Nutrition Environment Measures Survey (NEMS): Introduction

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The BEAT Institute -- Boston, MA
- Nutrition environment & measurement
- **NEMS** development research
- NEMS-S and NEMS-R: the tools and their characteristics
- NEMS-CS for PDA, NEMS-V
- Disseminating NEMS & the future opportunities
Why study nutrition environments?

- Obesity is epidemic
- Psychological & social factors don’t fully explain diet & physical activity
- Food environments are not well understood
- Need to understand the food environment in order to develop interventions
Environments are believed to be important among the multiple levels of determinants of nutrition and physical activity.

Environmental Causes of Obesity

- Increased eating
- Decreased energy expenditure
Nutrition Environments & Disparities

More fast-food restaurants in minority neighborhoods

Some healthy foods less available &/or poorer quality in minority & low income areas

Supermarkets less accessible in poor and Black areas
Income and Obesity in NYC Neighborhoods (2003 & 2007)

### PERCENTAGE OF RESIDENTS WHO ARE OBSESE

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>2003</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manhattan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper East Side</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gramercy Park–Murray Hill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper West Side</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chelsea–Clinton</td>
<td>Greenwich Village–Soho</td>
<td></td>
</tr>
<tr>
<td>Union Square–Lower East Side</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Manhattan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington Hts–Inwood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Harlem–Morningside Hts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Harlem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brooklyn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bensonhurst–Bay Ridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borough Park</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coney Island–Sheepshead Bay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downtown–Brooklyn Hts–Park Slope</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greenpoint</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunset Park</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Flatbush–Flatbush; Canarsie–Flatbush</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Williamsburg–Bushwick</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedford–Stuyvesant–Crown Hts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East New York</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Queens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flushing–Clearview</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ridgewood–Forest Hills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long Island City–Astoria; West Queens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bay Ridge–Little Neck; Fresh Meadows</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2007 Percent Obese:
- < 10.0
- 10.1 - 15.0
- 15.1 - 20.0
- 20.1 - 25.0
- 25.1 - 30.0
- > 30.1
- Non-Residential

Map showing the percentage of residents who are obese in different NYC neighborhoods.
Why study nutrition environments?

• Obesity is epidemic
• Psychological & social factors don’t fully explain diet & physical activity
• Food environments are not well understood
• Need to understand the food environment in order to develop interventions
Built Environment & Nutrition

- Cost, time pressures $\rightarrow$ reliance on fast foods & convenience foods
- These foods are higher in calories & fat
- Access to, affordability of F&V
- Large portion sizes
The Rationale for NEMS

*Why do a MEASUREMENT study?*

→ In order to do good research, we need reliable and valid measures, yet...

→ Good measures of nutrition environments don’t exist.

→ We need to understand the practical side of measures (time, efficiency)
## Soft Drink Single Serving Size, 1950 - 2002

<table>
<thead>
<tr>
<th>Size</th>
<th>Price per oz.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 ounces</td>
<td>5¢</td>
</tr>
<tr>
<td>12 ounces</td>
<td>4¢</td>
</tr>
<tr>
<td>20 ounces</td>
<td>2.3¢</td>
</tr>
<tr>
<td>42 ounces</td>
<td>2.3¢</td>
</tr>
</tbody>
</table>
Model of Community Nutrition Environments

[Glanz, Sallis, Saelens & Frank 2005]

Environmental Variables

Community Nutrition Environment
- Type & Location of Food Outlets (stores, restaurants)
- Accessibility: hours of operation, drive-through

Organizational Nutrition Environment
Home School

Work Other

Consumer Nutrition Environment
- Available healthy options
- Price, promotion, placement
- Nutrition information

Information Environment
Media, Advertising

Policy Variables

Government and Industry Policies

Individual Variables

Sociodemographics

Psychosocial Factors
Perceived Nutrition Environment

Behavior

Eating Patterns

This model blends public health, health psychology, & urban planning perspectives

Guides developments of measures & research priorities
Types of Nutrition Environments

1. Community *
2. Consumer *
3. Organizational
4. Informational

* Less studied; may have broad effects

- Moderating & mediating pathways hypothesized
Community & Consumer Nutrition Environments

• **Community** nutrition environments =
  – Type & location of food outlets
  – Accessibility (e.g., hours, drive-thru)

