



Interdisciplinary Approaches to Physical Activity: Built **Environment Research and Translation to Policy James Sallis, PhD University of California, San Diego Australian Catholic University** For ACCORDS. UC Denver April 23, 2019

# Outline

- Application of ecological models to physical activity
- Macro-environments
- Micro-environments
- Multiple pathways to research translation
- Evidence of impact on science, policy, practice
- Become an advocate

### Deaths attributed to 19 leading factors, by country income level, 2004



### **How Did We Become Inactive?**



## An Ecological Model of Health Behavior



#### **Ecological Model of Four Domains of Active Living**



07-20-05

### **Ecological Model of Four Domains of Active Living**



## Elements of An Active Living Community

Community Design Destinations

**Transportation System** 

Home



School & Worksite



Park & Rec



21<sup>st</sup> century global health challenges related to urban design & transport

- Chronic disease
- Depression
- Road traffic
   injuries
- Air pollution
- Chronic noise
- Social isolation
- Personal safety
   and fear of crime
- Health inequities





## MACRO level: Cities Can be Designed to Move People or to Move Cars

The Neighborhood Quality of Life (NQLS) Study: The Link Between Neighborhood Design and Physical Activity 2001-2005

> James Sallis, Ph.D. Brian Saelens, Ph.D. Lawrence Frank, Ph.D. And team

## NQLS Neighborhood Categories

## Walkability

tus	Low	High
onomic Sta Low	4 per city	4 per city
Socioeco High	4 per city	4 per city

## Methods

Neighborhood Quality of Life Study (NQLS)

- King County-Seattle, WA and Baltimore-Washington DC regions
- 32 neighborhoods represented hi/lo walkability and hi/lo income
- n=2199 adults
- Survey + accelerometer measures of PA
- Survey + GIS measures of environments

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

Walkability: p = .0002Income: p = .36Walkability 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.

## Estimated Public Health Impact of Walkability

- 50 minutes per week = 2 miles per week
- 2 miles per week = 100 miles per year
- 100 miles per year = 10,000 kcal per year
- 10,000 kcal per year = 2.9 pounds/1.3 kg
- More than the average adult weight gain per year in the U.S.

Percent Overweight or Obese (BMI>25) in Walkability-by-Income Quadrants

> Walkability: p = .007Income: p = .081Walkability 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.

## Driving Minutes Per Week in Walkability-by-Education Quadrants

Walkability: *p* =.001

Education: *p* =.86

Walkability X Educ: p = .35



\* Adjusted for age, sex, ethnicity, whether or not the participant had a child living in the home

# Built environments across the lifespan

- In our US studies, design of cities is related to active transportation and total physical activity among
  - Children
  - Adolescents
  - Adults
  - Older adults
- Design of cities is related to BMI among
  - Children
  - Adults
  - Older adults



## www.ipenproject.org

- Encourage environment and policy research on physical activity worldwide
- Develop & encourage use of common measures and methods
- Coordinate international studies
  - IPEN Adult, funded by NCI
  - IPEN Adolescent, funded by NHLBI
- Communicate findings to decision makers

## Physical activity in relation to urban environments in 14 cities worldwide: a cross-sectional study



James F Sallis, Ester Cerin, Terry L Conway, Marc A Adams, Lawrence D Frank, Michael Pratt, Deborah Salvo, Jasper Schipperijn, Graham Smith, Kelli L Cain, Rachel Davey, Jacqueline Kerr, Poh-Chin Lai, Josef Mitáš, Rodrigo Reis, Olga L Sarmiento, Grant Schofield, Jens Troelsen, Delfien Van Dyck, Ilse De Bourdeaudhuij, Neville Owen

### Summary

Background Physical inactivity is a global pandemic responsible for over 5 million deaths annually through its effects on multiple non-communicable diseases. We aimed to document how objectively measured attributes of the urban environment are related to objectively measured physical activity, in an international sample of adults.

Published Online April 1, 2016 http://dx.doi.org/10.1016/ S0140-6736(15)01284-2

## Published in The Lancet. April 2016





## Results: Environmental Attributes + MVPA Min/Week

GIS-based Environmental Variable	Final adjusted model
Net residential density 1km	***
Intersection density 1km	NS
Mixed land use 1km (retail & civic)	NS
Public transit density 1km	*
Number of parks 0.5km	*

## Comparing MVPA by Lowest & Highest Cities on Environmental Variables

- Adults living in the most activity-friendly cities did 68-89 more minutes of MVPA per week compared to those in the least activity-friendly cities
- A commentary estimated that 2 million deaths per year could be prevented if every adult lived in activity-supportive communities



From: Association of Neighborhood Walkability With Change in Overweight, Obesity, and Diabetes JAMA. 2016;315(20):2211-2220. doi:10.1001/jama.2016.5898



