Fruit And Vegetable Preparation Changes During and After Cost-offset Community Supported Agriculture and Nutrition Education

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Acknowledgments

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• Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.
THE PROBLEM

• Fruits and vegetables (FV) are rich with health promoting compounds\(^1\)
  • A diet rich in FV may protect against some chronic diseases

• US adults and children don’t consume recommended levels of FV\(^2\)
  • Children 2-12 daily recommended intakes range from 1-3 cups of vegetables and 1-2 cups of fruit\(^3\)
  • Adults 2.5-4 cups of vegetables and 1.5-2.5 cups of fruit\(^3\)

• Individuals in low-income households have lower FV intake\(^4\)

COMMUNITY SUPPORTED AGRICULTURE (CSA)

• CSA provides a ‘share’ of a farm’s crops, typically paid in full at the beginning of the growing season
  • Consistent access to fresh, local fruits and vegetables for members
  • Economic benefits to farms and rural communities

• Cost-offset (or subsidized) CSA (CO-CSA) provide purchasing support for low-income consumers

• CO-CSA has the potential to improve access to fresh produce and dietary behavior
COMPLEMENTARY INTERVENTION APPROACH: PURCHASING SUPPORT PLUS SKILL-BASED EDUCATION

- Purchasing support (discounts) encourages individuals to consume more fruits and vegetables\(^1\)-\(^2\)

- Some research indicates purchasing support plus education may enhance dietary behavior change but studies are limited and often lack rigorous design and methods\(^3\)-\(^4\)

- Aim of the F3HK Trial: changing the economics and food environment of the household through the CO-CSA combined with tailored education to build knowledge, skills, and self-efficacy will help create long-term dietary behavior change

Farm Fresh Foods for Healthy Kids (F3HK)
- Randomized controlled trial
- Began in 2016

Enrolled individuals who were:
- Caregivers with children 2-12 years old
- Living in rural areas of four states
- Household income < 185% of the federal poverty line

305 enrolled at baseline, 148 assigned to intervention group were included in this analysis
## Intervention Components

<table>
<thead>
<tr>
<th><strong>Cost-offset CSA share</strong></th>
<th><strong>Selection of 2-4 large kitchen tools</strong></th>
<th><strong>9 CSA-tailored education classes to:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• 15-24 week summer share</td>
<td>• Slow cooker</td>
<td>• Improve skills and self-efficacy to:</td>
</tr>
<tr>
<td>• Share size and pick-up location selected by participant</td>
<td>• Food processor</td>
<td>• store, prepare, and consume CSA produce;</td>
</tr>
<tr>
<td>• Share price subsidized 50%</td>
<td>• Chef's knife</td>
<td>• substitute FV for energy-dense foods;</td>
</tr>
<tr>
<td>• Balance of share price paid weekly ($8-$21 depending on share size)</td>
<td>• Salad spinner</td>
<td>• prepare foods to minimize added (solid) fat and sugar;</td>
</tr>
<tr>
<td>• SNAP/EBT accepted for payment</td>
<td>• Cutting board</td>
<td>• be more active in daily life and reduce sedentary time;</td>
</tr>
<tr>
<td></td>
<td>• Stock pot</td>
<td>• Promote the value of consuming FV; and</td>
</tr>
<tr>
<td></td>
<td>• Reusable grocery bag</td>
<td>• Reduce barriers to CSA produce acceptance.</td>
</tr>
</tbody>
</table>
DATA COLLECTION

- **Baseline Online Survey**
- **CSA SEASON (15 – 24 weeks)**: Lessons attended recorded per session (1-3, 4-6, 7-9)
- **POST-SEASON**: Additional online survey at one-year timepoint

**ENROLLMENT**

**Findings**

**Discussion**
RESEARCH QUESTIONS AND OUTCOMES

1. Does frequency of FV preparation by caregivers change during and after this intervention?

Three main outcomes:
• Monthly frequency of total fruit prepared for snack
• Monthly frequency of total vegetables prepared for snack
• Monthly frequency of total vegetables prepared for dinner
RESEARCH QUESTIONS AND OUTCOMES