• **Consumer** nutrition environments =
  – Availability of healthful food choices
  – Pricing, promotion, placement
  – Information availability
✓ This model is a starting point
✓ Complex research & practice area
✓ Greater priority is needed for nutrition environments
• NEMS-S and NEMS-R are research-tested measurement tools

• NEMS was originally developed for research

• NEMS can be used for community assessment, advocacy, and intervention
Nutrition Environment Measures Study (NEMS)

Funded by: THE ROBERT WOOD JOHNSON FOUNDATION
Aims of NEMS

1. Develop measures of nutrition environments – retail & food service outlets (stores, restaurants)

2. Test the inter-rater reliability and test-retest reliability of nutrition environment measures

3. Examine sampling and generalizability issues
The Most Important Measurement Concepts:

Validity

Reliability
Validity

• Whether an instrument measures what it proposes to measure

• Measures reflect true differences in the things they intend to measure
Types of Reliability Examined in NEMS

1. Inter-rater reliability (equivalence)

2. Test-retest reliability (stability)
Reliability in NEMS

1. Inter-rater reliability:

Two raters go to same store/restaurant, same day, same time...

Do they get the same results?
2. Test-retest reliability:

The same rater goes to the same store/restaurant, one week apart…

Do they get the same results?

This assumes that stores don’t change that fast, but we’re not sure…It depends on measures that aren’t too subject to “random error.”
Test-Retest Reliability and Inter-Rater Reliability

TIME 1
Rater #1

Inter-Rater Reliability

Test-Retest Reliability

TIME 2
(T1+1 week)
Rater #1

Rater #2

Test-Retest Reliability
Phases of the Study

1. Pre-test

Preliminary work:
- develop measures
- test measures
- revise/improve measures for formal research purposes

Where? Atlanta neighborhoods: Decatur (high walk) & Toco Hills (low walk)
2. Main measurement study

Collect data to allow us to calculate test-retest reliability & inter-rater reliability in 4 neighborhoods around schools

**Where?** High/low walk & high/low SES neighborhoods in metro Atlanta

- High walk, high SES
- High walk, low SES
- Low walk, high SES
- Low walk, low SES
Selection of Communities & Identification of Food Outlets

- Communities selected using maps, census data, GIS
- Outlets enumerated by project staff – online directories, business directories, health department, etc.
Measures of Nutrition Environments in Stores

< *Grocery Stores & Convenience Stores* >

- **Availability** of healthful choices
- **Prices**
  - Compare healthy to less healthy, grocery to convenience stores, etc.
- **Quality** of fresh produce
# Measures of Nutrition Environments in Stores

*< Groceray Stores & Convenience Stores >*

## Core Categories of Foods

<table>
<thead>
<tr>
<th>Milk</th>
<th>Ground Beef</th>
<th>Baked Goods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>Hot Dogs</td>
<td>Frozen Dinners</td>
</tr>
<tr>
<td>Bread</td>
<td>Vegetables</td>
<td>Baked Chips</td>
</tr>
<tr>
<td></td>
<td>Fruit Juice</td>
<td></td>
</tr>
</tbody>
</table>
Convenience Stores: Consumer Nutrition Environment Measures
Measures of Nutrition Environments in Restaurants

< *Fast-Food & Sit-Down Restaurants* >

Sources of Information:
- Internet
- Menu
- Visit, observation
- Interview manager
Measures of Nutrition Environments in Restaurants

< *Fast-Food & Sit-Down Restaurants* >

- Availability of healthful choices
- Prices
  - Compare healthy to less healthy, fast-food vs. sit-down restaurants, etc.
- Promotion, Information
- Facilitators & Barriers
- Kid’s Menus
Restaurant Measures
Restaurant Measures: 

Eat more!
## Nutrition Environment Measures Study (NEMS) Food Outlet Cover Page

**Rater ID:**

- Grocery Store
- Convenience Store
- Other

**Store ID:**

**Restaurant ID:**

**Date:**

- Start Time:
- End Time:

**Site Visit**

- Date:
- Start Time:
- End Time:

**Menu/Internet Review**

- Date:
- Start Time:
- End Time:

**Other Visit/Interview**

- Date:
- Start Time:
- End Time:

**Number of cash registers:**

**Comments:**

---

**Nutrition Environment Measures Study (NEMS) Cover Page**

8250013302
## Nutrition Environment Measures Study (NEMS)
### Measure #2: FRUIT

<table>
<thead>
<tr>
<th>Produce Item</th>
<th>Available</th>
<th>Price</th>
<th>Unit</th>
<th>Quality</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bananas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Apples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Oranges</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Grapes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Cantaloupe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Peaches</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Strawberries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Honeydew Melon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Watermelon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Pears</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Rater ID:**

