Examination of the built environment and prevalence of obesity:

Neighborhood characteristics, food purchasing venues, green space and distribution of body mass index in Pittsburgh, PA.

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Obesity is an epidemic in the United States

- 65% of the United States population is either overweight or obese
- Individuals unequally affected
- Limited research has been able to combine neighborhood level variables of the built and social environment, especially considering both diet (i.e. the food environment) and physical activity (i.e. green space environment) concurrently, alongside of individual-level health behavioral and obesity (BMI) data.
Access to open space for physical activity and healthy food comprise two major pathways which link dimensions of the built environment to obesity.
Individual level and Neighborhood Data

• NEIGHBORHOOD LEVEL
  • Socioeconomic and racial/ethnic composition of neighborhoods
    – United States Census 2000
  • Food purchasing venues
    – Allegheny County Health Department – Pittsburgh, PA
    – ReferenceUSA
  • Green space data
    – Allegheny County Parks Department

• INDIVIDUAL LEVEL
  • Behavior Risk Surveillance System (BRFSS) Data
    – BMI
    – Age
    – Sex
    – Race/Ethnicity
Pittsburgh, PA, its parks and food purchasing venues
### Descriptive Statistics: BRFSS Data

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
<th>BMI</th>
<th>NH Black</th>
<th>NH White</th>
<th>Hispanic</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1335</td>
<td>430</td>
<td>905</td>
<td>18 – 24.9 (Normal)</td>
<td>503</td>
<td>41.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>430</td>
<td></td>
<td></td>
<td>25 – 29.9 (Overweight)</td>
<td>424</td>
<td>34.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>905</td>
<td></td>
<td></td>
<td>30+ (Obese)</td>
<td>296</td>
<td>24.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
<td>NH Black</td>
<td>335</td>
<td>25.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NH White</td>
<td>884</td>
<td></td>
<td></td>
<td>NH White</td>
<td>66.2</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Hispanic</td>
<td>41</td>
<td></td>
<td></td>
<td>Hispanic</td>
<td>3.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>75</td>
<td></td>
<td></td>
<td>Other</td>
<td>5.6</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Tamara Dubowitz and Theresa Osypuk 6
## Descriptive Statistics: Pittsburgh Neighborhoods

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parks</td>
<td>183</td>
</tr>
<tr>
<td>Total acreage</td>
<td>2576.8</td>
</tr>
<tr>
<td>Median acreage</td>
<td>9.2</td>
</tr>
<tr>
<td>Food Purchasing Places</td>
<td>1798</td>
</tr>
<tr>
<td>Grocery Stores</td>
<td>143</td>
</tr>
<tr>
<td>Convenience Stores</td>
<td>168</td>
</tr>
<tr>
<td>Fast food places</td>
<td>182</td>
</tr>
<tr>
<td>Carry out, pizza and sandwiches</td>
<td>211</td>
</tr>
<tr>
<td>Limited service branch restaurants</td>
<td>117</td>
</tr>
<tr>
<td>Limited service single location restaurants</td>
<td>707</td>
</tr>
<tr>
<td>Specialty food stores</td>
<td>55</td>
</tr>
<tr>
<td>Candy and Confectionary</td>
<td>57</td>
</tr>
<tr>
<td>Coffee Shops</td>
<td>81</td>
</tr>
</tbody>
</table>
**Multilevel models**

- 5 models: **BMI** as a continuous outcome
  - Percent greenspace
  - Percent Black
  - Percent poverty
  - Median Income
  - Percent White

- Individual level covariates:
  - Age, sex, race/ethnicity
Unadjusted Multilevel Models (adjusting for level one and level 2 variance)

<table>
<thead>
<tr>
<th></th>
<th>Intercept</th>
<th>Coefficient</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion Green Space in Neighborhood</td>
<td>27.04</td>
<td>-0.28</td>
<td>0.036</td>
</tr>
<tr>
<td>Proportion Black in Neighborhood</td>
<td>27.13</td>
<td>0.18</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Proportion Poverty in Neighborhood</td>
<td>27.06</td>
<td>0.11</td>
<td>0.37</td>
</tr>
<tr>
<td>Median HH Income</td>
<td>27.10</td>
<td>-0.26</td>
<td>0.004</td>
</tr>
<tr>
<td>Proportion White</td>
<td>27.11</td>
<td>-0.164</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>
### Multilevel Models Adjusting for Individual level Age, Sex and Race/ethnicity

<table>
<thead>
<tr>
<th></th>
<th>Intercept</th>
<th>Coefficient</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proportion Green Space in Neighborhood</strong></td>
<td>26.53</td>
<td>-0.235</td>
<td>0.057</td>
</tr>
<tr>
<td><strong>Proportion Black in Neighborhood</strong></td>
<td>26.54</td>
<td>0.017</td>
<td>0.74</td>
</tr>
<tr>
<td><strong>Proportion Poverty in Neighborhood</strong></td>
<td>26.48</td>
<td>-0.06</td>
<td>0.595</td>
</tr>
<tr>
<td><strong>Median HH Income</strong></td>
<td>26.60</td>
<td>-0.16</td>
<td>0.042</td>
</tr>
<tr>
<td><strong>Proportion White</strong></td>
<td>26.52</td>
<td>-0.0053</td>
<td>0.916</td>
</tr>
</tbody>
</table>
Density of green space and median neighborhood income matter for prevalence of obesity in Pittsburgh

• In raw models (unadjusted):
  – All variables except for percent poverty are associated with BMI

• Adjusted models:
  – Neighborhood racial composition no longer significant
  – Percent green remains marginally significant
  – Median income is significant
Pittsburgh, Pa: Neighborhood Proportion of the Population under Poverty and Average BMI per neighborhood

Legend
Proportion Under Poverty
- 0.000 - 0.102
- 0.103 - 0.179
- 0.179 - 0.260
- 0.261 - 0.406
- 0.407 - 0.701

Average BMI
- 18.134 - 24.900
- 24.901 - 29.900
- 29.901 - 40.0482
Pittsburgh, Pa: Neighborhood Park Acreage and Average BMI per neighborhood

Park Acres
- 0.000000 - 10.975400
- 10.975401 - 35.471200
- 35.471201 - 63.439600
- 63.439601 - 256.730700
- 356.730701 - 683.927500

Average BMI
- 19.1349 - 24.0000
- 24.0001 - 29.0000
- 29.0001 - 40.0482
Food Purchasing Data: presenting a challenge

• Compiled food purchasing data from ReferenceUSA, which is a subsidiary of InfoUSA
  – Grocery Stores; Convenience Stores; Fast food places; Carry out, pizza and sandwiches; Limited service branch restaurants, Limited service single location restaurants, etc.

• Geocoded data, merged with neighborhood data

• In reviewing data, found misclassification of restaurants (fast food restaurants classified with higher end restaurants)
Conclusions

• Capturing appropriate and relevant environmental variables is difficult.
• The SOCIAL and BUILT environment matter to health, and in particular – obesity.

• We need better and more systematic data collection that is available for use.
RAND’s Center for Population Health and Health Disparities

- Data Core
  http://www.rand.org/health/centers/pophealth/data.html

- The CPHHD Data Core houses a large number of measures derived for a variety of substantive areas in several distinct data series including:
  - Cost-of-Living
  - Disability
  - Pollution
  - Population and Housing Characteristics
  - Segregation Indices
  - Street Connectivity
Acknowledgements

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  – BRFSS data

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