Active Living and Community Design: The Twin Cities Walking Study

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Active Living and Community Design
The Twin Cities Walking Study

1. Why walking?
2. How environments affect walking
3. Twin Cities Walking Study
4. Environmental change is not a quick fix
1. Why Walking?
Big Picture

• Popular interest in obesity
• Weight = food minus activity
• Early studies found exercise did not vary by environment but weight did
• Explanations:
  – Research design
  – Food intake
  – Non-leisure physical activity
• Education not working
• Seemed possible to increase overall activity through utilitarian PA
1. Why Walking?
Why People Die in the US, 2002

<table>
<thead>
<tr>
<th>Disease</th>
<th>US (CDC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Disease</td>
<td>28.5%</td>
</tr>
<tr>
<td>Cancer</td>
<td>22.8%</td>
</tr>
<tr>
<td>Stroke</td>
<td>6.7%</td>
</tr>
<tr>
<td>Emphysema, chronic bronchitis</td>
<td>5.1%</td>
</tr>
<tr>
<td>Accidents</td>
<td>4.4%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3.0%</td>
</tr>
<tr>
<td>Flu &amp; pneumonia</td>
<td>2.7%</td>
</tr>
<tr>
<td>Alzheimer's/senility</td>
<td>2.4%</td>
</tr>
<tr>
<td>Kidney disease</td>
<td>1.7%</td>
</tr>
<tr>
<td>Septicemia/systemic infection</td>
<td>1.4%</td>
</tr>
</tbody>
</table>
1. Why Walking?
Underlying Preventable Causes in US, 2000

<table>
<thead>
<tr>
<th>Cause</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>18.10%</td>
</tr>
<tr>
<td>Poor diet and physical inactivity</td>
<td>16.60%</td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>3.50%</td>
</tr>
</tbody>
</table>

Percent Doing 
No Leisure Time 
Physical Activity 
--staying much the same

Percent Obese 
1990-2002 
--going up

Source: 
http://apps.nccd.cdc.gov/brfss/Trends/
1. Why Walking
The Idea of Active Living

“A way of life that integrates physical activity into daily routines. The goal is to accumulate at least 30 minutes of activity each day.” Active Living by Design

Related to CDC recommendation
Walking key to active living as almost everyone walks already, every day
1. Why Walking?
How Active are People Now?

• We don’t really know
• People are active in different parts of their lives

• Work
• Exercise and leisure
• Care/chores/errands
• Commuting to work

• Until recently, data collected only for some types of activity
2. How Environment Affects Walking
Three Perspectives on Reasons for Walking

- Transportation
- Urban/landscape design (physical planning, architecture, landscape architecture)
- Physical activity research
Different Views of the Same Place
• Transportation: Disincentives to driving
• Urban design: Dynamic, complex environment (Jane Jacobs)
• Physical activity: Social/physical supports and constraints
• Why this matters…because of different solutions
2. Environment
Four Aspects of Community Design Related to Walking

Four dimensions
– Density
– Street pattern
– Mixed use
– Pedestrian infrastructure

But other aspects of the environment also matter, though these are not technically part of the built environment but rather its use:
– Traffic
– Climate and air quality
– Etc.
Why street pattern matters—0.25 mile crow flies vs. street network distances

Street Network Grid

Street Network Cul-de-sac
2. Environment
The State of Knowledge When We Started the Twin Cities Walking Study

- We knew that differences in density, street pattern, mixed use, and pedestrian infrastructure seem to affect travel walking
- But so did incomes, pricing, social and cultural norms, and personal preference, etc.
- We didn’t know how much the environment mattered, who was most affected, and if the perceived vs. the real environment was most important
- We didn’t know which aspects were key—e.g. sidewalks or crosswalks
3. Twin Cities Walking Study
Big Ideas/Hypotheses

1. Density, street pattern, mixed use, pedestrian infrastructure and amenities affect utilitarian walking
   Results to date: generally true
2. But so do socio-economic factors, perceptions, and individual tastes
   Results to date: confirmed
3. Assumed leisure physical activity similar most places so if travel/utilitarian physical activity is increased, overall physical activity will increase
   Results to date: we were wrong (at least in typical North American cities)
3. Twin Cities Walking Study
Ann Forsyth, Kathryn Schmitz, J. Michael Oakes

36 805*805 meter areas in corridor from St. Paul to Blaine
- Vary by combinations of high/low gross density + median block size
  - 9 big blocks/high density, 9 big blocks/low density, etc.