**Store ID:**

**Date:**

**Availability and Price**

- **Quality:** A

**Comments**

**Total Types:**
**Vegetables**

<table>
<thead>
<tr>
<th>Produce Item</th>
<th>Available</th>
<th>Price</th>
<th>Unit</th>
<th>Quality</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrots</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tomatoes</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweet Peppers</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broccoli</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lettuce</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Celery</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cucumbers</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cabbage</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cauliflower</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. Total Types: 6
## Nutrition Environment Measures Study (NEMS)
### MEASURE #5: HOT DOG

**Availability and Price**

<table>
<thead>
<tr>
<th>Item</th>
<th>Available</th>
<th>Price/pkg.</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Healthier option:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Oscar Mayer Fat-free Wieners (turkey/beef) 0g fat</td>
<td>Yes</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td><strong>Alternate Items:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Fat-free other brand 0g fat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Light Wieners (turkey/pork) 7g fat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Light beef Franks (1/3 less calories, 50% less fat) 6g fat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Turkey Wieners (1/3 less fat) 8g fat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Regular option:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Oscar Mayer Wieners (turkey/pork/chicken)-regular 12g fat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Alternate Items:</strong> (≥10g fat)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Beef Franks (regular) 13g fat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Measure #10: BAKED CHIPS

**Availability & Price**

Low-fat chips <=3g fat/serving

#### Item

<table>
<thead>
<tr>
<th>Healthier Option</th>
<th>Available</th>
<th>Price</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Baked Lays Potato Chips</td>
<td>Yes</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>2 1/8 oz.</td>
<td>Yes</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>5 oz.</td>
<td>Yes</td>
<td>$</td>
<td></td>
</tr>
</tbody>
</table>

#### Alternate Item:

<table>
<thead>
<tr>
<th>Regular Option (select most comparable size to healthier option available):</th>
<th>Available</th>
<th>Price</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Lays Potato Chips Classic</td>
<td>Yes</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>1 1/2 oz.</td>
<td>Yes</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>2 3/4 oz.</td>
<td>Yes</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>5 oz.</td>
<td>Yes</td>
<td>$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alternate Item:</th>
<th>Available</th>
<th>Price</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Yes</td>
<td>$</td>
<td></td>
</tr>
</tbody>
</table>
Findings
88 Stores (90.6% completion rate)
- 24 grocery stores
- 64 convenience stores
- 16-27 stores per neighborhood

301 Restaurants
- 217 restaurants assessed:
  - 102 fast food (99% completion rate)
  - 115 sit-down (100% completion rate)

- 129 SDR's in high-walk, high-income area
  - Sample of 40
High Income/High-Walkability
High Income/Low-Walkability
# Inter-Rater Reliability of NEMS Store Observations

<table>
<thead>
<tr>
<th>Variable/Indicator</th>
<th>Inter-Rater Reliability (2 raters, same day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% agreement</td>
</tr>
<tr>
<td>Any fruit – availability</td>
<td>96.47%</td>
</tr>
<tr>
<td>Any vegetables – availability</td>
<td>100%</td>
</tr>
<tr>
<td>Baked chips</td>
<td>96.47%</td>
</tr>
<tr>
<td>Lean ground beef</td>
<td>98.82%</td>
</tr>
<tr>
<td>100% Whole grain bread</td>
<td>92.94%</td>
</tr>
<tr>
<td>Skim/Low-fat milk</td>
<td>100%</td>
</tr>
<tr>
<td>Hot dogs (regular vs. fat-free)</td>
<td>100%</td>
</tr>
<tr>
<td>Reduced- calorie frozen dinner</td>
<td>100</td>
</tr>
<tr>
<td>Low-fat baked goods</td>
<td>95.29%</td>
</tr>
</tbody>
</table>

* Cramer’s V statistic was used when Kappa could not be computed due to asymmetric rater response dimensions.
# Test-Retest Reliability of NEMS Store Observations

