BEAT Institute:
The Appetizer or Warm Up Walk

James F. Sallis, PhD
Active Living Research
San Diego State University
Goals of Talk

- Welcome to BEAT Institute
- Reason for focus on diet & physical activity
- Reason for focus on built environments
- Overview of research findings & research needs
- Examples of built environment measures
- Uses of measures for researchers & practitioners
- Introduction to Active Living Research
Oxford Health Alliance's key message:

3 risk factors –
  - tobacco use, poor diet, lack of physical activity

Contribute to Four chronic diseases –
  - heart disease, type 2 diabetes, lung disease and some cancers

Which, in turn, contribute to more than 50 per cent of deaths in the world
The Working Hypothesis
(Vastly Simplified)

Environments
- Policies
- Society

Genes
- Biology
- Psychology

Energy Balance
- Diet
- Physical Activity
- Sedentary

Obesity
- Diabetes
- Heart Disease
- Cancers

Sickness
- Death
- Costs
Deaths (thousands) attributable to individual risk factors in both sexes

Danaei G et al, PLoS Medicine, 2009
Deaths attributed to 19 leading factors, by country income level, 2004

Mortality in thousands (total: 58.8 million)
How are we doing?

Reported Physical Activity by Adults in the USA: 1997-2006.
The Healthy People 2010 Database
Percentage of youth ages 6-19 meeting 60 min/day physical activity guidelines.
Based on accelerometers. NHANES 2003-4

Troiano, MSSE 2007
Walking for transport & overweight: Adults

Based on data from the Nationwide Personal Transportation Survey and the Centers for Disease Control and Prevention.
Recipe for Progress Toward Evidence-Based Practice & Policy

• Develop conceptual model of causes of health behaviors and problems
• Hypothesize specific causal factors
• Develop and test measures of those factors
• Conduct research to identify probable causes
• Test interventions to change those causes
• Wide application of effective interventions
• Conduct surveillance to see if world changes
Different environments----Different congestion
Karen will cover food environments
Most Models of Health Behavior

Social/Cultural

Individual
- Biological
- Psychological
- Skills

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What Maria Taught Me
Environment & PA

• Reliance on psychosocial models delayed research interest in environments & PA
• It seems obvious now that PA must be done in “places”, but models could not accommodate place
• Development of ecological models and applications to PA in the mid 1990s was a first critical step
• Early measurement efforts set the stage for progress in research on environments & behavior
An Ecological Model of Health Behavior

Policy Context

Physical Environment

Social/Cultural

Individual
  Biological
  Psychological
  Skills

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An Ecological Model of Health Behavior

Policy Context

Physical Environment

Social/Cultural

Individual
Biological
Psychological
Skills

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SLOTH: Domains of Physical Activity

Sleep
Leisure
Occupation
Transportation
Household

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Trends in % of SBM Abstracts with Policy or Environment Content

Environment/Policy SBM Abstracts

- PA
- Nutrition
- Obesity

<table>
<thead>
<tr>
<th>Year</th>
<th>PA</th>
<th>Nutrition</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>7%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>2000</td>
<td>9%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>2005</td>
<td>20%</td>
<td>15%</td>
<td>13%</td>
</tr>
</tbody>
</table>
Elements of An Active Living Community

Community Design
Destinations

Transportation System

School & Worksite

Home

Park & Rec
## Summary of Research on Built Environment & Adults’ Physical Activity

<table>
<thead>
<tr>
<th>Built Environment Attribute</th>
<th>Active Transport</th>
<th>Active Recreation or Total Physical Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walkability: mixed land use, street connectivity, residential density</td>
<td>++</td>
<td>0</td>
</tr>
<tr>
<td>Sidewalks</td>
<td>?</td>
<td>+</td>
</tr>
<tr>
<td>Proximity of recreation facilities (parks, trails, private facilities)</td>
<td>0</td>
<td>++</td>
</tr>
<tr>
<td>Aesthetics of recreation facilities</td>
<td>xx</td>
<td>++</td>
</tr>
</tbody>
</table>

Sallis & Kerr. For PCPFS Research Digest. 2007
What about social environments?

• We will focus mainly on built or physical environments
• Social environments are important too
• Modeling, culture, social norms & media are social environments
• Crime, traffic, graffiti, trash, noise are social environments too
Interest vs Expertise in Environments

• Physical activity researchers are interested in effects of place
  – Health promotion
  – Health psychology
  – Exercise science

• Expertise in measuring environments was elsewhere
  – City planning
  – Geography
  – Environmental psychology
  – Parks & recreation

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“Walkable”: Mixed use, connected, dense
Not “walkable”

street connectivity and mixed land use
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.

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Accelerometer-based MVPA Min/day in Walkability-by-Income Quadrants

Walkability: $F=13.74; p = .000$
Income: $F=2.59; p = .108$
Walkability X Income: $F=0.001; p = .981$

* Adjusted for gender and age
Walkable neighborhoods encourage more walking in older adults

Older women who live within walking distance of trails, parks or stores recorded significantly higher pedometer readings than women who did not. The more destinations that were close by, the more they walked.

