It’s Great to Be in Beautiful Melbourne
Greetings from San Diego
Where we drive instead of walk
We have some places to be active
Deaths attributed to 19 leading factors, by country income level, 2004

- High blood pressure
- Tobacco use
- High blood glucose
- Physical inactivity
- Overweight and obesity
- High cholesterol
- Unsafe sex
- Alcohol use
- Childhood underweight
- Indoor smoke from solid fuels
- Unsafe water, sanitation, hygiene
- Low fruit and vegetable intake
- Suboptimal breastfeeding
- Urban outdoor air pollution
- Occupational risks
- Vitamin A deficiency
- Zinc deficiency
- Unsafe health-care injections
- Iron deficiency

Mortality in thousands (total: 58.8 million)
Need for International Research on Environment + PA

• Ecological models of behavior teach that policy & environmental factors have the broadest & longest-lasting impacts
• WHO global strategy & national PA plans emphasizes environment & policy change
• Research on PA environments is limited in all countries and absent in most
• Local data can stimulate & guide local change
Environments Differ!!!!

Ghent, Belgium

Atlanta, USA
“Walkable”: Mixed use, connected, dense
Not "walkable"

street connectivity and mixed land use
Neighborhood Walkability and Income Are Related to Physical Activity & BMI


San Diego State University; University of Washington; University of British Columbia
Primary Aim

- Investigate whether people who live in “walkable” communities are more active, after adjusting for SES, than people who live in less walkable communities.

- This study was the methodological template for other studies so comparisons could be made.
<table>
<thead>
<tr>
<th>Socioeconomic Status</th>
<th>Walkability</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
<td>4 per region</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>4 per region</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>4 per region</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>4 per region</td>
</tr>
</tbody>
</table>
GIS-Based Walkability Index

- Net Residential Density
- Intersection Density (intersections per acre)
- Retail floor area ratio (FAR): ratio of retail building square footage to land area
- Land Use Mix: evenness of mix across 4 types of uses.

*Walkability* = sum of z-scores of components

- Calculated for census block groups to select N-hoods
Participant Selection & Recruitment

- Adults aged 20-65 recruited from randomly selected households in target neighborhoods
- Recruitment by mail & phone
- 2100 available for analyses; 30% response rate
- 48% female; 25% non-white
Key Measures

- Actigraph accelerometer
  - Worn for up to 14 days
  - Outcome is mean daily minutes of MVPA
- BMI, based on self-report height & weight
- NEWS: Neighborhood Environment Walkability Scale
Accelerometer-based MVPA Min/day in Walkability-by-Income Quadrants

Walkability: $p = .0002$
Income: $p = .36$
Walkability X Income: $p = .57$

* Adjusted for neighborhood clustering, gender, age, education, ethnicity, # motor vehicles/adult in household, site, marital status, number of people in household, and length of time at current address.
Percent Overweight or Obese (BMI > 25) in Walkability-by-Income Quadrants

Walkability: \( p = .007 \)
Income: \( p = .081 \)
Walkability X Income: \( p = .26 \)

* Adjusted for neighborhood clustering, gender, age, education, ethnicity, # motor vehicles/adult in household, site, marital status, number of people in household, and length of time at current address.
The PLACE Project

Physical Activity in Localities and Community Environments
PLACE Study
Physical activity in Localities And Community Environments

Neville Owen, Adrian Bauman, Graeme Hugo, James F Sallis, Eva Leslie, Jo Salmon, Ester Cerin, Tim Armstrong

National Health and Medical Research Council of Australia, 2002–2004

Primary Aim:
to investigate whether people who live in ‘walkable’ communities are more physically active, after adjusting for socio-economic status
Not “walkable”
Walking for Transport and Recreation in Low- and High-Walkable Communities*

* Preliminary Analyses: unadjusted for confounders
Differences in PA behaviour in Belgian adults living in ‘high walkable’ versus ‘low walkable’ neighbourhoods. Belgian Environmental Physical Activity Study (BEPAS)

Ghent University – BELGIUM
Faculty of Medicine and Health Sciences
Department of Movement and Sports Sciences

Preventive Medicine, 2010
BEPAS: Accelerometer-based MVPA Min/day in Walkability-by-Income Quadrants

Walkability: $\beta(\text{SE})= .095(.030) \ p < .001$

Income: $\beta(\text{SE})= -.026(.029) \ p = 0.18$

Walkability X Income: $\beta(\text{SE})= -.014(.040) \ p = .36$

Adjusted for neighborhood clustering, gender, age, education, working status
BEPAS: Transport Walking Min/week in Walkability-by-Income Quadrants

Walkability: $\beta$(SE) = 0.746 (0.157) $p < 0.001$
Income: $\beta$(SE) = -0.360 (0.155) $p < 0.05$
Walkability X Income: $\beta$(SE) = 0.027 (0.220) $p = 0.45$

Adjusted for neighborhood clustering, gender, age, education, working status
BEPAS: Transport Cycling Min/week in Walkability-by-Income Quadrants

Walkability: $\beta$(SE) = .447(.105) $p < .001$
Income: $\beta$(SE) = .029(.102) $p = .39$
Walkability X Income: $\beta$(SE) = -.051(.144) $p = .36$

Adjusted for neighborhood clustering, gender, age, education, working status
BEPAS: Percent Overweight or Obese (BMI $>25$) in Walkability-by-Income Quadrants

Walkability: $\beta$(SE) = $-.870(.182)$ $p < .001$
Income: $\beta$(SE) = $-.197(.167)$ $p = .12$
Walkability X Income: $\beta$(SE) = $.910(249) p < .001

Adjusted for neighborhood clustering, gender, age, education, working status
Relationships between environmental attributes and walking for various purposes among Japanese adults

Shigeru Inoue, MD, PhD
Department of Preventive Medicine and Public Health
Tokyo Medical University
Nakano area of Tokyo, Japan

Residential area

Shopping street
Study design

A Cross-sectional mail survey in four Japanese cities (Tsukuba, Koganei, Shizuoka and Kagoshima).
Summary of the results from NEWS

• All environmental variables were related to specific types of walking behavior in expected direction.
• Environmental variables related to walking for leisure and walking for daily errands were different.
• Relationship between walking and environment was especially strong in women’s walking for daily errands.