<table>
<thead>
<tr>
<th>Variable/Indicator</th>
<th>Test-retest Reliability (1 rater, 2 weeks apart)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% agreement</td>
</tr>
<tr>
<td>Any Fruit – availability</td>
<td>92.68%</td>
</tr>
<tr>
<td>Any Vegetables – availability</td>
<td>96.34%</td>
</tr>
<tr>
<td>Baked chips</td>
<td>95.12%</td>
</tr>
<tr>
<td>Lean ground beef</td>
<td>98.78%</td>
</tr>
<tr>
<td>100% Whole grain bread</td>
<td>90.24%</td>
</tr>
<tr>
<td>Skim/low-fat milk</td>
<td>97.56%</td>
</tr>
<tr>
<td>Hot dogs (regular vs. fat-free)</td>
<td>98.78%</td>
</tr>
<tr>
<td>Reduced calorie frozen dinners</td>
<td>98.78</td>
</tr>
<tr>
<td>Low-fat baked goods</td>
<td>93.90%</td>
</tr>
</tbody>
</table>

* Cramer’s V statistic was used when Kappa could not be computed due to asymmetric rater response dimensions
Grocery Stores vs. Convenience Stores: Availability of Fruit & Vegetables

- Grocery Stores (G.S.):
  - Types of Fruit: 9
  - Types of Vegetables: 7
- Convenience Stores (C.S.):
  - Types of Fruit: 1
  - Types of Vegetables: 0

Significance:
- Types of Fruit: p < .001
- Types of Vegetables: p < .001
Grocery Stores vs. Convenience Stores: Availability of Fat-Free Hot Dogs & Baked Chips

- Fat-Free Hot Dogs: G.S. > C.S., p < .001
- Varieties of Baked Chips: G.S. > C.S., p < .01
High- vs. Low-Income Neighborhoods: Availability of Fruits & Vegetables

- **Types of Fruit**
  - Hi SES: 5
  - Low SES: 2

- **Types of Vegetables**
  - Hi SES: 5
  - Low SES: 3

**p < .01**
High- vs. Low-Income Neighborhoods: Availability Fat-Free Hot Dogs & Baked Chips

- Fat-free Hot Dogs:
  - High SES: 25%
  - Low SES: 15%

- Varieties of Baked Chips:
  - High SES: 1.4
  - Low SES: 1.0

The difference is significant for both hot dogs (p < .01) and varieties of baked chips (p < .01).
Shelf Space

Skim Milk vs. Full-Fat Milk

40% of shelf space was occupied by skim milk

This percentage was found to be higher in grocery stores & high SES areas
Cost Comparisons

Fruits (Bananas)
Bananas cost 32% more in convenience stores than in grocery stores.

\[ \frac{0.62}{0.47} = 132\% \ \text{CS/GS} \quad (p<.001) \]

Milk
The difference in cost of skim milk versus full fat milk was not significant.

\[ 0.99 = \text{ratio skim/full fat milk} \]
Cost Comparisons

Hot Dogs
Lean franks cost 15% more than regular-fat franks

Ground Beef
Lean meat costs 55% more than regular-fat

Chips
Low-fat chips cost 31% more than regular-fat

Juice
100% juice costs 53% more than juice drink
## NEMS Composite Mean Scores for Stores

<table>
<thead>
<tr>
<th></th>
<th>Grocery Stores (n=24)</th>
<th>Convenience Stores (n=61)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability</td>
<td>17.33</td>
<td>3.54</td>
</tr>
<tr>
<td>Price</td>
<td>0.13</td>
<td>1.54</td>
</tr>
<tr>
<td>Quality</td>
<td>5.13</td>
<td>0.077</td>
</tr>
<tr>
<td><strong>Total</strong>*</td>
<td>22.58</td>
<td>5.85</td>
</tr>
</tbody>
</table>

*Maximum possible total score is 50 points*
## NEMS Composite Mean Scores for Stores By Neighborhood SES

<table>
<thead>
<tr>
<th></th>
<th>High Income (n=44)</th>
<th>Low Income (n=41)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability</td>
<td>10.23</td>
<td>4.44</td>
</tr>
<tr>
<td>Price</td>
<td>0.30</td>
<td>2.05</td>
</tr>
<tr>
<td>Quality</td>
<td>2.61</td>
<td>1.34</td>
</tr>
<tr>
<td><strong>Total</strong>*</td>
<td><strong>13.14</strong></td>
<td><strong>7.83</strong></td>
</tr>
</tbody>
</table>