King, W., Am. J. of Public Health 2003

Photo: Michael Ronkin, ODOT
Associations Between Individual Environmental Characteristics and HEPA/Minimal Activity Among Respondents who Live in Cities with Population ≥ 30,000

- 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

'Oagree' with Environmental Characteristic ('Disagree' is referent)
Dose Response between Number of Environmental Characteristics and HEPA/Minimal Activity (Pooled City Sample)
Net Residential Density (1km buffers)

1 km² = 247 acres
High Walkable Adelaide, Australia
Intersection Density (1km buffers)

- Colombia (Bogotá)
- Hong Kong
- Denmark (Aarhus)
- Belgium (Ghent)
- Australia (Adelaide)
- United States (Seattle & Baltimore)
- New Zealand (North Shore, Waitakere, Wellington, & Christchurch)

$1 \text{ km}^2 = 247 \text{ acres}$
People with access to parks & recreation facilities are more likely to be active

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Access to Recreation Facilities Related to MVPA & Overweight in Youth

Availability of recreational & PA facilities and relative odds of overweight and bouts of moderate and vigorous physical activity (MVPA)

Number of facilities per block group

Gordon Larsen
Pediatr 2006
Recreation Facilities May Be More Important for Minorities

Percent being active with high and low recreational resources within 1 mile of home

Diez-Roux 2007

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Percent of census tracts without a recreational facility by race/ethnicity

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>% with no recreation facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>70%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>81%</td>
</tr>
<tr>
<td>White</td>
<td>38%</td>
</tr>
</tbody>
</table>


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Type of activity zones in parks Are related to PA
Mean EE by Park Activity Zones (Chicago)

Chicago, $F = 10.20, \ p < .001$

Scheffe’s post hoc test
People are Most Active on Tracks and Walking Paths

Cohen. RAND
Activity-Friendly Transportation Systems
Where do people bicycle in Portland, OR? Based on GPS.

<table>
<thead>
<tr>
<th>Type of road</th>
<th>% of bicycle miles</th>
<th>% of road miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without bicycle facilities</td>
<td>51</td>
<td>92</td>
</tr>
<tr>
<td>With bicycle facilities (lane, separate path, bike boulevard)</td>
<td>49</td>
<td>8</td>
</tr>
</tbody>
</table>

Measuring PA in Environments

• Observations of stair use
• SO—What is Thom McKenzie up to???
  – SOFIT—for PE classes
  – SOPLAY—for unstructured activity areas
  – SOPARC—for parks
Measuring PA Environments

• Self-report measures ask people to rate characteristics
  – Several valid scales are available

• Geographic Information Systems—GIS
  – Software system that can link data with places
  – Maps useful for researchers & practitioners

• Observations or audits
  – Require clear definitions & observer training
  – Agreement between observers indicates quality
Assessing School Environments


• Activity areas at middle schools were identified, mapped, & coded for selected permanent attributes
• While physical activity was being coded with SOPLAY, concurrent attributes were observed
  – Equipment available, supervision, area accessible, weather
  – Reliability is high, given adequate training
### M-SPAN: School Environments & PA

**Explaining % of attendance in MVPA--Boys**

<table>
<thead>
<tr>
<th>Variable</th>
<th>eta squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>area size</td>
<td>.02</td>
</tr>
<tr>
<td>#improvements</td>
<td>.01</td>
</tr>
<tr>
<td>supervision</td>
<td>.002</td>
</tr>
<tr>
<td>organized activities</td>
<td>.02</td>
</tr>
<tr>
<td>equipment available</td>
<td>.10***</td>
</tr>
<tr>
<td>type of area</td>
<td>.01</td>
</tr>
<tr>
<td>area typeXequipment</td>
<td>.16***</td>
</tr>
<tr>
<td>area typeXsupervision</td>
<td>.05*</td>
</tr>
<tr>
<td>improvementsXsupervision</td>
<td>.09***</td>
</tr>
</tbody>
</table>

**Adjusted R² = .59**
Checklist for Health Promotion Environments at Work (CHEW)


• Direct observation to assess characteristics of worksite environments for physical activity, diet, smoking, and alcohol
• Worksite physical attributes: bike parking, stairs, foods in cafeteria & vending
• Information environment: posters, bulletin boards, newsletters
• Immediate neighborhood environment: trails, parks, health clubs, foods in restaurants
Developing a Reliable Audit Instrument to Measure the Physical Environment for Physical Activity

Terri J. Pikora, MPH, Fiona C.L. Bull, PhD, Konrad Jamrozik, MBBS, DPhil, Matthew Knuiman, PhD, Billie Giles-Corti, PhD, Rob J. Donovan, PhD

Background: The physical environment plays an important role in influencing participation in physical activity, although which factors of the physical environment have the greatest effect on patterns of activity remain to be determined. We describe the development of a comprehensive instrument to measure the physical environmental factors that may influence walking and cycling in local neighborhoods and report on its reliability.

