Promoting Food Security and Food Sovereignty in Indigenous Communities: Lessons from Tribally-Driven Research

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Center for Indigenous Health Research and Policy at Oklahoma State University Center for Health Sciences
Food Insecurity and Chronic Disease

- Food insecurity – lacking consistent access to enough food for an active and healthy life
- In 2017, 13% of US population was food insecure
- Food insecurity is associated with obesity, diabetes, and hypertension:
  - Stress
  - Overconsumption of foods high in sugar, fat, and salt
  - Underconsumption of nutritious foods
  - Feast or famine eating cycles
  - Reduced employability
  - Spending tradeoffs

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Prevalence of Food Insecurity in Native Communities

• Studies documented food insecurity prevalence from 39% in California to 76% in Navajo Nation.

• Using the Current Population Survey Food Security Supplement, we analyzed the food insecurity trends of Natives compared to other racial and ethnic groups.

• From 2000 to 2010, 25% of Natives remained consistently food insecure.

• Natives were twice as likely to be food insecure as Whites.

• Urban Natives more likely to be food insecure than rural Natives.

Figure 1. Prevalence of food insecurity by race and ethnicity, 2000–2010.

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Factors Associated with Food Insecurity in Native Communities

- Limited access/availability to fresh, healthy foods\(^5\)
- Urban Natives have access to corner stores, where goods are expensive, few grocery stores, "food swamps"\(^6\)
- Rural Native communities lack grocery stores; shoppers travel to Wal-Marts\(^5\)
- On reservations, foods are more expensive than in neighboring non-reservation communities\(^7\)

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Factors Associated with Food Insecurity in Native Communities cont.

- Farmers in rural areas report the lack of a cash economy to ensure produce stays local\(^5\)
- The limited number of food distributors, restricts options\(^8\)
- Historical reliance on commodity foods has cultivated taste preferences for foods high in fat/sugar/sodium\(^8\)

Improved food security is associated with better dietary intake and lower weight, improved disease management, lower health care costs and overall better health\(^9\)


\(^9\)https://hungerandhealth.feedingamerica.org/understand-food-insecurity/hunger-health-101/
Food Systems Interventions to Improve Health within Oklahoma Native Nations
THRIVE preliminary studies: food insecurity and chronic disease among Natives in Choctaw and Chickasaw Nations

- Conducted cross sectional survey of 513 Natives
- Administered USDA 6-item short form Household Food Security Scale
- **58% of Natives surveyed were food insecure**
- Among those who were food insecure, the prevalence of diabetes (27.3% vs 18.8%), obesity (60.7% vs 45.8%), and hypertension (52.5% vs 42.5%) was higher compared to those who were food secure, even after adjustment for age, gender, education, income, and study site
- **More than 60% of Natives surveyed reported shopping for food at tribal convenience stores 3 or more times per week**

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THRIVE study question: can we increase healthy food access by improving tribal stores?
Food System Conceptual Model

Design and Methods

- Participatory research orientation
- Cluster control trial with eight stores (4 intervention/4 control)
- Longitudinal cohort study surveyed Native shoppers (n=1637) before and after the intervention
- Intervention strategies:
  - Product
  - Placement
  - Promotion
  - Pricing
Outcomes

- **Store:**
  - Increased fruit/vegetable availability
  - Store inventory and sales;
  - Nutrition environment measures scores

- **Individual:**
  - Exposure to interventions
  - Sociodemographic
  - Eating behaviors
  - Self-efficacy
  - Perceived nutrition environment
  - Increased fruit/vegetable purchasing and intake
Intervention strategies development phase one: product

Intervention strategies development phase two: placement, promotion, pricing\textsuperscript{12}

Placement

a. Store layout before intervention

- Packaged foods
- Refrigeration unit

b. Store layout after intervention

- Intervention foods
Promotion
Pricing
Statistical Analysis

- **Participants lost to follow-up compared to those completing follow-up surveys**
  - Demographics
  - Fruit and vegetable intake at baseline

- **Intervention stores – promotion effects**
  - Promotion (signs) recall
  - Purchase promoted product
  - Effect of sign on purchase

- **Intervention vs control stores**
  - Perceived nutrition environment (NEMS-P)
  - Food and beverage consumption with an emphasis on healthy items targeted in the interventions (e.g. fruits and vegetables)

- **Effect of dose of exposure to intervention – frequency of shopping at home store**