*Maximum possible score is 50 points

![Bar chart showing availability, price, quality, and total scores for high and low income neighborhoods.](image)
Restaurant Findings

Inter-Rater Reliability (% agreement):

- Recording sources = 100%
- Healthy choices shown = 86%
- Total entrees = 78%
- # Healthy entrees = 87%
<table>
<thead>
<tr>
<th>Variable</th>
<th>Sit-down (n=115)</th>
<th>Fast Food (n=102)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy entrée available</td>
<td>20.9%</td>
<td>36.3%</td>
</tr>
<tr>
<td>Proportion of entrees that are healthy</td>
<td>3.2%</td>
<td>8.8%</td>
</tr>
<tr>
<td>Healthy main dish salads available</td>
<td>9.6%</td>
<td>24.5%</td>
</tr>
<tr>
<td>Proportion of healthy main dish salads</td>
<td>11.1%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Fruit available</td>
<td>11.3%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Non-fried vegetables available</td>
<td>53.0%</td>
<td>26.5%</td>
</tr>
</tbody>
</table>
Kid’s Menu Review By Restaurant Type

- **Available Healthy choice**: Sit-down 50%, Fast food 40%
- **100% juice**: Sit-down 60%, Fast food 50%
- **Low-fat milk**: Sit-down 70%, Fast food 60%

Legend:
- Light blue: Sit-down
- Dark blue: Fast food
Time for Completing Measures

Convenience stores
mean = 14.4 minutes; range = 10-18 min.

Grocery Stores
mean = 41.8 minutes; range = 30-66 min.

Restaurant site visits
mean = 11.5 minutes; range = 9-35 min

Menu reviews
mean = 35 minutes
Limitations

Other venues where food is sold not included

May have left out some important variables
Dissemination of NEMS Tools & Methods

- Demand started during development
- Initial funding support from RWJF
- 2-3 day trainings & train-the-trainer
- CD-Rom and online tools post-training
- Assumed from the start that many users would customize the tools
- Partnerships to stretch $$$ - state health departments, universities, CDC, etc.
Dissemination of NEMS: In Person Trainings

40 states in the U.S. with over 200 people trained, 3 from Canada, 3 from Singapore, and participants from Netherlands, Japan, and China
Customization

• The NEMS-S tool was designed to be easily customizable to suit a project’s needs
• All measures are available in Word or Teleform formats
• Be sure to pre-test!
Examples of NEMS in Research

- Boston Child Health Study (in progress)
- NIK Study (Neighborhood Influences on Kids) – assessments in block groups in San Diego & Seattle [B. Saelens, PI; NIEHS]
- Dissertations and theses of food environment (i.e., Southern Illinois and Northern Alabama, Puerto Rico, etc.)

Examples of NEMS in Practice

- Wisconsin state & local obesity prevention (SHOW)
- Native American reservations in Idaho
- Rural counties in Oklahoma & Colorado
- Restaurant interventions in upstate NY & in New Elm, MN
What’s now & next for NEMS?

- Sharing user adaptations
- PDA/GPS Integrated systems
- Applications in research – NIK, TEAN, etc.
- Learn more about sampling, sensitivity to change
- Disseminate online training program
- Continue to gather NEMS related resources and information from NEMS users
Other NEMS Versions

- Hospital cafeteria
- Entire hospital food environment scan by CDC (Being piloted by PhD student)
- University campuses
- National parks by CDC (Data being analyzed)
NEMS Online Training

- Includes NEMS-S and NEMS-R modules
- Initially launched in January 2010
- Course is free
- Won a bronze award from the United States Distance Learning Association (USDLA) for 2010 Best Practices in Distance Learning Programming
U.S. Map of NEMS Online Participants
(Jan. 2010 - May 2012)

730 domestic registrants, 46 international (Brazil, Canada, England, France, Iran, Ireland, Jamaica, Jordan, New Zealand, Singapore, Spain…).
# Evaluation Data (n=265)

