USDA Food Safety and Inspection Service: Consumer Behavior Research

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Background

- FSIS Food Safety Education Staff’s consumer outreach efforts educate the public on how to safely handle, prepare, and store meat, poultry, and processed egg products to help prevent foodborne illness
- Messages focus on four core food safety behaviors—clean, separate, cook, and chill—and are shared via multiple approaches
- Behavioral research can assess the impact of FSIS consumer outreach efforts on consumers’ food safety behaviors
Overview

FSIS’s integrated approach to understand impact of its outreach efforts on consumer behavior, using:

- Web-based surveys
- Focus groups
- Observational meal preparation experiments with microbiological sampling
Limitations of Current Approaches:
Understanding Consumer Food Handling Behavior

- Limited data available to provide complete understanding of consumer food safety behavior
- Previous studies typically address one behavior; thus, do not provide complete picture of consumer food handling behavior
- Previous studies limited to one data collection approach and each approach has advantages and disadvantages
- Limited research has been conducted to evaluate the effectiveness of food safety interventions at changing consumer behaviors
Advantages and Disadvantages of Alternative Approaches

<table>
<thead>
<tr>
<th>Focus Groups &amp; In-depth Interviews</th>
<th>Surveys</th>
<th>Observational Experiments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative data</td>
<td>Quantitative data</td>
<td>Observational data</td>
</tr>
<tr>
<td>Understand the whys</td>
<td>Measure knowledge, attitudes, behavior</td>
<td>Impact on behavior change</td>
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<tr>
<td>Descriptive</td>
<td>Inferences to population</td>
<td>Power to detect change</td>
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<tr>
<td>Small number of respondents</td>
<td>Large sample size</td>
<td>Diverse sample</td>
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<td>1 to 2 months</td>
<td>&lt; 1 month to several months</td>
<td>4 to 5 months</td>
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</table>
• Self-reported survey data on consumers’ food safety practices may overreport actual behavior due to social desirability bias and reporting errors

• Each study focuses on different behavior, food and food preparation task, and food safety communication product and will:
  – Assess adherence to recommended food safety behaviors
  – Determine whether food safety messaging affects behavior
  – Determine whether consumers introduce cross-contamination during food preparation
FSIS: Using an Integrated, Holistic Approach:

Overview

- Integrated study allows FSIS to capitalize on strengths of some methods, and address limitations of other methods
- 5-year study working with researchers at RTI International and North Carolina State University
- Multi-modal approach to data collection to provide comprehensive understanding of consumer food handling and preparation behaviors

<table>
<thead>
<tr>
<th>Activity (Year)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observational Experiment w/ Microsampling</td>
<td>●</td>
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<tr>
<td>Focus Groups</td>
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<tr>
<td>Nationally Representative Web-based Survey</td>
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## FSIS: Using an Integrated, Holistic Approach: Year-by-Year

<table>
<thead>
<tr>
<th>Activity (Year)</th>
<th>Year 1 FY17 (Complete)</th>
<th>Year 2 FY18 (In Progress)</th>
<th>Year 3 FY19</th>
<th>Year 4 FY20</th>
<th>Year 5 FY21</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Observational Experiment w/ Microsampling</strong></td>
<td>“Cook” Messages: • Food thermometer usage • Pathogen transfer</td>
<td>“Clean” Messages: • If wash/rinse raw chicken before cooking • Pathogen transfer</td>
<td>“Cook” Messages: • Prepare not-ready-to-eat (NRTE) frozen chicken product</td>
<td>“Separate and Chill” Messages: • Intact beef • Leftovers</td>
<td>“Clean, Separate, Cook, and Chill” Messages: • Prepare hamburgers • Prepare ready-to-eat (RTE) food</td>
</tr>
<tr>
<td><strong>Focus Groups</strong></td>
<td></td>
<td>Topics focused on consumption of raw/not fully cooked meat &amp; poultry, if wash/rinse poultry before cooking, etc.</td>
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<td>Investigate topics gleaned from previous research and any emerging food safety topics</td>
<td></td>
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<tr>
<td><strong>Nationally Representative Web-based Survey</strong></td>
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<td></td>
<td>Questions re: recall/outbreak awareness, message fatigue, food safety info sources, food prep, etc.</td>
<td></td>
<td>Investigate topics gleaned from previous research and any emerging food safety topics</td>
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</tbody>
</table>
Year 1: Observational Experiment
Cook (study completed)