Adjusted Neighborhood-Level Diabetes Incidence Among an Urban Population Aged 30 to 64 Years, by Walkability Quintile, Fiscal Year 2001-2012Data sources: Ontario Diabetes Database and Registered Persons Database. Study areas include London, Ottawa, Toronto, Hamilton, and surrounding communities. N = 2 775 781 in 2001 and 2 906 539 in 2012; yearly median (range): quintile 1, 641 307 (553 144-670 082); quintile 2, 573 943 (555 943-596 845); quintile 3, 537 596 (529 913-560 935); quintile 4, 556 765 (539 137-575 020); and quintile 5, 585 166 (568 646-615 810). Median neighborhood population (IQR): quintile 1, 551 (420-644); quintile 2, 561 (441-747); quintile 3, 533 (435-728); quintile 4, 513 (451-701); and quintile 5, 521 (457-677). Rates represent modeled diabetes incidence by neighborhood, based on all dissemination areas in a given quintile. Error bars indicate 95% CIs around incidence. Disseminated area-level models were adjusted for age, sex, area-level income, and area-level ethnicity. Lines were smoothed with the SAS Proc LOESS method. Fiscal year runs from April 1 to March 31 of the next year.



# MICRO level: Design of streetscapes matters



## Importance of Micro-Scale Environments

- Many studies show walkability and land use attributes are related to walking and health
  - Mixed use, density, connectivity
- Research on "micro-scale" attributes is limited, and results are not consistent
  - Sidewalks, crossings, street trees, bike facilities
- But micro-scale features are easier to modify
- Many micro-scale measures, but they are not often used
  - Too long, difficult to score, hard to interpret
  - Length is a barrier to use of measures in practice

# **MAPS-Mini**

- 15-item, evidence-based tool designed for practitioners and advocates
- Developed from 120-item original MAPS
- Items were selected based on:
  - Correlations with physical activity
  - Guidelines and recommendations
  - Modifiability within realistic budgets & time frames
- Requires minimal training and free to use

### How do MAPS-Mini scores relate to active transportation? ADJUSTED

MAPS Mini Score	Children	Adolescents	Adults	Seniors
Commercial Segments	3			N/A
Public Parks				
Transit Stops	48			
Street Lights				
Benches				
Building Maintenance				
Absence of Graffiti				
Sidewalk				
Buffer				THE REAL PROPERTY.
Tree, Awning Coverage				
Absence of Trip Hazards				
Marked Crosswalk				
Curb Cuts				
Crossing Signal				
GRAND SCORE				
GRAND SCORE (for Active Transport)				



4th Quintile 5th Quintile

# THE LANCET

### Urban design, transport, and health



"Systematic designing of cities to enhance health through active transport promises to be a powerful strategy for improvements in population health on a permanent basis."

A Series by The Lancet

# **Research is Not Easy to Put into Practice**





### Evidence about urban design and health is accumulating



**Biggest Challenge** is <u>translating</u> it into urban planning and transport policy

### How to improve research translation

- 1. Conduct policy-relevant research
- 2. Use research methods relevant to policy-makers
- 3. Actively disseminate findings
- 4. Engage in advocacy



## What kinds of evidence do policy makers value?

- Petticrew conducted interviews with decision makers about research.
- They said researchers did not understand the policy-making process, especially time constraints and how political pressure outweighs evidence.
- Stories and case studies are more compelling than rigorous studies.
- They valued evaluations of real-world interventions—natural experiments.
- Cost and cost-effectiveness analyses were high priorities.
- Decision makers called for research that was designed to assist them in making decisions.
- J Epidemiol Community Health 2004; 58: 811–16.

# **Pathways to Research Translation**



## **Pathways to Research Translation**



## My Ask: Take a Step Toward Research Translation

- Communicate your research through lay summary, press release, op-ed, letter to editor, social media
- Join a local or national advocacy group & share your research
- Develop relationship with knowledge broker
- Develop relationship with a decision maker
  - Elected rep, agency staff, corporate leader
- CALL your US Senator and Representative in support of NIH and science in general. They will notice

# Research Brief Tweet: #globalactivecities



### **Physical Activity in Urban Areas**

Evidence from International Study Highlights Need for More Walkable Neighborhoods

#### Introduction

Physical inactivity has been linked to diabetes, heart disease, and some cancers. It is a global problem, estimated to account for more than 5 million deaths per year worldwide. Adults tend to be more physically active when they live in areas that have higher density of people, and are near shops, services, restaurants, public transit, and parks, compared to residents of less-walkable areas. But the evidence showing the link between walkable features (the built environment) and physical activity has not always been consistent.

