of vegetables; provide more variety

- Currently testing **vegetable recipes with spices and herbs** among Cristo Rey students with following characteristics:
  - **Sensory-tested recipes**: flavor, aroma, appearance, texture
    - Recipes ranked, Likert-scale surveys, qualitative feedback collected
  - **Simple recipes**: vegetables steamed or baked
    - Allows for reproducibility in other schools
  - Using only readily accessible spices and herbs
    - Allows for reproducibility in other schools
Using Spices & Herbs to Overcome Barriers to NSLP Vegetable Intake

Most popular vegetable recipes flavored with spices & herbs will be offered in Cristo Rey school lunch. Based on student sensory rankings, Likert-scale surveys of 2015-2016 school-year vegetables:

1.) Broccoli, 2.) Carrots, 3.) Black beans & corn, 4.) Peas, 5.) Cauliflower

All vegetable recipes flavored with spices & herbs meet NSLP requirements!
- Calories, macronutrients, sugar, sodium, etc.
- Vegetable recipes with spices & herbs will be publicly-available
- Goal: reproducibility in other high school settings
Using Spices & Herbs to Overcome Barriers to NSLP Vegetable Intake

Direct Intervention: Using Spices & Herbs to Increase NSLP Vegetable Intake

- Vegetable intake compared: “typical” (oil & salt) vs. “spices and herbs” (same oil & salt + spices and herbs)
  - Important that only difference be addition of spices and herbs!

- Student vegetable intake assessed by plate waste
  - “Gold standard” of dietary intake in cafeteria settings
  - Quarter plate waste method... visual & validated for accuracy
    - Preferred method for large populations
    - Accurate and time- & space-efficient (no weighing)

- All 350 Cristo Rey students participate in school lunch
  - Will assess vegetable intake among entire student body
  - Provides great statistical power... one of largest studies of its kind

Direct Intervention: Using Spices & Herbs to Increase NSLP Vegetable Intake

- Vegetable intake assessments tentatively scheduled!
  - May 16-20 (typical vegetables)
  - May 23-27 (spice and herb vegetables)

- More vegetable intake assessments during 2016-2017
  - Testing at least 6 weeks (Fall, Winter, Spring) of vegetables
    - Beets, green beans, squash, spinach, tomatoes, etc.
  - Testing accompanying education & student advocacy
    - 2015-2016 “naïve” - no student advocacy or school-wide education
    - 2016-2017 test brief adjuvant “Spice MyPlate” curriculum... synergy?

- Future directions
  - If successful in 2015-2016 & 2016-2017, expand to other schools in Cristo Rey network and beyond...
Mission Thrive Summer: Intervention

6-week multi-modality integrative health program for Baltimore high school students during Summer vacation

- Nutrition & cooking
- Farming, food system & environmental education
- Physical activity
- Yoga
- Mindfulness
- Leadership

Offered at Real Food Farm to YouthWorks students

June-August 2013-2015, Monday-Friday, 8:30 am-3:15 pm

15-25 participating students per year paid $7.25/hour

Mission Thrive Summer: Farming

Mission Thrive Summer: Integrative Health Program

for Baltimore High School Students

June 24 – August 2

Learn, grow, lead

Mission Thrive Summer: Farming

real food farm

realfoodfarm.org
Mission Thrive Summer: Farming

Mission Thrive Summer: Physical Activity

Mission Thrive Summer: Farming

Mission Thrive Summer: Yoga
Mission Thrive Summer: Outcomes

- No changes in stress or mindfulness
  - Perceived Stress Scale, Child & Adolescent Mindfulness Measure (p>0.05)

- Increased physical activity
  - ActiGraph accelerometry ("Gold Standard" physical activity assessment)
    - Took 7,158 steps & burned 544 calories per day during program activities
  - Physical Activity Questionnaire for Adolescents
    - Means: Baseline 1.8, End 2.1, Follow-up 1.6 (baseline to end p = 0.008)

- Improvements in nutrition
  - Block Kids Food Screener food frequency questionnaire
    - Increased vegetables, whole grains; decreased hot dogs, ice cream (p < 0.05)

- Qualitative changes
  - Themes – “new experiences”, “cooking skills”, “enjoy cooking/eating healthy foods”, “fitness/exercise fun”, “importance of communication”

Summary: Engaging Urban Youth in Healthy Dietary Habit Changes

- Partnership essential!
  - Existing relationships in school if school-based, existing relationships in community if community-based

- Experiential nutrition education a key
  - More effective than lecture-based

- Group nutrition and cooking activities helpful
  - Fun and accountability to group members
Summary: Engaging Urban Youth in Healthy Dietary Habit Changes

- Young instructors or those trained with children & adolescents may deliver diet habit change message best
  - Better communication

- Youth-led activities when possible
  - Achieve buy-in and sense of responsibility

Summary: Engaging Urban Youth in Healthy Dietary Habit Changes

- Data collection – use brief, easily understood outcomes
  - Validated for children and adolescents
  - No longer than 10 minutes per data collection session

- Qualitative data tells more comprehensive story
  - Often many non-quantifiable benefits

- Assess impact on families/guardians
  - Parents and guardians also often benefit!

Thank you! Questions?

Contact Information: cdadamo@som.umaryland.edu