Rating Aspects of Online Training on 1-5 Scale

<table>
<thead>
<tr>
<th>Item</th>
<th>Avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall training</td>
<td>4.41</td>
</tr>
<tr>
<td>Organization</td>
<td>4.68</td>
</tr>
<tr>
<td>Content</td>
<td>4.50</td>
</tr>
<tr>
<td>Resources &amp; printable items</td>
<td>4.55</td>
</tr>
<tr>
<td>Software works on computer</td>
<td>4.60</td>
</tr>
<tr>
<td>Ease of navigation</td>
<td>4.46</td>
</tr>
<tr>
<td>Registration process</td>
<td>4.49</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store simulations (n=264)</td>
<td>4.36</td>
</tr>
<tr>
<td>Restaurant simulations (n=259)</td>
<td>4.30</td>
</tr>
<tr>
<td>Other online activities (n=184)</td>
<td>4.42</td>
</tr>
<tr>
<td>Fieldwork (n=219)</td>
<td>4.35</td>
</tr>
<tr>
<td>Quality of instructor’s responses to questions (n=165)</td>
<td>4.38</td>
</tr>
</tbody>
</table>
Questions related to using NEMS in real world setting...

Confidence level

- Somewhat Confident (3)
- Confident (4)
- Very Confident (5)

Helpfulness of each item in preparation for using NEMS

<table>
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<tr>
<th>Item</th>
<th>Avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store simulations (n=261)</td>
<td>4.55</td>
</tr>
<tr>
<td>Restaurant simulations (n=252)</td>
<td>4.48</td>
</tr>
<tr>
<td>Fieldwork (n=220)</td>
<td>4.50</td>
</tr>
<tr>
<td>QA activities (n=258)</td>
<td>4.29</td>
</tr>
<tr>
<td>Data analysis scoring activities (n=248)</td>
<td>4.25</td>
</tr>
</tbody>
</table>
NEMS goes Mobile

• **Current CPPW Enhanced Evaluation**
  – Evaluation of Philadelphia Healthy Corner Store Network
    • Philadelphia Dept of Public Health, The Food Trust, Temple U, UPenn
  – NEMS-CS: Additions include frozen and canned fruits and vegetables, number of F&V
  – 100 low-intervention and 100 high-intervention corner stores
  – **PDA version developed and currently in use**
Investigating Software Options

- Cardiff TeleForm
- Pendragon
- Snap Survey Software
- Or have it specifically programmed

Considerations

- Cost
- Ease of use
- Flexibility
- Robustness
Snap Survey Software: Mobile Module

- Includes design templates suitable for PDAs, UMPCs, Tablets, Kiosks and Laptops.
- Allows for routing, text substitution, code masking and pattern validation.
- Exclusive responses and minimum and maximum number of responses.
- Calculated values within the questionnaire (Derived variables) to manage dynamic text substitution, routing and answer masks.
- Allow respondents to choose their language.
- Responses can be downloaded directly into Snap using synchronization, via a USB stick or e-mail.
Considerations for Hardware

Portability  Screen size  Ease of Use

Cost  Software Compatibility  Unobtrusive
Considerations for Hardware

Portability  Screen size  Ease of Use

Cost  Software Compatibility  Unobtrusive

HP iPAQ 211
Snap PDA Screen Shots: Milk

Shelf Space: (measure only if low fat milk is available)

Lowest fat milk
- Skim
- 1%
- 2%
- NA

Pricing - lowest fat milk (Do not enter dollar signs. Enter dollars and cents such as 2.35)
- Pint
- Quart
- Half gallon
- Gallon

Comments
Snap PDA Screen Shots: Ground Beef

**AVAILABILITY AND PRICE**

Healthier Option:

Is lean ground beef (90% lean, 10% fat, Ground Sirloin) available?
- Yes
- No

**Price/lb. (no dollar signs)**

Comments

**Number of varieties of lean ground beef (<=10% fat)**
- 0
- 1
- 2
- 3
- 4
- 5
- 6+

Buttons:
- Back
- Reset
- Save
- Next
PDA Limitations

• Not as easy to move forward and back through survey
• Technical issues i.e. PDA freezing up
• PDA is seen as more “inspector” like from the point of the store staff/customers
• Snap is very user friendly but the length of NEMS and the multiple skip patterns made it very complex
• Features such as GPS, wireless transmission are options – but too costly for current project use
Nutrition Environment Measures Survey-Vending Machines (NEMS-V)

• Developed to assess the nutrition environment of workplace vending machines.
• Based on the Institute of Medicine’s (IOM) nutrition standards for foods in schools.
• Intended to be easy to use by having a red, yellow and green coding system.
• Goal is to have machine stocked with more yellows and greens than red so workers have more options to healthier choices.
Development & Pilot-testing of NEMS-V

