Introduction

• The built environment and walkability
  – Americans spend 70%+ of their waking hours sitting

• Different communities require different solutions
  – Climate
  – Community type (“modern” vs “traditional”)
  – Geography

• Most walkability literature from temperate climates in the Western world
Introduction

• Evaluation of walkability in a sub-tropical climate through four perspectives:
  – Land use
  – Built environment
  – Transportation Infrastructure
  – Urban Tree Canopy

• “Walkability” determined based on WalkScore
Four South Florida communities selected

“Walkable” traditional communities:
• Wynwood/Edgewater - 88
• South Beach - 76

“Not Walkable” modern communities:
• Miami Lakes - 39
• Doral - 42

(All located in Miami-Dade County)
<table>
<thead>
<tr>
<th>Study Area Information</th>
<th>Miami Lakes</th>
<th>Doral</th>
<th>Wynwood-Edgewater</th>
<th>Miami Beach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year Incorporated</td>
<td>2000</td>
<td>2003</td>
<td>1896*</td>
<td>1915</td>
</tr>
<tr>
<td>Land Area (sq. mi.)</td>
<td>5.63</td>
<td>13.88</td>
<td>4.01</td>
<td>7.63</td>
</tr>
<tr>
<td>Population per sq. mi.</td>
<td>5,211.40</td>
<td>3,293.50</td>
<td>9,065.48</td>
<td>11,510.50</td>
</tr>
<tr>
<td>Median HH Income</td>
<td>$66,601</td>
<td>$72,933</td>
<td>$35,796</td>
<td>$44,342</td>
</tr>
<tr>
<td>% Walking to Work</td>
<td>0.10</td>
<td>0.60</td>
<td>5.42</td>
<td>11.60</td>
</tr>
<tr>
<td>% Bicycling to Work</td>
<td>0.00</td>
<td>0.00</td>
<td>2.17</td>
<td>5.00</td>
</tr>
<tr>
<td>% Public Transit to Work</td>
<td>0.80</td>
<td>0.90</td>
<td>13.88</td>
<td>10.60</td>
</tr>
</tbody>
</table>

*City of Miami
Land Use and Built Environment

Land Use
• Population density
• Housing mix
• Land use mix
• Proximity of destinations
• Presence of green space & water bodies

Built Environment
• Access to recreational activities
• Building density

Miami Beach
Transportation Infrastructure

- Road infrastructure
  - Intersection Density
  - Block Length
  - Grid System
  - Street Density

- Pedestrian Infrastructure

- Public transit
  - “Pedestrian extender”
Geography and Development Type

• **Urban Development Boundary (UDB)**
  - Intention: to protect environmentally sensitive areas
  - Boundary shifts have led to incremental growth/sprawl

• **Walking Purpose**
  - Walking for transportation (older communities) vs recreational walking (newer communities)
Climate Mitigation - Shade

• Tropical climate affect on pedestrians
  – heat, humidity, glare, heavy rain

• Limited literature

• Thermal comfort plays an important role in walkability
  – Shorter block lengths than typically recommended
  – Shade is vital

• Urban Tree Canopy as indicator

[Image: Street scene with shade provided by trees]
Data

• GIS Data sources:
  – Miami Dade County
  – Florida International University GIS Center
  – Million Trees Miami

• Data standardized by using 1-mile buffers around neighborhood centers
  – Geographic center
  – Local seat of government
  – Major Arterials
Results – Land Use
Non-walkable Communities

• Doral highest land use %: “Industrial” (17.57)

• Increased agricultural land and water bodies

• “Commercial” land use isolated

Walkable Communities

• Higher % of “Residential – Multi Family”

• Greater mixes of uses

• “Commercial” land use more spread out
# Results – Built Environment

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</thead>
<tbody>
<tr>
<td><strong>Total Area</strong></td>
<td>28.38</td>
<td>51.74</td>
<td>12.72</td>
<td>25.75</td>
</tr>
<tr>
<td>(million sq. ft.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Building Footprint</strong></td>
<td>9.96</td>
<td>8.33</td>
<td>10.12</td>
<td>13.38</td>
</tr>
<tr>
<td>(million sq. ft.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Building Density</strong></td>
<td>0.35</td>
<td>0.16</td>
<td>0.80</td>
<td>0.51</td>
</tr>
</tbody>
</table>
Results – Built Environment

Large setbacks & low building density (Miami Lakes)

Small setbacks and high building density (Miami Beach)
Results – Transportation Infrastructure

- Walkable Communities had:
  - Higher total street length
  - Smaller average block length
  - Higher # of intersections per sq. mi.
  - Higher sidewalk and crosswalk density
  - Increased transit access

- Non-Walkable Communities had increased presence of cul-de-sacs and gated communities

- Non-walkable communities’ average block lengths fell under recommended guidelines (400-500 ft.)
  - Even shorter block lengths needed in hotter climates
Pedestrian Infrastructure

Transit Infrastructure
Results – Climate Mitigation

- No association found between UTC and walkability
- Average UTC actually *lower* in walkable communities
- UTC likely not best measurement for measuring urban shade

### Urban Tree Canopy

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<tbody>
<tr>
<td>Existing UTC (%)</td>
<td>18.8</td>
<td>14.1</td>
<td>15.1</td>
<td>11.6</td>
</tr>
<tr>
<td>Possible UTC - Pervious (%)</td>
<td>21.3</td>
<td>21.5</td>
<td>17.1</td>
<td>21.6</td>
</tr>
<tr>
<td>Possible UTC - Impervious (%)</td>
<td>22.6</td>
<td>26.6</td>
<td>31.7</td>
<td>28.8</td>
</tr>
<tr>
<td>Not Suitable</td>
<td>37.3</td>
<td>37.8</td>
<td>36.1</td>
<td>37.9</td>
</tr>
</tbody>
</table>
Site observation of walkable communities showed that both natural shade from urban trees and man-made shade from buildings and awnings were very much present. Pedestrians opted to stay in shady areas when possible.
Conclusion

• Walkability indicators in sub-tropical communities similar to those in temperate ones

• Greatest effect on walkability in South Florida:
  – Land use mix
  – Building density
  – Short block lengths in grid-like network
  – Transit access

• Block lengths should be shorter than current recommended guidelines
  – (≤~300 ft in tropical climates)

• Urban tree canopy theorized to affect walkability but no strong association found
  – Walkable communities had less UTC
  – UTC likely not best measurement for urban pedestrian shade
Discussion

• Urban Development Boundary
  – County to gain 700,000 residents by 2030
  – Current development restrictions: 5-acre min. lot size
  – Continued development along line associated with less walkability

• Climatic effects on pedestrians
  – New measures needed to foster urban shade

• Possible role of public art?

Wynwood-Edgewater
References


References


References

- Eliasson, I. The Use of Climate Knowledge In Urban Planning. *Landscape and Urban Planning*, Vol. 48, No.1, 2000, pp. 31-44. [https://doi.org/10.1016/S0169-2046(00)00034-7](https://doi.org/10.1016/S0169-2046(00)00034-7).