Assessing the Community Food Environment: Results from a Food Store Reliability Study

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Background

- Environmental factors like the availability and characteristics of community food outlets play a role in dietary behaviors and obesity.
- Understanding the relationships between diet, weight, and the characteristics of food outlets requires reliable measurement of these characteristics.

Objective: To test the inter-rater reliability of a Food Store Observation Form.

Methods

Instrument: 12-page pen and paper Food Store Observation Form developed, building off of pre-existing instruments and including the following measures:
- Store type
- Presence of store services/amenities
- Availability and price of specified food/beverage products
- Price type (regular, sale, member/loyalty card)
- Quality of select fresh fruits and vegetables
- # of fresh, frozen and canned fruits and vegetables
- # of cash registers and items in the check-out aisle
- # of food/beverage ads on store exterior
- Presence of incivilities outside the store

Store Sample:
- Stores pulled from Dun & Bradstreet commercial business list and from supplemental web searches
- 141 stores sampled from Chicago MSA + 50 mile buffer

Data Collection:
- Data collected by six trained field staff in January 2010

Reliability Measures:
- Categorical variables: Simple Kappa and % Agreement
- Continuous variables: Intraclass Correlation Coefficient (ICC)
- Proportion agreement is given for variables where the Kappa value may be artificially low due to a skewed distribution.
- Reliability results are presented only for those measures with at least 15 completed observations.

Results

Completed Store Sample | N
---|---
Supermarkets | 26
Grocery stores | 34
Gas/convenience stores | 54
Discount department stores | 6
**TOTAL** | **120**

Average Inter-Rater Reliability (and Range) for Availability and Price of Various Product Categories

<table>
<thead>
<tr>
<th>Product Category (if of measures)</th>
<th>Product Availability</th>
<th>Product Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh Fruits and Vegetables (8)</td>
<td>0.97 (0.91-1.00)</td>
<td>0.86 (0.41-1.00)</td>
</tr>
<tr>
<td>Meat and Dairy Products (10)</td>
<td>0.91 (0.80-1.00)</td>
<td>0.96 (0.92-0.97)</td>
</tr>
<tr>
<td>Bread and Cereal Products (5)</td>
<td>0.87 (0.81-0.93)</td>
<td>0.92 (0.86-0.96)</td>
</tr>
<tr>
<td>Canned Beans and Vegetables (6)</td>
<td>0.89 (0.80-0.96)</td>
<td>0.91 (0.80-0.99)</td>
</tr>
<tr>
<td>Family Size Beverages (6)</td>
<td>0.75 (0.67-0.82)</td>
<td>0.97 (0.96-0.99)</td>
</tr>
<tr>
<td>Individual Size Beverages (9)</td>
<td>0.71 (0.17-0.94)</td>
<td>0.93 (0.83-1.00)</td>
</tr>
<tr>
<td>Snack Foods (6)</td>
<td>0.65 (0.00-0.91)</td>
<td>0.93 (0.77-0.99)</td>
</tr>
<tr>
<td>Frozen Vegetables (4)</td>
<td>0.94 (0.91-0.98)</td>
<td>0.97 (0.96-0.99)</td>
</tr>
</tbody>
</table>

* Sample size too small to calculate result.

Key Findings:
- 77% of all product availability measures had a Kappa ≥ 0.80 (almost perfect agreement); 92% had a Kappa ≥ 0.60.
- 62% of all product pricing measures had an ICC ≥ 0.80; 89% had an ICC ≥ 0.60.
- Average ICC for fruit and vegetable counts was 0.90 across six categories (fresh, frozen, and canned).
- Proportion agreement for quality of fresh fruits and vegetables was >90% for eight different items.
- Measures with lowest reliability (Kappa/ICC < 0.60 and/or proportion agreement < 75%) were the following:
  - Availability of juice drink, bottled water, cookies and candy
  - Price of oranges, family-size juice drink, juice boxes, least expensive 2-liter soda, and candy
  - Presence of bike parking and sidewalk outside main entrance
  - Presence of at least one candy-free register at checkout
  - Number of beverage ads on the store property

Inter-Rater Reliability for the Number of Advertisements on Store Exterior (ICC)

<table>
<thead>
<tr>
<th># Food ads</th>
<th>Building Exterior</th>
<th>Store Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.96</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td># Food ads with price promotion</td>
<td>0.90</td>
<td>*</td>
</tr>
<tr>
<td># Beverage ads</td>
<td>0.88</td>
<td>0.51</td>
</tr>
<tr>
<td># Beverage ads with price promotion</td>
<td>0.87</td>
<td>0.86</td>
</tr>
<tr>
<td># Combination (food &amp; beverage) ads</td>
<td>0.62</td>
<td>0.73</td>
</tr>
<tr>
<td># Combination ads with price promotion</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

* Sample size too small to calculate result.

Discussion and Conclusions

- Most measures on the Food Store Observation Form could be captured feasibly and reliably in various store types.
- Measures that were most highly reliable included product availability, presence of store services/amenities, and counts of fruits and vegetables.
- Limited measures were dropped from the Food Store Observation Form.
- Changes were made to the observation form and protocol to address issues discovered during the reliability study:
  - Definitions tightened for some beverage and snack products
  - Definitions tightened for main entrance on store exterior measures
  - Training and practice exercises added for capturing price and price type
- Finalized measures were incorporated into a Food Store Observation Form that was fielded in a national sample of 154 communities in the spring/summer of 2010.

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