- Developed by Susan Klein of Iowa State and Carol Voss of the Iowa State Health Department.
- Funding provided by the Wellmark Foundation.
- Consulted with NEMS staff - Karen Glanz, PhD, MPH and Margaret Clawson, MPH.
- Reliability testing of instrument and online training conducted and both proved reliable.
  - There was high percentage of agreement for both product and color between rater groups (A versus B) and time (time 1 versus time 2).
# NEMS-V Reliability Testing Results

<table>
<thead>
<tr>
<th></th>
<th>% Agreement</th>
<th>k value*</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inter-rater Reliability</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Group A vs. Group B</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product - pre</td>
<td>98.3</td>
<td>-.006*</td>
<td>NA</td>
</tr>
<tr>
<td>Product – post</td>
<td>97.6</td>
<td>-.006*</td>
<td>NA</td>
</tr>
<tr>
<td>Color – pre</td>
<td>95.2</td>
<td>.56</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Color – post</td>
<td>95.2</td>
<td>.56</td>
<td>&lt; .01</td>
</tr>
<tr>
<td><strong>Test-retest Reliability</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Time 1 vs. Time 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product - Rater Group A</td>
<td>99.3</td>
<td>-.003*</td>
<td>NA</td>
</tr>
<tr>
<td>Product - Rater Group B</td>
<td>98.3</td>
<td>.44</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Color - Rater Group A</td>
<td>99.0</td>
<td>.79</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Color - Rater Group B</td>
<td>99.3</td>
<td>.93</td>
<td>&lt; .01</td>
</tr>
</tbody>
</table>

* Due to small cell sizes, kappa values could not be computed for these categories.
NA, not applicable
NEMS-V Coding

- **RED** food and beverages are not as healthy and fall outside the Dietary Guidelines for Americans.
- **YELLOW** food and beverages are healthy foods that meet the Dietary Guidelines, but do not provide a serving of fruit, vegetable, low-fat dairy or whole grain.
- **GREEN** food and beverages are considered the healthiest, are consistent with the Dietary Guidelines for Americans and provide a serving of fruit, vegetable, low-fat dairy or whole grain.
- A healthy choice calculator is available on website if one can’t figure out if the product is coded red, yellow or green.
NEMS-V Tool

- Vending Location Cover Page: 9 questions about worksite and vending machines (who stocks, gets profit, etc.)
- Individual Machine Cover Page: 9 questions related to the machine (type of machine, location, accessibility, etc.)
- Individual Machine Graphic: Tracks the number and products to record for each machine.
- Food & Beverage Recording Sheet: record each item, size, price, category of beverage, fruit/vegetable/refrigerated, salty, sweet, ns entrees/sandwiches, and its NEMS-V code
NEMS-V Website

- Website intended to guide an employee of a company through all steps from the initial assessment to how to implement changes.
- Tips and guidance are offered on how to communicate with a vendor (the stocker of the machine) and renegotiate the contract.
- Success stories highlighted.

www.nems-v.com
NEMS-V Website Features

- **NEMS-V Tools Tutorial**: 15 minute online demonstration on how to complete a NEMS-V assessment
- **NEMS-V Healthy Choices Calculator Tutorial**: 5 minute online demonstration on how to use the Healthy Choices Calculator to determine green, yellow, or red food/beverage choices
- **Ready to complete graphic** for displaying vend #, color code and/or calories for each machine
- **Printable awards and report cards** for each machine
- **Social marketing messages** that can be printed
- **Developing an iPhone & android application** of healthy choices calculator
Nearly 60% of respondents thought the message worked best to communicate the snack rating system clearly.

Respondents liked that it illustrated examples of foods, which made the color coding system very clear. The main message was focused on encouraging people to choose better snacks at least some of the time. Many noted they had never seen vending machines with healthy options stocked in them.
What We DO and DO NOT Know

• Distribution of unhealthy environments (SES, etc.) → *we know A LOT*

• Environmental vs. individual/social determinants? → *we know A BIT*

• How much environmental change is needed? → *we know VERY LITTLE*
Keeping Up with NEMS NEWS

- 13 publications by NEMS users
- 7 recorded webinars by NEMS users
Let’s build a better mousetrap…
Acknowledgments

Jim Sallis
Larry Frank
Brian Saelens
Terry Conway
Linda Schuessler
Michelle Carvalho
Monique Young
Molly Dowling
Margaret Clawson
Erica Davis
Jim Chapman
Carol Voss
Susan Klein

Funding Support: