Nutrition and Obesogenic Environments

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Snapshot of the Appalachian Region

- Population of 23 million in 420 counties and 13 states.
  - Forty-two percent of the region's population is rural.

- Highest in the nation for percentage of overweight or obese youth (32.9% versus 31.1%)

- Compared to other areas of the country, people living in Appalachia face a heavier burden from chronic diseases and higher rates of premature mortality.
Objectives

1. Describe key features of community and consumer food environments, the types of methods used to measure food environments, and their strengths and limitations.

2. Discuss the roles of geography and rurality in producing food environments that promote obesity.

3. Identify potential environmental and policy-related solutions to prevent obesity among rural children and their caregivers.
Figure 2. A Multilevel Approach to Epidemiology


- Homes
- Schools
- Workplaces
- Recreational Facilities
- Foodservice and Retail Establishments
- Other Community Settings

- Belief Systems
- Heritage
- Religion
- Priorities
- Lifestyle
- Body Image

- Demographic Factors (e.g., age, gender, socioeconomic status, race/ethnicity, disability status)
- Psychosocial Factors
- Knowledge and Skills
- Gene-Environment Interactions
- Other Personal Factors

- Government
- Public Health and Health Care Systems
- Agriculture
- Marketing/Media
- Community Design and Safety
- Foundations and Funders
- Industry
  - Food
  - Beverage
  - Physical Activity
  - Entertainment

Adapted from Story M et al., Annu Rev Public Health 2008;29:253-272
Community and consumer food environments

Figure 1
Model of Community Nutrition Environments

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

Individual Variables
- Sociodemographics
- Psychosocial Factors
  - Perceived Nutrition Environment

Behavior
- Eating Patterns

Obesogenic food environment

Obesogenic environment – “an environment that promotes gaining weight and one that is not conducive to weight loss within the home or workplace.” (Swinburn B, et al (1999))

Factors in the environment that support obesity-related behaviors

- Lack of access to healthy foods (food deserts)
- Plenty of access to less healthy foods (food swamps)
Food Deserts and Food Swamps


Methods used to measure food environments: Five “As” of Access

**Availability**—Is there an adequate supply of healthy foods?
- Number of supermarkets near home.

**Accessibility**—Where is the location of the food supply and ease of getting to that location?
- Travel time and distance.

**Affordability**—What is the price of food and perceptions of worth relative to the cost?
- Salad versus French fries.

**Acceptability**—Does the given food environment meet personal standards?
- Quality of products.

**Accommodation**—How well do local food sources meet residents’ needs?
- Hours open, types of payment accepted.

Methods used to measure food environments: Community food environment

• Type and location of food outlets

• Geographic Information Systems databases constructed to determine coverage of or proximity to various food venues:

• Retail Food Environment Index (RFEI)
The Retail Food Environment Index (RFEI)

The Retail Food Environment Index is constructed by dividing the total number of fast-food restaurants and convenience stores by the total number of grocery stores (including supermarkets) and produce vendors (produce stores and farmers’ markets) within a radius around an individual CHIS respondent’s home (0.5 mile in urban areas, 1 mile in smaller cities and suburban areas, and 5 miles in rural areas).

\[
RFEI = \frac{\# \text{ Fast-Food Restaurants} + \# \text{ Convenience Stores}}{\# \text{ Grocery Stores} + \# \text{ Produce Vendors}}
\]

The result is the ratio of retail food outlets around an individual’s home that are likely to offer little in the way of fresh fruits and vegetables or other healthy foods to those in which such products are likely to be more readily available. For example, an individual whose RFEI is 2.0 has twice as many fast-food restaurants and convenience stores nearby as grocery stores and produce vendors.
The average local RFEI for California adults is approximately 4.5, meaning that for each grocery store or produce vendor around Californians’ homes, there are more than four fast-food restaurants and convenience stores.
Methods used to measure food environments: Community food environment


→ Take home: Used a novel measure of access that took into account hours markets were open (relative to supermarkets) + distance to markets.

→ Among students, greater access was associated with less frequent farmers’ market shopping.
Methods used to measure food environments: Community food environment


→ Take home: Rural participants had larger activity spaces than urban participants.

→ Employed participants had larger participant-defined neighborhood size than unemployed participants.
Fig. 2. Self-defined sketch neighborhoods for selected participants, map image randomly rotated for confidentiality.

Fig. 4. Time-weighted standard deviational ellipses (SDE) and time-space path for 2 selected participants. Vertical dimension represents a single 24-h day. Paths are for one 24-h day, ellipses are based on a 3-day period, green shaded and bounded area is the city of Greenville NC.
Types of methods used to measure food environments: Community food environment

**Policy observation form**

- **Take home:** At the county-level, healthier food zoning was greater in more urban areas and areas with less poverty.
- **At the individual-level,** self-reported fruit and vegetable consumption was associated with healthier food zoning.
## Food Store Provisions

<table>
<thead>
<tr>
<th>Category of Districts</th>
<th>Type of Store and Use</th>
<th>% of Census tracts</th>
<th>CL Addressed</th>
<th>CL Addressed*</th>
<th>CL Addressed*</th>
<th>CL Addressed*</th>
<th>CPD Addressed</th>
<th>CPD Addressed*</th>
<th>CPD Addressed*</th>
<th>CPD Addressed*</th>
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<tbody>
<tr>
<td>Agricultural</td>
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<td>Dairy stores</td>
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<td>Grocery stores</td>
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<td>Mixed use areas</td>
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<td>Produce/sales by coach</td>
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</tbody>
</table>

## Healthy Food Access Provisions

<table>
<thead>
<tr>
<th>Category of Districts</th>
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<th>% of Census tracts</th>
<th>CL Addressed</th>
<th>CL Addressed*</th>
<th>CL Addressed*</th>
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<td>Grocery stores</td>
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</table>

## Restaurant-Related Provisions

<table>
<thead>
<tr>
<th>Category of Districts</th>
<th>Types of establishments</th>
<th>% of Census tracts</th>
<th>CL Addressed</th>
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<td>General convenience</td>
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<td>Residential</td>
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<tr>
<td>Grocery stores</td>
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<tr>
<td>Produce/sales by coach</td>
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</tbody>
</table>

## Additional Notes

- **Categories of Districts**
  - Agricultural
  - Dairy stores
  - General convenience
  - Residential
  - Grocery stores
  - Mixed use areas
  - Produce/sales by coach

- **Types of Establishments**
  - Agricultural
  - Dairy stores
  - General convenience
  - Residential
  - Grocery stores
  - Mixed use areas
  - Produce/sales by coach

- **Notes**
  - Data collected and analyzed by the Community Food Code and Policy Audit Form (CFC-PAF).
Types of methods used to measure food environments: Consumer food environment

In store observations and audits

Shelf space for healthy versus unhealthy foods

Checklist or market basket of foods
Nutrition Environment Measures Survey (NEMS)

Measure #1: MILK

Rate ID: [ ] [ ] [ ]
Store ID: [ ] - [ ] - [ ]

Date: [ ] / [ ] / [ ]
Month Day Year
O Grocery Store O Convenience Store O Other

Marking Instructions: Correct [ ] Incorrect [ ] [ ] [ ] [ ] [ ]

A. Reference Brand
1. Store brand (preferred) O Yes O No
2. Alternate Brand Name:

Comments:

B. Availability

1. a. Is low-fat (skim or 1%) available? O Yes O No
   b. If not, is 2% available? O Yes O No O NA
2. Shelf space: (measure only if low fat milk is available)
   a. Skim
   b. 1%
   c. Whole

Type Pint Quart Half gallon Gallon

C. Pricing All items should be same brand

1. Whole milk, quart [ ]
2. Whole milk, half-gallon [ ]
3. Skim or 1% milk, quart [ ]
(Lowest-fat milk available)
4. Skim or 1% milk, half-gallon [ ]
(Lowest-fat milk available)

Alternate Items:
5. 2%, quart [ ] [ ] O N/A
6. 2%, half-gallon [ ] [ ] O N/A

Nutrition Environment Measures Survey (NEMS)

Measure #2: FRUIT

Rate ID: [ ] [ ] [ ]
Store ID: [ ] - [ ] - [ ]

Date: [ ] / [ ] / [ ]
Month Day Year
O Grocery Store O Convenience Store O Other

Availability and Price

<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>O</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>2. Apples</td>
<td>O Yes</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>3. Oranges</td>
<td>O Navel</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>4. Grapes</td>
<td>O Red seedless</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>
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</tr>
<tr>
<td>7. Strawberries</td>
<td>[ ]</td>
<td>[ ]</td>
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<td>[ ]</td>
</tr>
<tr>
<td>8. Honeydew Melon</td>
<td>[ ]</td>
<td>[ ]</td>
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<td>[ ]</td>
</tr>
<tr>
<td>9. Watermelon</td>
<td>O Seedless</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>10. Pears</td>
<td>O Anjou</td>
<td>[ ]</td>
<td>[ ]</td>
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<td>[ ]</td>
</tr>
<tr>
<td>11. Total Types: (Count # of yes responses)</td>
<td>[ ]</td>
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</tr>
</tbody>
</table>
Types of methods used to measure food environments: Consumer food environment

• Nutrition Environment Measures Survey- Stores, restaurants, corner stores, beverages
  • [http://www.med.upenn.edu/nems/measures.shtml](http://www.med.upenn.edu/nems/measures.shtml)

  • In general, small grocery (n = 6, scores ranged from 8 – 34) and convenience stores (n = 10, scores ranged from 4 – 14) had the lowest NEMS-S-Rev scores.
  • Dollar stores were next; (n = 2, scores ranged from 19 – 23).
  • Supermarkets had the highest scores (n = 5, scores ranged from 34 – 47), mainly due to higher availability and quality sub-scores.
Nutrition Environment Measures Survey for Beverages (NEMS-B)

*The next three slides – come from Dr. Karen Glanz*
Rationale for NEMS-B

Public health experts recommend policies to reduce SSB consumption, including changes to marketing, portion size restrictions, and additional taxes.

• In 2012, the New York City Board of Health announced the Portion Cap Rule, which would have required food service establishments to limit beverage containers for SSBs to 16 ounces or less
  • NEMS-B was originally developed to evaluate the impact of the NYC Portion Cap Rule on store and restaurant beverage environments.
• In 2016, the Philadelphia City Council announced its beverage tax of 1.5 cents/oz on sugary and diet beverages.
  • NEMS-BPP was developed to evaluate prices and marketing of beverages before and after the 2017 tax implementation.
The measures have 2 main sections:

**Product Availability, Size, and Price**
- Fountain beverages
- Single-serving beverages available in bottles, cans, or cartons
- Blended beverages
- Coffee and hot beverages

**Promotional Signage**
- Beverage portion rule
- Location/content/size of signage within the store or restaurant
- Beverage price promotions (e.g., unlimited refills)
# Single Serving Beverages

## Measure 1: Soda - Healthy Items

**Store ID:** [ ]

**Rater ID:** [ ]

**Date:** [ ] / [ ] / [ ]

### Availability & Price - Healthier Options

<table>
<thead>
<tr>
<th>Item Name</th>
<th>Availability</th>
<th>Price</th>
<th>Tax Shown?</th>
<th>Sold?</th>
<th>Sale Type</th>
<th>Sale Price for 1 drink</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Diet Coke</td>
<td>YES NO NA</td>
<td>$</td>
<td>YES No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 oz.</td>
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<td></td>
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</tr>
<tr>
<td>20 oz.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Alternate Brand Diet Soda</td>
<td>YES NO NA</td>
<td>$</td>
<td>YES No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 oz.</td>
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<td>20 oz.</td>
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</tr>
</tbody>
</table>

### Tax Shown?

- **YES:** Included
- **NO:** Separate
- **NA:** Not Applicable

### Sale Types

- **RP:** Reduced Price
- **RQ:** Reduced Price for Quantity
- **BO:** BOGO
- **OT:** Other Sale (Comment)

### Notes

- **Yes, Included:** Sign/label indicates that soda tax increased the cost of this item (not beverages generally) and this increase is already included in the price.
- **Yes, Separate:** Sign/label indicates that the soda tax increased the cost of this item and the added tax is NOT included in the price—tax will be added at the register.
- **Added Tax:** If tax shown is *yes, included* or *separate,* enter the amount of tax added/included for that item. If specific tax amount is not provided, leave "added tax" blank and explain in comment.
Types of methods used to measure food environments – consumer food environment

- Farmers’ market audit tool: impact of improvements
  - Shopping frequency
  - Fruit and vegetable (FV) consumption
  - Audits of farmers’ market amenities
    - Signage
    - Payment types accepted (SNAP & EBT)
  - Availability and quality of food and beverage products, with a focus on fruits and vegetables
FM Inventory, v.08