<table>
<thead>
<tr>
<th></th>
<th>All total</th>
<th>leisure</th>
<th>daily errands</th>
<th>Men total</th>
<th>leisure</th>
<th>daily errands</th>
<th>Women total</th>
<th>leisure</th>
<th>daily errands</th>
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<tr>
<td>Land use mix-diversity</td>
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<tr>
<td>Land use mix-access</td>
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<td>Walking/cycling facilities</td>
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<td>Aesthetics</td>
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<td>-</td>
<td>○</td>
</tr>
</tbody>
</table>

● Significant relationship
Built environment correlates of physical activity behaviours in a developing city:

The case of Bogota, Colombia

Olga Lucia Sarmiento and team

Universidade de los Andes
Main Results

• Walking for transport (30 min/day for at least 5 days/week) was positively associated with:
  – Street density (POR 1.71, 95% CI 1.19-2.46)
  – Street connectivity (POR 2.21, 95% CI 1.40-3.49)
  – Bus Rapid Transit stations in the neighborhood (POR 1.71, 95% CI 1.19-3.47)

• Biking for transport was positively associated with:
  – Street density (POR 1.99, 95% CI 1.24-3.19)

• Leisure time physical activity (30 min/day for at least 5 days/week) was positively associated with:
  – Park density (POR 2.05, 95%CI 1.13-3.72)
  – Bus Rapid Transit stations in the neighborhood (POR 1.27, 95% CI 1.07-1.50)
Built Environments & Physical Activity: An 11-Country Study

James F. Sallis, USA
Heather Bowles, Australia
Adrian Bauman, Australia
Barbara E. Ainsworth, USA
Fiona C. Bull, UK
Michael Sjostrom, Sweden
Cora Craig, Canada
Et al.
Rationale

• Each country has limited range of variation in built environment variables, so multi-country studies are needed to understand full impact of environments.

• Most studies of environmental correlates of PA analyze each environment variable separately, so the cumulative effects are not clear.

• Built environment survey measure was added to International PA Prevalence Study
PANES: Physical Activity Neighborhood Environment Survey

- Perceived social & physical environment items adapted from published surveys (Kirtland, 2003; Saelens, 2003).
- Standard methods of translation and cultural adaptation.
- Reliability confirmed in Sweden, Nigeria, US
- Attributes rated on 4-point scale, but dichotomized as “agree” vs “disagree”
Sample Sizes by Country

- Belgium, 1425
- Brazil, 951
- Canada, 856
- Colombia, 2699
- Hong Kong, 1225
- Japan, 1001
- Lithuania, 2099
- New Zealand, 1298
- Norway, 1131
- Sweden, 998
- United States, 4711
Associations Between Individual Environmental Characteristics and HEPA/Minimal Activity Among Respondents who Live in Cities with Population ≥ 30,000

Odds Ratio

HEPA/Minimal Activity

1.8

1.6

1.4

1.2

1.0

0.8

0.6

Single Family Houses
Shops Near Home
Transit Stop Near Home
Sidewalks Present
Facilities to Bicycle
Low Cost Rec Facilities
Unsafe to Walk due to Crime

'Agree' with Environmental Characteristic
('Disagree' is referent)
Dose Response between Number of Environmental Characteristics and HEPA/Minimal Activity (Pooled City Sample)
Started at ICBM in Mainz Germany in 2004 by:
  Sallis & Kerr, US
  Owen, Australia
  DeBourdeaudhuij, Belgium

Studies in 3 countries indicated that a common study design and measures were feasible, so the goal was to apply methods to other countries, improving on IPS study\textsuperscript{42}
Maximizing within and between country variance (illustration)

BUT relationship between walking and walkability may not be linear
Main NCI Study Aims

• IPEN study funded by NCI 2009—2013
• Main aims:
  1. Support countries to collect or enhance data according to common protocol
  2. Transfer data to central dataset
  3. Study co-ordination, quality control, & pooled analyses
  4. Support the network more widely
  5. Advance science through pooled analyses
  6. Use results to inform policy internationally
IPEN participating countries (so far)

- Australia
- Belgium
- Brazil
- Denmark
- Columbia
- Czech Republic
- Hong Kong
- Mexico
- New Zealand
- Spain
- Sweden
- UK
- USA
Policy relevance

• If studies show stronger relationship between activity & environment, then policy makers more likely to support & fund environmental change

• Examples from other countries with unique environments can inform built environment changes (without expensive experiments)

• National data needed in each country to convince national policy makers
IPEN investigators in Toronto 2010: www.ipenproject.org
Conclusions
• Environments Seem to Matter Around the World
• The international database is expanding rapidly
• We need to use research to drive policy change

www.ipenproject.org
IPEN Adolescent Study

- We just learned that we will be getting NIH funding to support a study of environments and PA in adolescents
- At least 9 countries will be participating
- If you are willing to follow a common protocol and have the possibility of obtaining funding for a study in your country, contact us.