A built environment natural experiment:
Exploring the influence of changes to the built environment on walking behavior within a university campus

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Supervisor: Dr. Hui LIN
Host supervisor: Dr. Nicolas Oreskovic
Dr. Wendy Guan
Outline

• Background
  – Built environment and walking behavior

• My PhD thesis
  – Research questions, experimental design and preliminary studies

• Working here…
  – Changes analysis, statistical analysis consulting, a manuscript
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Why study walking?

• Studies in urban planning
  – By shaping the built environment, planners aim to encourage walking while reducing motorized movement

• Studies in public health
  – An important form of moderate-intensity physical activity
  – A practical health improvement method for general public (Owen, Humpel et al. 2004)
Built environment and walking behavior

• **Built environment**
  – Land use pattern, transportation, urban design (Handy 2005; Saelens and Handy 2008)
  – It provides spatial, temporal and social contexts for human behavior.

• **Walking behavior** (Saelens, Sallis et al. 2003)
  – Walking for transport: a modal choice
  – Walking for leisure

• **The title**
  – *For public health*: A built environment natural experiment: Exploring the influence of changes to the built environment on walking behavior within a university campus.
  – *For urban planning*: Evaluating the impact of land-use and transportation: How changes in the built environment affect walking behavior in Hong Kong.
  – *For GIS*: Using GIS to explore the influence of changes to the built environment on walking behavior within a university campus in Hong Kong.
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Research questions

- Will changes to built environment lead to changes to walking behavior?
  - How to measure the changes to walking behavior?
    - Walking diary and GPS
  - How to measure the changes to built environment?
    - GIS and questionnaire in theory of planned behavior
A natural experiment
Timeline of experiment

Since 2008

First survey: before change
21/27 Mar. 2012
Aug. to Sept. 2012
New built environment is open

Second survey: After change
21 Nov. to 5 Dec. 2012
198/169 respondents

<table>
<thead>
<tr>
<th>College distribution</th>
<th>Gender distribution</th>
</tr>
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<tbody>
<tr>
<td>SHHO 9%</td>
<td>M 45%</td>
</tr>
<tr>
<td>LWS 4%</td>
<td>F 55%</td>
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<tr>
<td>SC 15%</td>
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<tr>
<td>CC 21%</td>
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<tr>
<td>UC 22%</td>
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<tr>
<td>NA 26%</td>
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<td>MC 3%</td>
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<thead>
<tr>
<th>reply volunteer recuriment</th>
<th>Respondents</th>
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<tbody>
<tr>
<td>First-wave</td>
<td>246 198</td>
</tr>
<tr>
<td>Second-wave</td>
<td>198 169</td>
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</tbody>
</table>
Changes analysis

Increased intersections of pedestrian network

Comparison of density change to pedestrian network utilization (1st as referent category)
The increased using of escalator near YIA, and the decrease of traditional path (maybe induced by the hilly topography)
The increased using of New Asia pedestrian (maybe induced by the decrease of New Asia bus timetable)
The decreased using of road in the central campus (maybe induced by change of classroom)
Walking exposed to built environment: by walking diary

1st survey, subject 1’s daily walking

2nd survey, subject 1’s daily walking

<table>
<thead>
<tr>
<th>Independent variables:</th>
<th>Dependent variables:</th>
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</thead>
<tbody>
<tr>
<td>Exposed to buildings</td>
<td>D_walkingratio</td>
</tr>
<tr>
<td>ED_workcapacityU</td>
<td>D_walkingdistance</td>
</tr>
<tr>
<td>ED_workcapacityM</td>
<td>D_altitude_range</td>
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<td>ED_workcapacityL</td>
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<tr>
<td>ED_lifecapacityU</td>
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<td>ED_lifecapacityL</td>
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<tr>
<td>Exposed to pedestrian network</td>
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<td>ED_pedeintersect</td>
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<tr>
<td>Exposed to bus stations</td>
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<tr>
<td>ED_busregular</td>
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<tr>
<td>ED_busmiddleclass</td>
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<tr>
<td>Exposed to population density</td>
<td></td>
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<td>ED_popdensity</td>
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</table>
Accessibility in hilly environment
\[ A_i = \frac{\sum_{j=1}^{29} (Public\_Space_j \times e^{-\beta \times \text{Walking\_Time}_j})}{\sum_{j=1}^{29} Public\_Space_j} \]

(Guibo SUN, Hui LIN, Rongrong LI, 2012)
Statistical analysis

• **Two waves of survey**

Walking behavior (or bus riding behavior): Structural Equation Model with standardized path coefficients and explained variance in intentions and behavior. The subscripts 1 and 2 refer to Wave 1 and Wave 2, respectively.

A = attitude toward the behavior; SN = subjective norm; PBC = perceived behavioral control; I = intention; B = behavior.
Chi square = 336.336
df = 70
p = 0.000
GFI = 0.928
AGFI = 0.892
RMSEA = 0.082
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Working here…

• Changes analysis: A built environment natural experiment
• Statistical analysis consulting
• Prepare a manuscript for submission
Thanks!

Questions and comments are welcome!

Guibo SUN

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