# Resources at www.activelivingresearch.org







Sources: SIGPWAUX: Soille, J. Bourles H, Bournan A, et al. "Heighborhood Environments and Physical Activity annang Autors in D. Countries." American Journal of Preventive Heidhice, 36(6) 484–480, Jane 2010 Bits LAKES Soille, 194 et al. Explored Transportation and Health The Need Frances (2010) 255–5110, doi:10.255 484–480, Jane 2010 Bits LAKES Soille, 255–5110, doi:10.255/2010 Bits Jane 2010 Bits Jane 2010 Bits Jane 2010 484–480, Jane 2010 Bits LAKES Soille, 255–5110, doi:10.255/2010 Bits Jane 2010 Bits Jane 2010 Bits Jane 2010 7460–4180 Urban Transft Colliming Sciences A Meta-Analysis or Safety Effects: Accelerative Analysis and Prevention, 31(3): 327–336, May 2001, PUBLIC TRANSPORTATION: Education & "Public Transit, Desting, and Medical Collimong Sciences A Meta-Analysis or Safety Effects: A Accelerative Analysis and Prevention, 31(3): 327–336, May 2001, PUBLIC TRANSPORTATION: Education & "Public Transit, Desting, and Medical Collimong Sciences A Meta-Analysis or Safety Effects: A Accelerative Analysis and Prevention, 31(3): 327–336, May 2001, PUBLIC TRANSPORTATION: Education & "Public Transit, Desting, and Medical Collimong A Assessing The Magnitudes, Preventing, 31(3): 327–336, May 2001, PUBLIC TRANSPORTATION: Education & "Public Transit, Desting, and Medical Collimong A Assessing The Magnitudes, Preventing, 32(6): 3200, 2000, 2 Public Health Impact STEP IT UP! The surgeon general's call to action to promote walking and walkable communities



2015



### www.thecommunityguide.org

Physical Activity: Built Environment Approaches Combining Transportation System Interventions with Land Use and Environmental Design

Built Environment Approaches	s in C	ombination by Intervention Type
Pedestrian and Bicycle Transportation System Intervention Component		Land Use and Environmental Design Intervention Component
$_{\odot}$ Street pattern design and connectivity		<ul> <li>Mixed land use</li> </ul>
<ul> <li>Pedestrian infrastructure</li> </ul>		<ul> <li>Increasing residential density</li> </ul>
<ul> <li>Bicycle infrastructure</li> </ul>		<ul> <li>Proximity to community or neighborhood destinations</li> </ul>
$\circ$ Public transit infrastructure and access		<ul> <li>Parks and recreational facility access</li> </ul>

Cross-Sector Impact: Transport





### Ten Principles for Building Healthy Places





## Real Estate Industry Impact

Leveraging the power of ULI's global networks to shape **projects and places** in ways that improve the health of **people and communities.** 



AARP Home » Livable Communities - AARP » The AARP Network of Ag... » The AARP Network of Ag... AARP Network of Age-Friendly Communities Tool Kit The AARP Network of Age-Friendly Communities: An Introduction

G+1 ( 1

#### AARP Livable Communities

![](_page_43_Picture_3.jpeg)

🎔 Tweet

![](_page_43_Picture_5.jpeg)

As the U.S. population ages and people stay healthy and active longer, communities must adapt.

The AARP Network of Age-Friendly Communities helps participating communities become great places for all ages by adopting such features as safe, walkable streets; better housing and transportation options; access to key services; and opportunities for residents to participate in community activities.

Well-designed, livable communities promote health and sustain economic growth, and they make for happier, healthier residents — of all ages.

![](_page_43_Picture_9.jpeg)

![](_page_43_Picture_10.jpeg)

An age-friendly community is livable for people of all ages. — Getty

Learn how a town, city or

### Livable Communities Free E-Newsletter

![](_page_43_Picture_14.jpeg)

unities is an affiliate of the

# What Can I Do?

- "White coat" effect is also powerful outside of the clinic and hospital
- Health care professionals can be credible and powerful advocates for active, healthy communities
- LEARN. See resources at
   <u>www.activelivingresearch.org</u>
  - http://sallis.ucsd.edu
- JOIN. Walk Denver, Bike Denver
- SPEAK UP. City Council, DRCOG, Local planning groups.

![](_page_45_Picture_0.jpeg)

## http://sallis.ucsd.edu

# Caution: Income Disparities in Environments

![](_page_46_Picture_1.jpeg)

# Summary of microscale disparities

- Low-income and high racial/ethnic minority neighborhoods had aesthetic and social features that made them less pedestrian-friendly
- Pedestrian features varied greatly between and within (residential versus retail) cities
- Given each city's unique pedestrian environment, <u>local streetscape audits</u> are necessary to determine how to best allocate resources to address disparities in pedestrian environments.

Thornton. Soc Sci Med—Population Health, 2016

![](_page_47_Picture_5.jpeg)

![](_page_47_Picture_6.jpeg)