- **Statistical analyses:**
  - Chi-squared test for categorical variables
  - T-tests for continuous variables
  - Trend analysis for dose effect (frequency of shopping)
  - Confidence intervals for changes over time
## Nation A Demographic Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Control (n=240)</th>
<th>Intervention (n=292)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age, mean years (SD)</strong></td>
<td>44.3 (15.5)</td>
<td>41.0 (15.2)</td>
</tr>
<tr>
<td>Female, %</td>
<td>53</td>
<td>66</td>
</tr>
<tr>
<td><strong>Marital status, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>51.9</td>
<td>41.6</td>
</tr>
<tr>
<td>In a relationship</td>
<td>13.1</td>
<td>21.0</td>
</tr>
<tr>
<td>Widowed, Divorced, Separated</td>
<td>21.1</td>
<td>24.7</td>
</tr>
<tr>
<td>Never married</td>
<td>13.9</td>
<td>12.7</td>
</tr>
<tr>
<td><strong># of people &lt;18 years living in household, mean # (SD)</strong></td>
<td>1.4 (1.6)</td>
<td>1.8 (1.7)</td>
</tr>
<tr>
<td><strong>Education, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; high school</td>
<td>5.0</td>
<td>7.2</td>
</tr>
<tr>
<td>High school diploma</td>
<td>29.8</td>
<td>24.1</td>
</tr>
<tr>
<td>GED</td>
<td>9.2</td>
<td>17.2</td>
</tr>
<tr>
<td>Some college or technical school</td>
<td>31.9</td>
<td>33.8</td>
</tr>
<tr>
<td>Associate's degree or tech college degree</td>
<td>9.7</td>
<td>5.2</td>
</tr>
<tr>
<td>≥ Four-year college degree</td>
<td>14.3</td>
<td>12.4</td>
</tr>
<tr>
<td>Employed ≥ part-time, %</td>
<td>82.4</td>
<td>75.2</td>
</tr>
<tr>
<td><strong>Body mass index, mean kg/m² (SD)</strong></td>
<td>30.7 (6.8)</td>
<td>31.7 (7.1)</td>
</tr>
</tbody>
</table>
# Nation B demographic characteristics

<table>
<thead>
<tr>
<th></th>
<th>Control (n=322)</th>
<th>Intervention (n=350)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean years (SD)</td>
<td>41.9 (14.2)</td>
<td>42.3 (14.3)</td>
</tr>
<tr>
<td>Female, %</td>
<td>74</td>
<td>73</td>
</tr>
<tr>
<td>Marital status, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>54.4</td>
<td>53.7</td>
</tr>
<tr>
<td>In a relationship</td>
<td>13.7</td>
<td>11.6</td>
</tr>
<tr>
<td>Widowed, Divorced, Separated</td>
<td>20.9</td>
<td>21.8</td>
</tr>
<tr>
<td>Never married</td>
<td>11.1</td>
<td>12.8</td>
</tr>
<tr>
<td># of people &lt;18 years living in household, mean # (SD)</td>
<td>1.3 (1.4)</td>
<td>1.2 (1.2)</td>
</tr>
<tr>
<td>Education, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; high school</td>
<td>2.9</td>
<td>3.0</td>
</tr>
<tr>
<td>High school diploma</td>
<td>17.0</td>
<td>21.5</td>
</tr>
<tr>
<td>GED</td>
<td>4.6</td>
<td>4.2</td>
</tr>
<tr>
<td>Some college or technical school</td>
<td>32.7</td>
<td>28.1</td>
</tr>
<tr>
<td>Associate’s degree or tech college degree</td>
<td>18.0</td>
<td>12.8</td>
</tr>
<tr>
<td>≥ Four-year college degree</td>
<td>24.8</td>
<td>30.5</td>
</tr>
<tr>
<td>Employed ≥ part-time, %</td>
<td>78.3</td>
<td>83.0</td>
</tr>
<tr>
<td>Body mass index, mean kg/m² (SD)</td>
<td>31.2 (6.7)</td>
<td>32.2 (7.4)</td>
</tr>
</tbody>
</table>
Perceptions of healthy food options at control and intervention stores (Nation A)

<table>
<thead>
<tr>
<th>NEMS-P domain</th>
<th>Control store shoppers</th>
<th>Intervention store shoppers</th>
<th>Between-group effect (^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All stores:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Placement/Promotion of unhealthy items</td>
<td>Pre (n=127) 3.18 (0.77)</td>
<td>Post (n=127) 3.07 (0.73)</td>
<td>(95% CI) -0.11 (-0.26, 0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Placement/Promotion of healthy items and nutrition information</td>
<td>Pre (n=255) 3.15 (0.73)</td>
<td>Post (n=255) 3.08 (0.74)</td>
<td>(95% CI) -0.07 (-0.17, 0.04)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(95% CI) 0.01 (-0.08, 0.11)</td>
</tr>
<tr>
<td>Stores with a grill:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of healthy options at the grill</td>
<td>-- (n=0)</td>
<td>-- (n=0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The grill promotes healthy options/nutrition information</td>
<td>-- (n=147)   3.38 (0.83)</td>
<td>-- (n=147) 3.57 (0.77)</td>
<td>(95% CI) 0.19 (0.03, 0.34)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It costs more to buy the healthy options at the grill</td>
<td>-- (n=147)   3.08 (0.57)</td>
<td>-- (n=147) 3.18 (0.64)</td>
<td>(95% CI) 0.10 (-0.02, 0.22)</td>
</tr>
<tr>
<td></td>
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</tr>
</tbody>
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## Perceptions of healthy food options at control and intervention stores (Nation B)