• Primary outcome: thermometer use and cook to proper internal temp
• Participants prepare turkey patties and chef salad
• Experimental component:
  – To evaluate FSIS video on thermometer use
Year 2: Observational Experiment
Clean (study in progress)

• Primary outcome: not washing poultry
• Assess extent of cross-contamination due to poultry washing
• Participants prepare spiced chicken thighs and salad
• Experimental component:
  – To evaluate FSIS social media messaging
Years 3-5: Observational Experiment

Preliminary Study Plans

Year 3: COOK
- Participants prepare NRTE frozen chicken product
- Experimental component:
  - To evaluate news story on food safety playing in waiting room

Year 4: SEPARATE & CHILL
- Participants grill kabobs and serve as buffet with leftovers
- Experimental component:
  - To evaluate social marketing campaign

Year 5: CLEAN, SEPARATE, COOK & CHILL
- Participants prepare hamburgers and RTE food
- Experimental component:
  - To evaluate recipes with food safety instructions
Year 2: Focus Groups
First Iteration, Set 1

• Eight focus groups with parents of children (<18 years) in four different locations, segmented by language (English vs. Spanish) and education level
• Discussion topics:
  – Obtain feedback on Food Safe Families campaign materials
  – Assess response to different approaches for framing food safety messages

• Using a food thermometer can be the difference between life and death for a young child.
• Be a hero in your family: use a food thermometer!
• Using a food thermometer can help prevent illness and even death.
• Don’t skip using a food thermometer!
Year 2: Focus Groups
First Iteration, Set 2

- Eight focus groups with adults who prepare and/or eat specific raw or undercooked foods; two groups in each location

<table>
<thead>
<tr>
<th>Location</th>
<th>Food</th>
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<tbody>
<tr>
<td>Portland, Oregon</td>
<td>Undercooked (rare or medium rare) hamburgers</td>
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<tr>
<td>Newark, New Jersey</td>
<td>Undercooked chicken livers or pâté</td>
</tr>
<tr>
<td>Milwaukee, Wisconsin</td>
<td>Raw meat sandwiches (e.g., cannibal meat sandwiches) or steak tartare</td>
</tr>
<tr>
<td>Detroit, Michigan</td>
<td>Kibbeh made with raw meat or similar dishes</td>
</tr>
</tbody>
</table>

- Discussion Topics:
  - Preferences
  - Purchase and preparation practices
  - Response to FSIS educational materials
  - Motivators and barriers
  - How to reach target audience
Year 3: Web-Based Survey
First Iteration

• Survey of 2,400 randomly selected adult members of probability-based web-enabled panel
• Survey topics:
  – Meat and Poultry Hotline
  – Recall and outbreak message awareness & fatigue
  – Food safety information sources
  – Food Safe Families campaign
  – Food preparation behaviors
  – Use of devices
  – Disposable vs. reusable towels
  – Foodborne illness experience
Study Will Provide Holistic View of Consumer Practices

Example: Food Thermometer Use

- 5-year study will provide information on ...
  - Correct food thermometer use (observations)
  - Reasons for non-use (interviews, focus groups, survey)
  - Other methods used to determine doneness (interviews, focus groups, survey)
  - How to address barriers to use (focus groups)
  - How to motivate consumers (focus groups)
  - Impact of existing FSIS educational materials on thermometer use (observation/experiment)
Study Will Provide Holistic View of Consumer Practices
Example: Clean/Avoid Cross-Contamination