1. **Farmers’ Market (FM) Name (repeat from cover sheet):**

2. **Farmers’ Market Address (or nearest intersection, e.g. Main St & Cross Ave):**

3. **Is this a "producer-only" Farmers’ Market?**
   - [ ] Yes
   - [x] No

4. **Is there a Market layout plan available?**
   - [ ] Yes
   - [x] No

5. **Seasonality and business hours of market:**

<table>
<thead>
<tr>
<th>Months</th>
<th>Days</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>QMon</td>
<td>QTues QWed</td>
<td>QThurs QFri QSat QSun</td>
</tr>
<tr>
<td>QMon</td>
<td>QTues QWed</td>
<td>QThurs QFri QSat QSun</td>
</tr>
<tr>
<td>QMon</td>
<td>QTues QWed</td>
<td>QThurs QFri QSat QSun</td>
</tr>
</tbody>
</table>

6. **Does the Farmers’ Market receive national, state, or local funding to support the FM?**
   - [ ] National support
   - [ ] State support
   - [ ] Local funding
   - [x] None

   **List funders:**

7. **Is SNAP/EBT accepted at market?**
   - [ ] Yes, at market manager booth (central point of purchase)
   - [ ] Yes, individual vendors
   - [x] No

8. **What forms of payment are accepted at this Farmers’ Market?**
   - [x] Cash
   - [ ] Check
   - [ ] Credit/debit
   - [ ] SNAP
   - [ ] WIC

9. **Are the following national incentive programs distributed and/or accepted at this market?**
   - [ ] WIC CV
   - [ ] WIC FMNP
   - [ ] Senior FMNP
   - [ ] Other
   - [ ] NA

10. **Are there any other local or state-based incentive programs accepted at this market?**
    - [ ] No
    - [x] Yes: Name/s & Amount:

11. **Number and type of educational materials distributed by Farmers’ Market manager monthly:**

<table>
<thead>
<tr>
<th># Educational Materials/Weekly</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>QGen. Nutrition QHealthy Recipes QIncentives QFood Safety QOther:</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
</tbody>
</table>

12. **Number of food education events held, including cooking demonstrations:**

    /Per month

13. **Do food vendors exclusively sell items at advertised price or do they negotiate deals?**
   - [ ] Advertised price exclusively
   - [ ] Advertised price mostly
   - [ ] Half/Half
   - [ ] Negotiate mostly
   - [ ] All negotiation
   - [x] Don’t know

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Types of methods used to measure food environments: Consumer food environment

- *Bridging the Gap Community Measures Project*

- In store observation form

- → Take home: Significant association between the primary food store and consumption of fruits and vegetables ($P = .005$) and sugary beverages ($P = .02$).
### A. GENERAL AND CHECK-OUT

<table>
<thead>
<tr>
<th>A1. TYPE OF STORE</th>
<th>A2. Are these available at CHECK-OUT?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supermarket (Jewel-Osco, Kroger, Safeway)</td>
<td>a. Candy</td>
</tr>
<tr>
<td>Grocery (Aldi, Trader Joe's, &quot;mom &amp; pop&quot;)</td>
<td>b. Fresh fruits or vegetables</td>
</tr>
<tr>
<td>Limited Service CODE A2a</td>
<td>c. Bottled water</td>
</tr>
<tr>
<td>A1a. TYPE OF LIMITED SERVICE - CODE ONLY IF A2a=3</td>
<td>d. Sweetened beverages (soda, etc.)</td>
</tr>
<tr>
<td>Convenience Store (7-11, White Hen, ampm)</td>
<td>e. Mexican (tacos, burritos, tacos, etc.)</td>
</tr>
<tr>
<td>Small Discount Store (Dollar General, 99c Store)</td>
<td>f. Bottled water</td>
</tr>
<tr>
<td>Drug Store/Pharmacy (CVS, Rite Aid, Walgreens)</td>
<td>g. Bottled water</td>
</tr>
<tr>
<td>Liquor Store (Ryan’s Liquor and Mini Mart)</td>
<td>h. Bottled water</td>
</tr>
<tr>
<td>Other, SPECIFY:</td>
<td>i. Bottled water</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A3. Does the store have a...?</th>
<th>A4. Does the store have a plexiglass or other divider at the cash register?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Bank</td>
<td>NO YES</td>
</tr>
<tr>
<td>b. Pharmacy</td>
<td></td>
</tr>
<tr>
<td>c. Butcher or fresh meat service counter</td>
<td></td>
</tr>
<tr>
<td>d. Deli counter</td>
<td></td>
</tr>
<tr>
<td>e. Bakery</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A5. Number of cash registers (IF 20+, CODE 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO YES</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A6. Fast food or other individual, ready-to-eat items available?</th>
<th>A7. Is 50% or more of the store’s inventory beer, wine, and/or liquor?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Salads/salad bar</td>
<td>NO YES</td>
</tr>
<tr>
<td>b. Sandwiches (cold)</td>
<td></td>
</tr>
<tr>
<td>c. Pizza</td>
<td></td>
</tr>
<tr>
<td>d. Hot dogs/corn dogs/hamburgers</td>
<td></td>
</tr>
<tr>
<td>e. Mexican (tacos, burritos, tacos, etc.)</td>
<td></td>
</tr>
</tbody>
</table>

