Measuring Degrees of Walkability to Reduce Obesity using GIS
ESRI User Conference July 10 - 14, 2017

Bernardita Calinao
Marie Rusin
Outline

• Walkability and Obesity issue
• Central Harlem study area
• Objectives
• Methodology
• Walkability findings
• Walkzone improvement opportunities
• Conclusions
Outline

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WHAT IS WALKABILITY?

Walkability is a measure of the effectiveness of community design in promoting walking and bicycling as alternatives to driving cars to reach shopping, schools, and other common destinations in order to promote fitness, combat obesity, enhance sustainability and quality of life.

Source: Modeling Walkability, 2012
The Obesity Epidemic in the US

- **78M or 38%**
  - Adult Obesity

- **13M or 17%**
  - Children and teenage obesity

- **44%**
  - Of Americans will be obese by 2030

Central Harlem vs Upper East Side

- **Diabetes**
  - Manhattan: 13%
  - Upper East Side: 7%
  - Central Harlem: 4%

- **Obesity**
  - Manhattan: 16%
  - Upper East Side: 11%
  - Central Harlem: 13%

- **Poverty**
  - Manhattan: 18%
  - Upper East Side: 7%
  - Central Harlem: 11%

- **Unemployment**
  - Manhattan: 8%
  - Upper East Side: 5%
  - Central Harlem: 13%

Source: Community Health Profiles: 2015
Central Harlem – Study Area

Walkability study - Manhattan neighborhoods

Walkability study - Study Area

Legend
- Manhattan neighborhoods

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Study Area

<table>
<thead>
<tr>
<th># of parcels</th>
<th>1185</th>
<th>1185</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>69.4 hectares</td>
<td>171.5 acres</td>
</tr>
<tr>
<td>Width</td>
<td>0.85 km</td>
<td>0.53 miles</td>
</tr>
<tr>
<td>Length</td>
<td>0.79 km</td>
<td>0.49 miles</td>
</tr>
<tr>
<td>Sidewalk length</td>
<td>17.7 km</td>
<td>11 miles</td>
</tr>
</tbody>
</table>
Objectives

• To apply a microscale assessment approach to determine the walkability of sidewalks;

• To map degrees of walkability using Geographic Information System;

• To identify opportunities for sidewalk placemaking that would increase walking and improve health.
Microscale Methodology

Study Area
Sidewalk Visual Audit
Sidewalk Assessment
GIS Mapping & Analysis
Findings
Placemaking Opportunities

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Walkability criteria

- Beauty
- Use
- Safety
- Comfort
- Access
- Vibrance
- Interest
- Legibility
### Sidewalk inventory

<table>
<thead>
<tr>
<th>Comfort *</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public seating</td>
<td><img src="image" alt="Circle" /></td>
<td><img src="image" alt="Circle" /></td>
</tr>
<tr>
<td>Private seating</td>
<td><img src="image" alt="Circle" /></td>
<td><img src="image" alt="Circle" /></td>
</tr>
<tr>
<td>Umbrella</td>
<td><img src="image" alt="Circle" /></td>
<td><img src="image" alt="Circle" /></td>
</tr>
<tr>
<td>Awning for shading</td>
<td><img src="image" alt="Circle" /></td>
<td><img src="image" alt="Circle" /></td>
</tr>
<tr>
<td>Tree shading</td>
<td><img src="image" alt="Circle" /></td>
<td><img src="image" alt="Circle" /></td>
</tr>
<tr>
<td>Dog/ cat water bowl</td>
<td><img src="image" alt="Circle" /></td>
<td><img src="image" alt="Circle" /></td>
</tr>
<tr>
<td>Other comfort amenity</td>
<td><img src="image" alt="Circle" /></td>
<td><img src="image" alt="Circle" /></td>
</tr>
</tbody>
</table>

### Rule based scoring system

<table>
<thead>
<tr>
<th>Criteria</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfort</td>
<td>Seating (with public seating) + Shading + 1 amenity</td>
<td>Seating (with public seating) + Shading OR Seating (without public seating) + Shading + 1 amenity</td>
<td>Seating Only</td>
<td>Shading Only</td>
<td>No seating or shading</td>
</tr>
</tbody>
</table>
Microscale Methodology

Inter-rater reliability

- 2 raters
- Test on 1 avenue = 19 blocks
- 195 attributes
- 15 attributes < 80 % of agreement

<table>
<thead>
<tr>
<th>Criteria</th>
<th>% agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building façade compatibility/ continuity/ complementarity</td>
<td>73.7</td>
</tr>
<tr>
<td>Signage design</td>
<td>68.4</td>
</tr>
<tr>
<td>Boutique/nonfood store</td>
<td>78.9</td>
</tr>
<tr>
<td>Other specialty store small retail</td>
<td>78.9</td>
</tr>
<tr>
<td>Other safety measure</td>
<td>78.9</td>
</tr>
<tr>
<td>Awning for shading</td>
<td>78.9</td>
</tr>
<tr>
<td>Tree shading</td>
<td>78.9</td>
</tr>
<tr>
<td>Gathering</td>
<td>78.9</td>
</tr>
<tr>
<td>&gt; 50% block transparent (glass, able to see through &gt;75%)</td>
<td>73.7</td>
</tr>
<tr>
<td>Legibility</td>
<td>68.4</td>
</tr>
<tr>
<td>Pavement: misalignments</td>
<td>78.9</td>
</tr>
<tr>
<td>Litter/trash (WZ)</td>
<td>73.7</td>
</tr>
<tr>
<td>ADA</td>
<td>73.7</td>
</tr>
<tr>
<td>Does vegetation cover &gt; 50%</td>
<td>68.4</td>
</tr>
<tr>
<td>Litter/trash (FZ)</td>
<td>63.2</td>
</tr>
</tbody>
</table>
GIS analysis

- Display dynamic result in a Web Viewer;
- Display overall walkability;
- Identify problematic criteria;
- Identify patterns.
GIS analysis

- Web viewer
Walkability study - Central Harlem, NY

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**GREEN CART**

"Allowing pedestrians access to healthy food by locating green carts in the module. Shading covering multiple carts/desks help to maintain stylistic integrity and improve legibility."

**SHADING**

"Comfort element for pedestrians to improve walkability. Also solar panels installed for energy efficiency."

**EARTHEN BERM**

"Raised barrier to improve safety and noise pollution. Also planting enables natural beauty improvement and comfort by shading."

**SOLAR POWER RECYCLING**

"Recycling bins with solar power panels to improve sustainability whereas comfort and sidewalk use."

**BIOSWALE**

"Tree pits create raingarden conditions to manage stormwater whereas natural beauty, and comfort by shading and safety by fences."

**CURB EXTENSIONS**

"Improving safety and comfort by reducing speed and calming traffic down and extending pedestrian waiting area."
Conclusion

Microscale research method:

• Defines walkable routes by calculating scores
• Incorporates 8 walkability dimensions
• Identifies opportunities for building healthy places (low walkability score)
• Springboard for private-public partnerships
• By identifying walkable routes and sidewalk improvement opportunities – people will walk more

GIS tool:

• For health research
• For walkability assessment
• For placemaking opportunities
Aknowledgement

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