718 participants: surveys, travel diaries, motion detectors, measured height and weight

50+ environmental variables measured at multiple geographies around each participant
Example Study Area, Area 30:
High Gross Density—15.8 persons/acre, 39/ha
Small Median Block—3.7 acre, 1.5 ha
Example Study Area, Area 3:
Low Gross Density — 4.7 persons/acre, 11.6/ha
Large Median Block — 11.1 acres, 4.5ha
3. Twin Cities Walking Study
Who We Studied

• 25 and older
• Able to walk unaided for 20 minutes
• Description of participants (N = 718)
  – 67% with household income $40-90k, 55k median HH income (compared with $50k in census block groups)
  – 47% college graduates
  – 29% BMI over 30
  – 81% white (compared with 75% in census blocks)
  – 74% randomly selected
3. Twin Cities Walking Study

Data Collection

Individual Residents (N=718)
- 7-day travel diaries
- 7-day accelerometer records
- Measured height and weight
- Participant-drawn maps of self-defined neighborhood
- Telephone interview
  - International Physical Activity Questionnaire (IPAQ)
  - Quality of life, perceptions, demographics
  - Dog ownership
  - Bicycle ownership/use/safety

Environment
- Irvine Minnesota Inventory
- Orthophoto interpretation of street trees, lamps, sidewalks
- Plus existing GIS data: census, business/employment, parcel
On the Design Center web site at www.designcenter.umn.edu

Updated versions and articles are coming out periodically
3. Twin Cities Walking Study
Sample and Analysis

- Study design maximized exchangeability such that there was variation in built environment but minimal variation between the background characteristics of residents
- Tried different models and they get the same picture; considered errors in models
- Using both more complex models (lots of assumptions) and simpler analyses
- Accounted for clustering by focus area
- Adjusted for age, sex, race, college-degree, marital status, home ownership, home tenure length, and overall health
Leisure walking and travel walking are significantly different by density (p<0.001).

Holds after adjusting for age and income of respondent.

But neither total Physical Activity (PA) nor Body Mass Index (BMI) nor total walking differ by density.
Leisure walking and travel walking are not significantly different by block size
Holds after adjusting for age and income of respondent
Neither total PA nor BMI nor total walking statistically differ by block size
3. Twin Cities Walking Study
This is True So Far for Other Variables

- Multivariate analysis using gross focus area density and median block size: (1) negative binomial (continuous) and (2) ordinal logistic regression models (outcomes collapsed)
- Used IPAQ, diary, accelerometer
- Account for clustering by focus area and adjusted for lots of social and economic variables
- Density associated with travel walking, particularly for non-whites; odds ratio (model 2) of treatment/control = 1.436 total, p=0.032 (95% CI 1.032, 1.996); 2.30 non-white (N=140)
- Density not associated with overall PA (accelerometer)
- Bigger blocks lead to very slightly higher PA but not total walking—the trampoline/drive-in-gym effect
3. Twin Cities Walking Study
This is True So Far for Other Variables

• Measurement has been repeated for approximately 50 measures of environment at 5-9 geographies
• Few significant (unadjusted) correlations with total physical activity (IPAQ, accelerometer); small magnitudes

• Small environmental changes—such as those proposed in smart growth and new urbanism—don’t have much effect on overall PA and overall walking but they can shift toward travel walking over leisure
• More analysis to be done + research on youth
4. Environmental Change is Not a Quick Fix

• Environments change slowly—over decades—and the changes needed probably need to be large
  – To increase PA through environmental change, rather than merely shift purpose, likely need a very high threshold
• Is it more effective to make environments more attractive or to make other changes:
  – Make alternatives like driving more unattractive—a policy change?
  – Turn people into Germans
4. Environmental Change is Not a Quick Fix

- Environments change slowly—over decades—and the changes needed probably need to be large
  - To increase PA through environmental change, rather than merely shift purpose, likely need a very high threshold
- Is it more effective to make environments more attractive or to make other changes e.g. policy:
  - Make alternatives like driving more unattractive—a policy change?
  - Turn people into Germans “In most European Countries, at least a fourth of urban trips are made by walking and cycling.... the Dutch and Germans who are 75 and older make roughly half their trips by foot or bike, compared with only 6% of Americans aged 65 and older” (Pucher and Dijkstra 2003, 1510).
Liberty on the Lake, Stillwater

Density
Street pattern
Mixed use
Pedestrian amenities
4. Environmental Change

Bottom Lines

• Policy matters
• Economics matter
• Some apparent environmental effects are really reflecting self selection and socio-economic variables
• Environmental changes can shift toward travel walking but do not change total physical activity—still, more travel/utilitarian walking is good as if builds activity into daily life
• Children may be different
Active Living and Community Design
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1. Why walking?
2. How environments (and trees) affect walking
3. Twin Cities Walking Study
4. Environmental change is not a quick fix
Credits

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