1. Does frequency of FV preparation by caregivers change during and after this intervention?

2. Do the techniques used to prepare vegetables differ between timepoints?

**Healthy preparation techniques**
- Raw
- Steamed, boiled, or baked
- Roasted or sautéed in oil

**Less healthy prep techniques**
- Deep fat fried
- Cooked with meat, butter, or cheese

**Other techniques**
- Cooked another way
RESEARCH QUESTIONS AND OUTCOMES

1. Does frequency of FV preparation by caregivers change during and after this intervention?
2. Do the techniques used to prepare vegetables differ between timepoints?
3. Is number of lessons attended associated with changes in FV preparation frequency?
STATISTICAL ANALYSIS

1. **Repeated measures ANOVA** to examine change in monthly FV prep frequencies over time
2. **McNemar’s test** to examine differences in use of healthy prep techniques between timepoints
3. **Multivariate linear regression** to assess if education dose is associated with changes in FV prep frequency

In addition to the three main outcomes, we also examined individual produce items using Bonferroni corrections to adjust for multiple comparisons within categories

- Snack fruit: apples, melon, berries, other fruit
- Snack vegetables: carrots, celery, cucumbers, peppers, other vegetables
- Dinner vegetables: lettuce, cabbage, greens, potatoes, other root vegetables, squash
## CHANGE IN MEAN FV PREP FREQUENCY

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Baseline Mean CI</th>
<th>One-season later Mean CI</th>
<th>One-year later Mean CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prepared for child’s snack (times/mo)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total snack fruit</td>
<td>107</td>
<td>30.07&lt;sup&gt;a&lt;/sup&gt; 25.75, 35.08</td>
<td>36.90&lt;sup&gt;b&lt;/sup&gt; 32.34, 42.08</td>
<td>30.56&lt;sup&gt;a&lt;/sup&gt; 26.26, 35.55</td>
<td>0.002</td>
</tr>
<tr>
<td>Total snack vegetables</td>
<td>107</td>
<td>18.52&lt;sup&gt;a&lt;/sup&gt; 14.80, 23.12</td>
<td>28.60&lt;sup&gt;b&lt;/sup&gt; 23.64, 34.57</td>
<td>24.20&lt;sup&gt;b&lt;/sup&gt; 19.61, 29.82</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Prepared for dinner (times/mo)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total dinner vegetables</td>
<td>107</td>
<td>29.20&lt;sup&gt;a&lt;/sup&gt; 25.40, 33.55</td>
<td>38.70&lt;sup&gt;b&lt;/sup&gt; 34.31, 43.64</td>
<td>38.51&lt;sup&gt;b&lt;/sup&gt; 34.25, 43.29</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

- Change in frequency of preparing **melon, celery, cucumbers, peppers, other vegetables, lettuce, cabbage, and greens** were also significant.
USE OF HEALTHY VEGETABLE PREP TECHNIQUES

- Most participants used healthy preparation techniques at all timepoints (>78%)
- No significant differences between baseline and one-season or baseline and one-year

<table>
<thead>
<tr>
<th>Used healthy preparation technique (count)</th>
<th>Baseline</th>
<th>One-season later</th>
<th>One-year later</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Count</td>
<td>%</td>
</tr>
<tr>
<td>Cabbage</td>
<td>53</td>
<td>43</td>
<td>81.1</td>
</tr>
<tr>
<td>Greens</td>
<td>82</td>
<td>70</td>
<td>85.4</td>
</tr>
<tr>
<td>Potatoes</td>
<td>101</td>
<td>82</td>
<td>81.2</td>
</tr>
<tr>
<td>Other root vegetables</td>
<td>79</td>
<td>70</td>
<td>88.6</td>
</tr>
<tr>
<td>Squash</td>
<td>32</td>
<td>25</td>
<td>78.1</td>
</tr>
</tbody>
</table>
ROLE OF EDUCATION DOSE

• Most caregivers attended at least one lesson, but few attended all lessons\(^1\)
• The number of lessons attended was not found to be associated with changes in frequency of FV preparation

<table>
<thead>
<tr>
<th></th>
<th>One-season change</th>
<th>One-year later</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n)</td>
<td>(\beta)</td>
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<td>107</td>
<td>-0.43</td>
</tr>
<tr>
<td>Total snack vegetables</td>
<td>107</td>
<td>-0.73</td>
</tr>
<tr>
<td>Prepared for dinner (times/mo)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total dinner vegetables</td>
<td>107</td>
<td>-0.61</td>
</tr>
</tbody>
</table>

CONCLUSIONS AND IMPLICATIONS

1. CO-CSA plus education was associated with increases in the frequency of preparing fruits and vegetables, including increases in many different vegetables for dinner and for children’s snacks.