<table>
<thead>
<tr>
<th>NEMS-P domain</th>
<th>Control store shoppers</th>
<th>Intervention store shoppers</th>
<th>Between-group effect²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre (n=316)</td>
<td>Post (n=316)</td>
<td>Within-person effect¹</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>(95% CI)</td>
</tr>
<tr>
<td>All stores:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Placement/Promotion of unhealthy items</td>
<td>3.31 (0.83)</td>
<td>3.14 (0.66)</td>
<td>-0.16 (-0.26, -0.07)</td>
</tr>
<tr>
<td>Placement/Promotion of healthy items and nutrition information</td>
<td>3.25 (1.03)</td>
<td>3.39 (0.83)</td>
<td>0.14 (0.01, 0.27)</td>
</tr>
<tr>
<td>Stores with a grill:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of healthy options at the grill</td>
<td>2.81 (0.91)</td>
<td>3.23 (0.77)</td>
<td>0.43 (0.29, 0.57)</td>
</tr>
<tr>
<td>The grill promotes healthy options/nutrition information</td>
<td>2.78 (0.88)</td>
<td>3.06 (0.58)</td>
<td>0.28 (0.15, 0.41)</td>
</tr>
<tr>
<td>It costs more to buy the healthy options at the grill</td>
<td>3.82 (1.33)</td>
<td>3.50 (1.05)</td>
<td>-0.33 (-0.55, -0.10)</td>
</tr>
</tbody>
</table>
Store Food Availability Pre-Post Intervention *

*Measured by Nutrition Environment Measures Scores
Trend Analysis of Intervention Exposure Based on Frequency of Shopping\textsuperscript{13}

\textbf{Figure:}

A bar chart showing the trend analysis of intervention exposure based on frequency of shopping. The chart includes several bars for different actions, such as noticing reach-in food coolers, buying fruit or vegetables from reach-in food coolers, and buying salads, sandwiches, or wraps from reach-in food coolers. The chart also indicates the significance level with * for p-value < 0.05.

\textsuperscript{13}Jernigan, VB., Salvatore, AL., Williams, M...et al. (2018)
Summary and Next Steps

• THRIVE increased healthy food options (perceived and objective measures)
• Influenced decisions to purchase healthier items among a high proportion of shoppers
• Like other studies that only target the environment, we did not see significant changes in overall dietary intake, but we did change purchasing decisions, especially among those shopping more often
• Increased demand for healthy foods as evidenced by spread of intervention strategies
• Resulted in important policy changes: distributors for both Nations expanded suppliers and options
• Next steps: expand intervention strategies, include behavioral change and traditional foods focus, increase local food options

FRESH Study with Osage Nation
What study question: Can We Intervene More Broadly Upon the Food System?

• Community-initiated study
• Builds upon Osage Nation vision to create a sustainable tribal food system and build food sovereignty
• Multicomponent, multilevel intervention trial
• Aim: to reduce BMI and hypertension among 250 Osage families (total n=500)
• Wait-list control design with tribal head start programs (n=9) in 4 communities
• Intervention currently underway

“Finally, we have a way to do what we did 200 years ago...feed our own people.”
— Raymond Red Corn, Osage Nation Assistant Principal Chief
FRESH Intervention Components

- Farm to School Menu
- School Gardens
- Gardening, Healthy Eating, Cooking and Food Sovereignty Curriculum
FRESH Intervention Components, Processes, and Outcomes

**Intervention**
- Farm to School Menu
- School Gardens
- Gardening, Healthy Eating, Cooking and Food Sovereignty Curriculum

**Proximal effects**
- Exposure to fresh f/v
- Higher intake of f/v
- Nutrition and cooking knowledge
- Knowledge of traditional foods
- Improved nutritional intake

**Distal effects**
- Obesity and chronic disease prevention
- Sustainable fresh f/v
- Community food security; food sovereignty
- Lower obesity and chronic disease
- Strengthening of community collective efficacy, social networks; food security; food sovereignty
Summary and Conclusions

“We can’t heal the people if we don’t heal the food system”

-Kamuela Enos
Mao Organic Farms

• Future interventions must:
  • Support sustainable community food systems
  • Food security
  • Culturally and contextually centered interventions that restore the health of the environment, support traditional indigenous knowledge, and elevate what’s working in Native communities