### B. FRESH PRODUCE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NO YES</td>
<td></td>
<td>REGULAR</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### NOTES
- Each broccoli price per pound is different.
Limitations: Community food environment measures

• Most tools are geography based and do not account for features of the consumer food environment.
  • Need to combine consumer and community food environments.

• Inaccuracy of secondary data sources for finding food venues.
  • Especially in rural areas.

• Transience of food venues.

• Defining ‘healthy’ versus ‘unhealthy’ food venues.

• Difficult to determine what a “neighborhood” is.

• Proximity not always equal to use.
Limitations: Consumer food environment measures

• Some tools measure mostly healthy foods.
• Few tools assess food environment features related to impulse purchases.
• Most tools take a long time to complete!
• Validity of some tools may not be firmly established.
Roles of geography and rurality in producing food environments that promote obesity

- Rural food environment—Rural food deserts and food insecurity.
- Food access issues—Lack of geographic access can promote purchase of calorically dense items with longer shelf-lives.
- Long commute times—Increase exposure to fast, convenient food; less time for cooking;
- Rural “food culture”
Food Deserts – More prevalent in low-income rural areas

<table>
<thead>
<tr>
<th>Geographic area</th>
<th>Total households</th>
<th>Households without access to a vehicle</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Millions</td>
<td>Between 1/2 to 1 mile from a supermarket</td>
<td>Number</td>
<td>Percent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total U.S.</td>
<td>104.9</td>
<td>3.4</td>
<td>3.2</td>
<td>2.4</td>
</tr>
<tr>
<td>Low-income areas</td>
<td>25.1</td>
<td>1.6</td>
<td>6.4</td>
<td>0.9</td>
</tr>
<tr>
<td>Urban areas</td>
<td>69.9</td>
<td>2.9</td>
<td>4.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Low-income areas</td>
<td>15.6</td>
<td>1.3</td>
<td>8.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Urban clusters</td>
<td>9.7</td>
<td>0.4</td>
<td>4.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Low-income areas</td>
<td>3.6</td>
<td>0.2</td>
<td>5.6</td>
<td>0.1</td>
</tr>
<tr>
<td>Rural areas</td>
<td>25.3</td>
<td>0.2</td>
<td>0.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Low-income areas</td>
<td>5.9</td>
<td>0.1</td>
<td>1.7</td>
<td>0.4</td>
</tr>
</tbody>
</table>

1 This column shows the total number of households regardless of vehicle access.

Food Insecurity in the U.S.

In 2012, 14.5 percent (17.6 million households) were food insecure.

- Food-insecure households (those with low and very low food security) had difficulty at some time during the year providing enough food for all their members due to a lack of resources.

- Food insecurity was more common in large cities and rural areas than in suburban areas and exurban areas around large cities.

Rural obesity, food deserts, and food insecurity

- Higher prevalence of obesity in rural vs urban areas.
- Complex interplay between lower access to healthy foods and food insecurity.
Regardless, the greater distances and greater amounts of time rural dwellers must spend to procure healthy food in general is an impediment to access. For instance, we know that increased travel time is associated with decreased grocery-shopping frequency in some rural communities. To maximize shopping efficiency and minimize the time spent driving, rural residents often make large-volume shopping trips once monthly to supercenters.