Methods: Following consultation with experts from a variety of fields and a literature search, we developed a Systematic Pedestrian and Cycling Environmental Scan (SPACES) instrument and used it to collect data over a total of 1987 kilometers of roads in metropolitan Perth, Western Australia. The audit instrument is available from the first author on request. Additional environmental information was collected using desktop methods and geographic information systems (GIS) technology. We assessed inter- and intra-rater reliability of the instrument among the 16 observers who collected the data.

American Journal of Preventive Medicine, 2002

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Neighborhood Audits/Observations

- Developed by Boarnet/Day, Ewing, Brownson, Rodriguez
- Assess “microscale” details likely to affect experience of being in a place
- Usually assess each block & intersection
- Most have many variables because we don’t know which are most important
- Some short measures for practitioners
RALA: Rural Active Living Assessment Tools

- Town-Wide assessment
  - 18 town characteristic questions
  - inventory of 15 recreational amenities
- Program and Policy assessment (20 questions)
- Street Segment observations (28 questions)
- Some components assess by interview of knowledgeable leaders. Street observations require trained observers

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Walkability Index: Frank et al.

- Derived from planning & transportation literature
- Land Use Mix
  - geometric mean of residential, institutional, entertainment, retail and office uses.
- Retail Floor Area Ratio
  - ratio of retail building square footage to retail land square footage
- Intersection Density (connectivity)
- Residential Density

- Walkability Index: Index based on sum of z-scores of component variables
Measures from Recreation

• Concept of structural constraints to leisure
  – Lack of opportunities
  – Cost of activities or access

• Environmental concepts
  – Biophysical--proximity, vegetation
  – Social--crowding & conflict & incivilities
  – Managerial—rules, fees

• Assessment of aesthetics
• Little detailed assessment of park physical attributes

• Godbey et al., 2005, Am J Prev Med
Measuring recreation environments

• Knowing which park/trail characteristics are related to PA can inform park design
  – Saelens developed detailed assessment: EAPRS
  – Bedimo-Rung developed observational measure: BRAT-DO
  – Lee developed simpler inventory: PARA
  – Troped developed trail assessment: PEAT
  – Self-report measure from Kaczynski

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Environment Measures for Youth: Active Where?

– Developed based on formative research
– Evaluated in 3 cities
– Several papers published or in press
– Surveys available on ALR website or http://sallis.ucsd.edu
– Being used in our NIH studies of youth
– Encouraging others to use them for coordinated international studies
Environment Measures for Youth: Active Where?

• **PA environment**
  - NEWS for youth
  - Home electronic & PA equipment
  - Recreation facilities—proximity & use
  - Barriers to walking to school, park, shops
  - Barriers to PA in n’hood
  - Activity locations
  - School envi & policies
  - Family rules for PA & sedentary
  - Stranger danger

• **Food environment**
  - Fast food & sit-down restaurant proximity to home
  - Convenience store & market proximity to home
  - Healthy & unhealthy foods available at home
  - Family rules for eating
  - Vending at school
  - Salad bars at school
  - A la carte foods at school
  - Convenience stores near school
  - Fast food near school

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Next steps for research

- Environments related to sedentary behaviors
- Detailed evaluations of measures (i.e., content validity) to allow shortening them
  - This is now happening
- Measures tailored to subgroups??
  - Age, sex, race/ethnicity, SES
- Measures for rural environments
- Measures tailored to climate extremes
- Measures validated for international use
  - ALPHA project in Europe
We are aware . . .

- The measures we will present often need to be adapted because of different
  - Behavioral or health outcomes of interest
  - Target populations
  - Environmental contexts
  - Resource limitations
- We recommend you maintain as much of the core measures as possible, to enhance comparisons; then add new items/scales
- We recommend you evaluate (inter-observer) reliability of the adapted measure
Uses of environment measures by practitioners & advocates

• Conducting audits could empower communities
• Document local disparities & problem areas
• School projects
• Surveillance function of health departments
• Present findings to officials—maps are powerful
• Others?

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Active Living Research
Building the Evidence to Prevent Childhood Obesity and Support Active Communities

Active Living Research Update
Active Living Research: 2001-2012

• Contribute to Robert Wood Johnson Foundation’s goal of reversing the childhood obesity epidemic by 2015

• Focus on groups at highest risk
  – African American, Latino, Native American, Asian/Pacific Islander, lower income

• Build the evidence base
  – We manage $27 million in research grants
  – Investigators from 30+ disciplines
  – Funded 220 studies
  – 350 publications so far

• Use research to inform policy

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Resources on www.activelivingresearch.org

• No more grant funding planned
• Slides from annual conferences
• Journal special issues online--free
• Research briefs written for practitioners & policy makers
• Literature database with coded results of 800+ studies: Use for your lit reviews
• Literature searches every 6 months

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Resources at www.activelivingresearch.org
Our research is being used

- Let’s Move
- Communities Putting Prevention to Work
- Community Transformation Grants
- NCCOR
- Foundation projects nationwide

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BEAT: Opportunities for collaboration

- We will become a community by the end of the week
- Let’s find ways for researchers, practitioners, and advocates to work together
- Finding partners can make data collection, data management, and data use more effective for all
- Let’s use these measures to advance science, practice, policy, and public health
Maybe the next time David visits the US, he won’t leave looking like this.