• 5-year study will provide information on ...  
  – Rate of proper handwashing (observations)  
  – Rate of not washing/rinsing raw poultry (observations)  
  – Cross-contamination from washing poultry (micro analysis)  
  – Cross-contamination from raw to RTE foods or kitchen surfaces (micro analysis)  
  – Barriers and how to motivate consumers (survey/interviews)  
  – Impact of existing FSIS educational materials on poultry washing behavior (observation/experiment)
Applying Lessons From Research: FSIS Consumer Outreach

• Throughout the course of this research, FSIS will incorporate findings in:
  – Media outreach
  – Social media strategy
  – Website and fact sheet updates
  – Partnership engagement
  – Multi-media production
Applying Lessons From Research: Dissemination of Findings

- Conference presentations
  - IAFP
  - Consumer Food Safety Education Conference
  - Others
- FSIS.USDA.gov
- Peer-reviewed manuscripts
- Partners
  - CDC
  - FDA
  - Partnership for Food Safety Education
Year 1: Cook
Year 1: Cook
Overview of Study Approach

Recruit Participants
- Treatment (n = 182)
- Control (n = 201)

Cooking Task
- Turkey burgers
- Chef's salad

Video Recording
Real-Time Observation
Post-observation Interviews
Microsampling
Cleanup

Coding and Notational Analysis
Analysis of Microsamples
Final Report and Dissemination
Year 1: Cook
Participant Recruitment

- Recruited participants in two locations in North Carolina, using convenience sampling
- Screened participants for eligibility:
  - Prepare meals at home at least four times a week
  - Cook meat and poultry at home in the past 3 months
  - Have not had ServSafe training
  - Have not been employed in food service
- Ensured recruited participants mirrored U.S. population based on Census data for key demographics
- Randomly assigned participants to two groups:
  - Control group: Do not receive food safety messaging before meal preparation
  - Treatment group: Receive food safety messaging before meal preparation
Year 1: Cook
Cooking Task

Focus on cook message:
1. Whether participants use food thermometer to check doneness, and
2. Whether product is cooked to recommended temperature

Provided participants with recipes and ingredients to prepare turkey burgers and chef’s salad

- *Also assessed* pathogen transfer *during meal preparation*
Before cooking task:
• Treatment group viewed USDA YouTube video “The Importance of Cooking to a Safe Internal Temperature and How to Use a Food Thermometer,”
• Control group viewed video on general study information.
Year 1: Cook Observations

- Used video recording equipment to record meal preparation in test kitchens
- Streamed video so research staff could view participants and identify triggers for sampling and follow-up questions
- Using video observation rubric, coders watched videos to evaluate adherence to recommended practices
- Used notational analysis to assess recorded actions and their frequencies
Year 1: Cook

Microbiological Sampling

- Inoculated raw poultry product with harmless, realistic, and known amount of tracer (bacteriophage MS2)
- After cooking task, took surface swab samples from at least 15 sites
- Cleaned and sanitized kitchen surfaces and appliances after each participant
- Analysis
  - Plated swabs to determine presence and concentration of tracer
  - Compared extent of cross-contamination across sampling sites to determine highest risk areas
Year 1: Cook
Post-observational Interviews

- Collected qualitative data to connect knowledge, attitudes, and perceived behaviors with actual observed practices
- Topics
  - Attitudes/risk perception for food safety and foodborne illness
  - Observed unsafe handling practice
  - Behaviors unable to observe (e.g., thawing)
  - Response to educational video (treatment)
  - Preferences for receiving food safety information (control)
## Demographic Characteristics of Participants in Study Sample (n = 383)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Percentage from Census Data</th>
</tr>
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<tbody>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>74%</td>
</tr>
<tr>
<td>Non-White</td>
<td>26%</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
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<tr>
<td>Not Hispanic or Latino</td>
<td>83%</td>
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<tr>
<td>Hispanic or Latino</td>
<td>17%</td>
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<tr>
<td><strong>Age</strong></td>
<td></td>
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<tr>
<td>18–34</td>
<td>28%</td>
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<tr>
<td>35–54</td>
<td>36%</td>
</tr>
<tr>
<td>55+</td>
<td>36%</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
</tr>
<tr>
<td>Less than high school or high school diploma/GED</td>
<td>42%</td>
</tr>
<tr>
<td>Some college</td>
<td>29%</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>18%</td>
</tr>
<tr>
<td>Graduate or professional degree</td>
<td>11%</td>
</tr>
<tr>
<td><strong>Household status</strong></td>
<td></td>
</tr>
<tr>
<td>Family household (children)</td>
<td>66%</td>
</tr>
<tr>
<td>Nonfamily household (no children)</td>
<td>34%</td>
</tr>
</tbody>
</table>
Year 1: Cook (Results)
Thermometer Ownership (Self-Reported) and Use