2. Healthy preparation techniques were used by the majority of caregivers before, during, and after the intervention.

3. Changes in FV preparation frequency did not depend on how many lessons were attended.

**CO-CSA is associated with greater frequency of FV preparation, but there is no evidence that the education component of the intervention drives the observed differences.**
Acknowledgments

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Americans do not meet seafood intake recommendations.

Perceived unsustainability is one potential barrier to seafood intake.
U.S. fisheries and aquaculture yield healthy and sustainable seafood choices

Consumers need to be able to recognize which are the most sustainable choices

Objective:

To characterize label attributes indicative of sustainability on seafood packages.
Of 400,000 food products, we included 2,200 seafood products:
✓ Salmon, n = 730
✓ Shrimp, n = 1387
✓ Oysters, n = 83

✓ Both farmed and wild-caught products were included.
✗ Mixed dishes were excluded.
Label Insight indicates 320 label attribute terms appear on seafood packages.

Four trained coders identified which terms reference sustainability and other a priori themes.

Inter-rater reliability (Cohen’s Kappa)

Revised codebook, identified a posteriori themes, and recoded attribute term list.

A Priori
Label Attribute Themes
1. Sustainability
2. Health
3. Nutrition
4. Quality
5. Convenience
6. Place of Origin
7. Sociocultural Values
8. Other
Methods: Label Attribute Frequencies

- Created master dataset of salmon, shrimp, and oyster products
- Coded products for the presence/absence of each attribute term
- Determined frequencies of term appearance on labels
- Conducted Pearson Chi Square analysis to determine associates between seafood type and labeling practices

Identified 320 attribute terms that appear on seafood packages

Determines which of these refer to sustainability

Which types of seafood display each of these terms?
• Of 320 terms, 38 (11.88%) referenced sustainability.
• Terms ranged from broad statements to specific references. Examples include:
  – “Sustainable”
  – “Environmental”
  – “Fishing with Hooks and Lines”
  – “Dolphin Safe”
• Both claims and certifications were included
Results: Label Attribute Frequencies

- Overall, more salmon and shrimp packages displayed sustainability labels than did oysters.
- Use of sustainability labels is significantly correlated with seafood type according to Pearson Chi Square analysis.

\[ X^2 (2, N = 2,200) = 14.443, p = .001 \]
Results: Label Attribute Frequencies

Use of sustainability labels also differed by harvest method among the various seafood types.
Among the salmon, shrimp, and oyster products that do display sustainability labels, the type of label used most frequently also varies by seafood type.

<table>
<thead>
<tr>
<th></th>
<th>SALMON</th>
<th>SHRIMP</th>
<th>OYSTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>42% use environmental claims</td>
<td>36% use third-party certifications</td>
<td>27% use environmental claims</td>
</tr>
<tr>
<td>examples include:</td>
<td>Environmental Choice Environmentally Friendly Environmental Practices</td>
<td>examples include: Certified Sustainable Best Aquaculture Practices</td>
<td>examples include: Environmental Choice Environmentally Friendly Environmental Practices</td>
</tr>
</tbody>
</table>
• On salmon, shrimp, and oyster packages, 38 different label terms were used to reference sustainability

• Many labels used broad terms that are relatively vague

• Salmon and shrimp more often referenced sustainability than did oysters, but frequencies also varied among wild-caught and farmed products
Next steps and future studies to improve seafood intake might include:

• Increasing sustainability labeling practices to cue consumers toward sustainable seafood choices

• Developing industry consensus regarding which sustainability terms to use on seafood packages

• Conducting consumer education relative to sustainable seafood labels

• Measuring consumer understanding of and responsiveness to sustainability labels
THANK YOU

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