BODY MASS INDEX

AS A HEALTH QUALITY INDICATOR FOR EFNEP AND SNAP-Ed

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What are EFNEP and SNAP-Ed?

- **EFNEP**: Expanded Food and Nutrition Education Program

- **SNAP-Ed**: Supplemental Nutrition Assistance Program - Education

- **Target audience**: Low-income families with young children

- **Health-related problems**: Obesity, malnutrition, and limited physical activities

- **Lessons**: Food safety, food saving, nutrition practices, and diet quality
EFNEP and SNAP-Ed Evaluation

- Evaluation/Reporting System (ERS)
  - Family Record
  - A food practice checklist (FPC)
  - 24-hour food recall
- Benefit Cost Analysis
  - Based on a food practice checklist and 24-hour food recall
Problems?

- Concern only behavior changes (eating and activity habits)
  - Assume that behavior changes will lead to physical changes which resulted in health quality

- No individual-level physical outcomes measured
  - Body mass index (BMI), blood Pressure (BP), waist circumference, waist-hip ratio, A1C, cholesterol, biomarkers, etc
Objectives

• Evaluating the accuracy of using behavior changes as an effectiveness indicator of EFNEP and SNAP-ED

• Exploring associations between shifts in BMI and changes in eating and activity habits
What is BMI?

• Body mass index (BMI) is a measure of body fat based on height and weight*

\[ BMI = \frac{weight (lb) \times 703}{(height (in))^2} \]

• BMI Categories*:
  - Underweight = <18.5
  - Normal weight = 18.5–24.9
  - Overweight = 25–29.9
  - Obesity = BMI of 30 or greater

* National Institutes of Health    Department of Health and Human Services
Procedures

• Individual-level data
• 180 EFNEP and SNAP-Ed participants
• Michigan data from 2009 to 2010
• County Reporting System (CRS5)
  Demographic: household income, age, sex, race, urbanity, education and Healthy Eating Index (HEI), number of lesson, number of contact, type of lesson
• Supplemental checklist
  BMI at Entry and Exit
Results: Characteristics of Participants in Entry-Exit Sample

**Sex**
- Male: 11%
- Female: 89%

**Age**
- 0-50: 13%
- 50-100: 23%
- 100+: 14%
- 21-30: 37%
- 31-40: 15%
- 41-50: 14%
- 51-60: 7%
- 61+: 1%

**Household Income per Month per Adult**
- 0-500: 63%
- 501-1000: 23%
- 1001+: 14%

**Race**
- White: 70%
- Black: 23%
- Others: 7%
Results: Characteristics of Participants in Entry-Exit Sample

- **Education**
  - College or Higher: 30%
  - Grade 1-12: 70%

- **Urbanity**
  - Rural: 14%
  - City: 32%
  - Town: 36%
  - Suburb: 18%

- **Entry BMI**
  - Normal: 21%
  - Overweight: 26%
  - Obesity: 53%
**Results:** Characteristics of Participants in Entry-Exit Sample

**Number of Lesson**
- '1-6: 41%
- 6+: 59%

**Number of Contact**
- '1-6: 67%
- 6+: 33%

**Type of Lesson**
- Both: 10%
- Group: 30%
- Individual: 60%

**Health Eating Index Change**
- 0-20: 49%
- -20-0: 29%
- < -20: 9%
- 20+: 13%
## Results: Changes in Eating and Activity Habits

<table>
<thead>
<tr>
<th>Behavior Change</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
<th>P-value (H0:mean=0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change In: Food Choices</td>
<td>180</td>
<td>0.64</td>
<td>1.25</td>
<td>4.00</td>
<td>5.00</td>
<td>0.0000</td>
</tr>
<tr>
<td>Change In: Without Adding Salt.</td>
<td>180</td>
<td>0.26</td>
<td>1.53</td>
<td>4.00</td>
<td>4.00</td>
<td>0.0228</td>
</tr>
<tr>
<td>Change In: Food Labels</td>
<td>180</td>
<td>1.12</td>
<td>1.31</td>
<td>2.00</td>
<td>4.00</td>
<td>0.0000</td>
</tr>
<tr>
<td>Change In: Vegetables</td>
<td>180</td>
<td>0.39</td>
<td>1.45</td>
<td>4.00</td>
<td>4.00</td>
<td>0.0003</td>
</tr>
<tr>
<td>Change In: Fruit</td>
<td>180</td>
<td>0.15</td>
<td>0.99</td>
<td>5.00</td>
<td>4.00</td>
<td>0.0444</td>
</tr>
<tr>
<td>Change In: Whole Grain</td>
<td>180</td>
<td>0.03</td>
<td>1.57</td>
<td>5.00</td>
<td>5.00</td>
<td>0.7757</td>
</tr>
<tr>
<td>Change In: Low-fat Or Fat-free Dairy</td>
<td>180</td>
<td>0.57</td>
<td>1.40</td>
<td>4.00</td>
<td>5.00</td>
<td>0.0000</td>
</tr>
<tr>
<td>Change In: Daily Physically Active</td>
<td>180</td>
<td>0.71</td>
<td>1.38</td>
<td>5.00</td>
<td>2.00</td>
<td>0.0000</td>
</tr>
<tr>
<td>Change In: 30 M. Physically Active</td>
<td>180</td>
<td>0.40</td>
<td>1.46</td>
<td>4.00</td>
<td>4.00</td>
<td>0.0003</td>
</tr>
<tr>
<td>Change In: Meals From Scratch</td>
<td>180</td>
<td>0.58</td>
<td>1.33</td>
<td>5.00</td>
<td>4.00</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
# Results: Changes in BMI