- Thermometer ownership (self-reported):
  - Control (n = 201): 61%
  - Treatment (n = 182): 63%

- Used a thermometer:
  - Control (n = 201): 34%
  - Treatment (n = 182): 75%*

* Differences between two groups statistically significant at $p < .001$
Year 1: Cook (Results)
Correctly Used Thermometer

- Placed thermometer in correct location (among total attempts):
  - Control: 23% (n = 168)
  - Treatment: 52%* (n = 322)

- Checked both patties (among thermometer users):
  - Control: 73% (n = 60)
  - Treatment: 82%* (n = 128)

* Differences between two groups statistically significant at $p < .001$. 

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Year 1: Cook (Results)  Turkey Patty with Heat Maps Showing Thermometer Placement by Group

North is part of pan farthest from participant. Red dots indicate placement of thermometer insertion. Brown area represents top of turkey patty and blue halo represents side profile of turkey patty.
Year 1: Cook (Results) Internal Temperature of Patties for Initial Insertion among Thermometer Users

Note: temperature reading is for initial insertion; participants could have continued cooking patties.
Year 1: Cook (Results)

Handwashing Attempts among Required Events

Successful attempts: 26 out of 2,249 (1.15%)
Year 1: Cook (Results)
Reasons for Unsuccessful Handwashing Attempts

Did not wet hands: 40% (Control), 44% (Treatment)
Did not use soap: 24% (Control), 18% (Treatment)
Did not rub hands with soap for at least 20 seconds: 76% (Control), 83% (Treatment)
Did not rinse hands with water: 1% (Control), 1% (Treatment)
Did not dry hands: 13% (Control), 10% (Treatment)
Dried hands with surface other than disposable towel: 16% (Control), 23% (Treatment)

Note: there may be multiple reasons for a handwashing event to be unsuccessful.
Year 1: Cook (Results) Prevalence of MS2 Contamination for Four Kitchen Locations and Salad Lettuce (All Participants)

8% Refrigerator handle 5.50 ± 0.37<sup>a</sup> (n = 369)
49% Spice containers 6.18 ± 0.82<sup>b</sup> (n = 369)
12% Faucet handle 5.47 ± 0.52<sup>a</sup> (n = 369)
8% Mobile device 5.73 ± 0.79<sup>c</sup> (n = 78)
6% Salad lettuce 5.52 ± 0.45<sup>d</sup> (n = 367)

<sup>a</sup> Level of contamination ± SD, log genome copies/handle.
<sup>b</sup> Level of contamination ± SD, log genome copies/bottle.
<sup>c</sup> Level of contamination ± SD, log genome copies/device.
<sup>d</sup> Level of contamination (SD), log genome copies/18–25g
Year 1: Cook (Results) Participants’ Responses to USDA Video on Thermometer Use (Treatment Group)

Did the video influence your action in the kitchen today? Why or why not?

Yes: 67% (n = 121)

- Used thermometer to check doneness of patties: 11%
- New information about temperatures: 8%
- Reinforced existing thermometer use/normally use a thermometer at home: 7%
- Not answered/answer not clear/answer not relevant: 4%
- Other: 9%

No: 33% (n = 60)

- Comfortable with cooking experience and other methods of determining doneness: 55%
- Learned about correct placement of thermometer: 28%
- Other: 8%
• FSIS conducted a media tour promoting food safety related to grilling in advance of the Fourth of July, and the results of this research were the primary focus of the press release, media alerts, blog and social media messages