<table>
<thead>
<tr>
<th>Body Mass Index</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
<th>P-value (H0:Mean=0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI Entry</td>
<td>180</td>
<td>32.48</td>
<td>8.86</td>
<td>18.28</td>
<td>59.88</td>
<td>N/A</td>
</tr>
<tr>
<td>BMI Exit</td>
<td>180</td>
<td>32.21</td>
<td>8.47</td>
<td>18.55</td>
<td>59.26</td>
<td>N/A</td>
</tr>
<tr>
<td>BMI Change (BMI Exit - BMI Entry)</td>
<td>180</td>
<td>(0.27)</td>
<td>2.21</td>
<td>(8.38)</td>
<td>7.68</td>
<td>0.1057</td>
</tr>
</tbody>
</table>
Results:

\[ \Delta \text{BMI} (\text{BMI Exit} - \text{BMI Entry}) = f(\text{Demographics}, \Delta \text{HEI Score}, \Delta \text{Activity habits}, \Delta \text{Eating habits}) \]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P&gt;t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Obesity</td>
<td>-0.756**</td>
<td>0.343</td>
<td>-2.20</td>
<td>0.03</td>
</tr>
<tr>
<td>Age</td>
<td>-0.175***</td>
<td>0.063</td>
<td>-2.78</td>
<td>0.01</td>
</tr>
<tr>
<td>Age(^2)</td>
<td>0.00191***</td>
<td>0.001</td>
<td>2.71</td>
<td>0.01</td>
</tr>
<tr>
<td>Female</td>
<td>-0.4099</td>
<td>0.483</td>
<td>-0.85</td>
<td>0.40</td>
</tr>
<tr>
<td>Household Income</td>
<td>-0.0004</td>
<td>0.000</td>
<td>-1.48</td>
<td>0.14</td>
</tr>
<tr>
<td>Number of Lesson</td>
<td>0.0495</td>
<td>0.114</td>
<td>0.43</td>
<td>0.67</td>
</tr>
<tr>
<td>Individule Lesson</td>
<td>-0.965**</td>
<td>0.381</td>
<td>-2.53</td>
<td>0.01</td>
</tr>
<tr>
<td>White</td>
<td>0.5245</td>
<td>0.412</td>
<td>1.27</td>
<td>0.21</td>
</tr>
<tr>
<td>City</td>
<td>0.3133</td>
<td>0.427</td>
<td>0.73</td>
<td>0.46</td>
</tr>
<tr>
<td>Number of Contact</td>
<td>-0.0306</td>
<td>0.121</td>
<td>-0.25</td>
<td>0.80</td>
</tr>
<tr>
<td>Education</td>
<td>-0.1133</td>
<td>0.090</td>
<td>-1.27</td>
<td>0.21</td>
</tr>
<tr>
<td>HEI Change</td>
<td>-0.0188*</td>
<td>0.010</td>
<td>-1.94</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Results:

$$\Delta BMI \ (BMExit - BMIEntry) = f(Demographics, \Delta HEI \ Score, \Delta Activity \ habits, \Delta Eating \ habits)$$

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P&gt;t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in: food choices</td>
<td>-0.2524</td>
<td>0.164</td>
<td>-1.53</td>
<td>0.13</td>
</tr>
<tr>
<td>Change in: without adding salt.</td>
<td>-0.0498</td>
<td>0.100</td>
<td>-0.50</td>
<td>0.62</td>
</tr>
<tr>
<td>Change in: food labels</td>
<td>-0.0795</td>
<td>0.140</td>
<td>-0.57</td>
<td>0.57</td>
</tr>
<tr>
<td>Change in: vegetables</td>
<td>0.0246</td>
<td>0.122</td>
<td>0.20</td>
<td>0.84</td>
</tr>
<tr>
<td>Change in: fruit</td>
<td>0.1297</td>
<td>0.200</td>
<td>0.65</td>
<td>0.52</td>
</tr>
<tr>
<td>Change in: whole grain</td>
<td>-0.1415</td>
<td>0.135</td>
<td>-1.05</td>
<td>0.30</td>
</tr>
<tr>
<td>Change in: low-fat or fat-free dairy</td>
<td>0.0403</td>
<td>0.118</td>
<td>0.34</td>
<td>0.73</td>
</tr>
<tr>
<td>Change in: daily physically active</td>
<td>0.0885</td>
<td>0.130</td>
<td>0.68</td>
<td>0.50</td>
</tr>
<tr>
<td>Change in: 30 m. physically active</td>
<td>-0.1306</td>
<td>0.112</td>
<td>-1.16</td>
<td>0.25</td>
</tr>
<tr>
<td>Change in: meals from scratch</td>
<td>0.1142</td>
<td>0.143</td>
<td>0.80</td>
<td>0.43</td>
</tr>
<tr>
<td>Constant</td>
<td>5.421**</td>
<td>2.222</td>
<td>2.44</td>
<td>0.02</td>
</tr>
</tbody>
</table>
Conclusions

• The participants have positive changes significantly in their eating and activity habits
• BMI on average decreased by 0.27 but not significant
• The physical outcome of program is not captured by changes in eating and activity habits
Implementations

• Extend to 3, 6 and 12 months past program data set

• Benefit Cost Analysis based on BMI changes

• The future research for other physical outcome
  — Blood Pressure (BP), waist circumference, waist-hip ratio, A1C, cholesterol, biomarkers, etc.
Limitations

• Self-Report BMI
  – EFNEP and SNAP-Ed staff are not allowed to collect BMI data of participant because it is not covered in their current job description

• Sampling Bias
  – Missing data