Built Environments, Physical Activity, and Health: 20 Years of Research

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For Third Fuse Physical Activity Pop Up Workshop.

South Tees. 22 October, 2020

Outline

- Physical activity and COVID-19
- US studies of macro-environments and physical activity
- US studies of micro-environments and physical activity
- Built environment relevance for infectious diseases

Is PA relevant to COVID-19?

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Editorial

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Multiple benefits of physical activity during the Coronavirus pandemic

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CORRESPONDING

Physical activity is one of the strongest forces for good health. Physical activity helps prevent and/or treat many physical and mental health conditions by improving functioning of numerous physiological systems[1]. In this piece we explain how harnessing the salutogenic power of physical activity could help ease the consequences of the coronavirus pandemic in six ways. This commentary is an expanded version of a blog that was distributed to leaders in physical activity and public health in early April 2020 to bring awareness of the relevance of physical activity during the coronavirus pan-

Physical Activity May Contribute to Controlling the Pandemic in 6 Ways

- Moderate PA enhances immune function and reduces inflammation, so it could reduce severity of infections
  - Extended vigorous PA seems to reduce immune function
  - Walking is an ideal and accessible activity for most people
- Moderate PA can improve the common chronic conditions that increase risk for severe COVID-19
  - About 95% of COVID-19 deaths are in people with chronic conditions
- Moderate PA is one of the best stress management methods

Physical Activity May Contribute to Controlling the Pandemic in 6 Ways

- Stress and distress create imbalances of cortisol, that negatively affect immune function and inflammation
  - Moderate PA helps bring cortisol into balance
- Moderate PA produces antioxidants that reduce the severity of acute respiratory distress syndrome (ARDS), a serious complication of COVID-19
- Both acute and chronic PA improve immune responses to vaccines
  - Older adults assigned to aerobic exercise were 30-100% more likely than a flexibility control group to attain sufficient antibodies from flu vaccines

Elements of An Active Living Community

Community Design
Destinations

Transportation System

Home

School & Worksite

Park & Rec

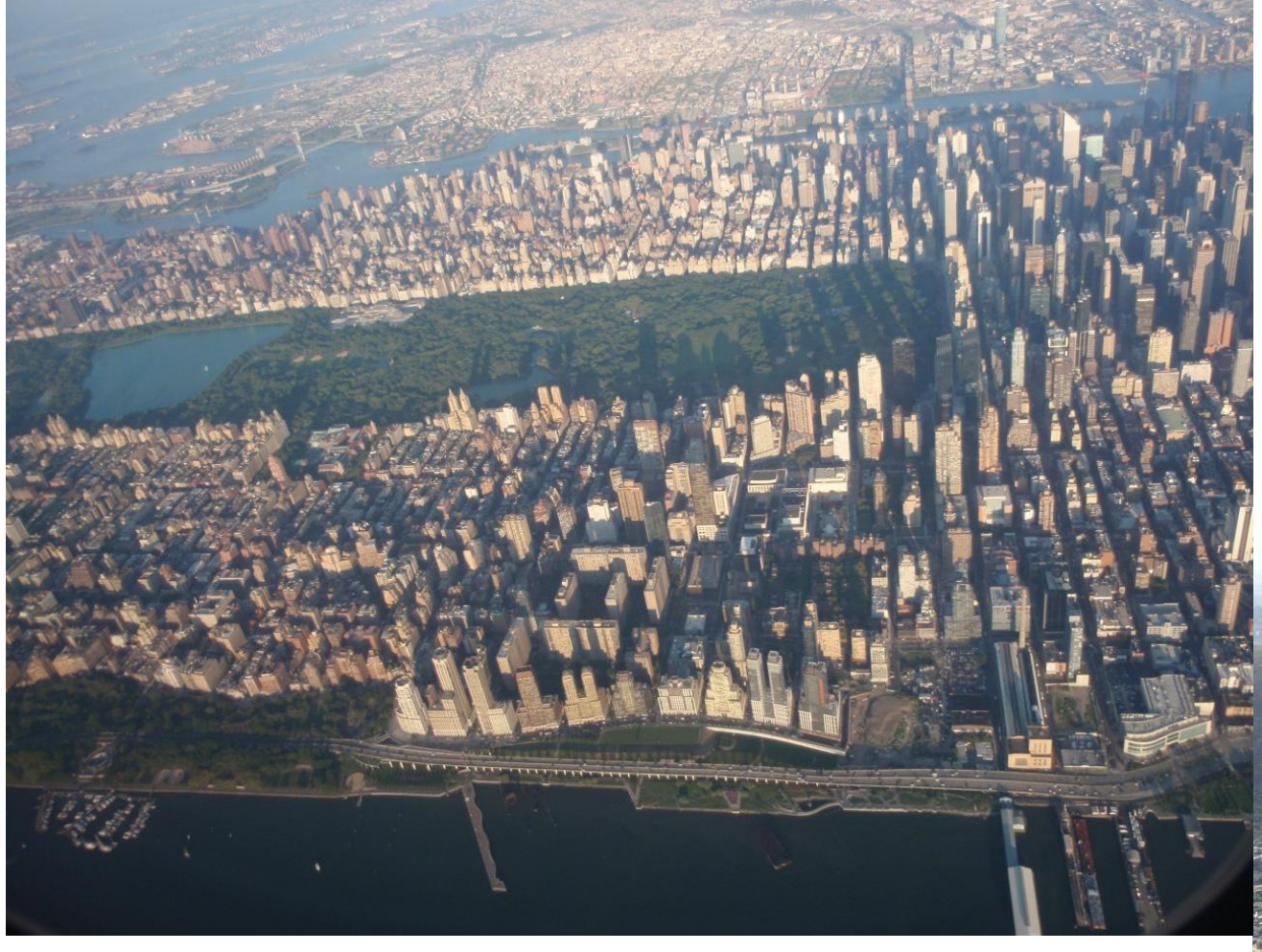
Public Health Needs to Partner

Setting for PA

- Neighborhood
- Transportation facilities (sidewalks)
- Recreation facilities
- Schools & workplaces

Expertise for Policy, Practice

- Planners
- Transport engineers & planners
- Park & rec, landscape architects
- Educators, architects



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

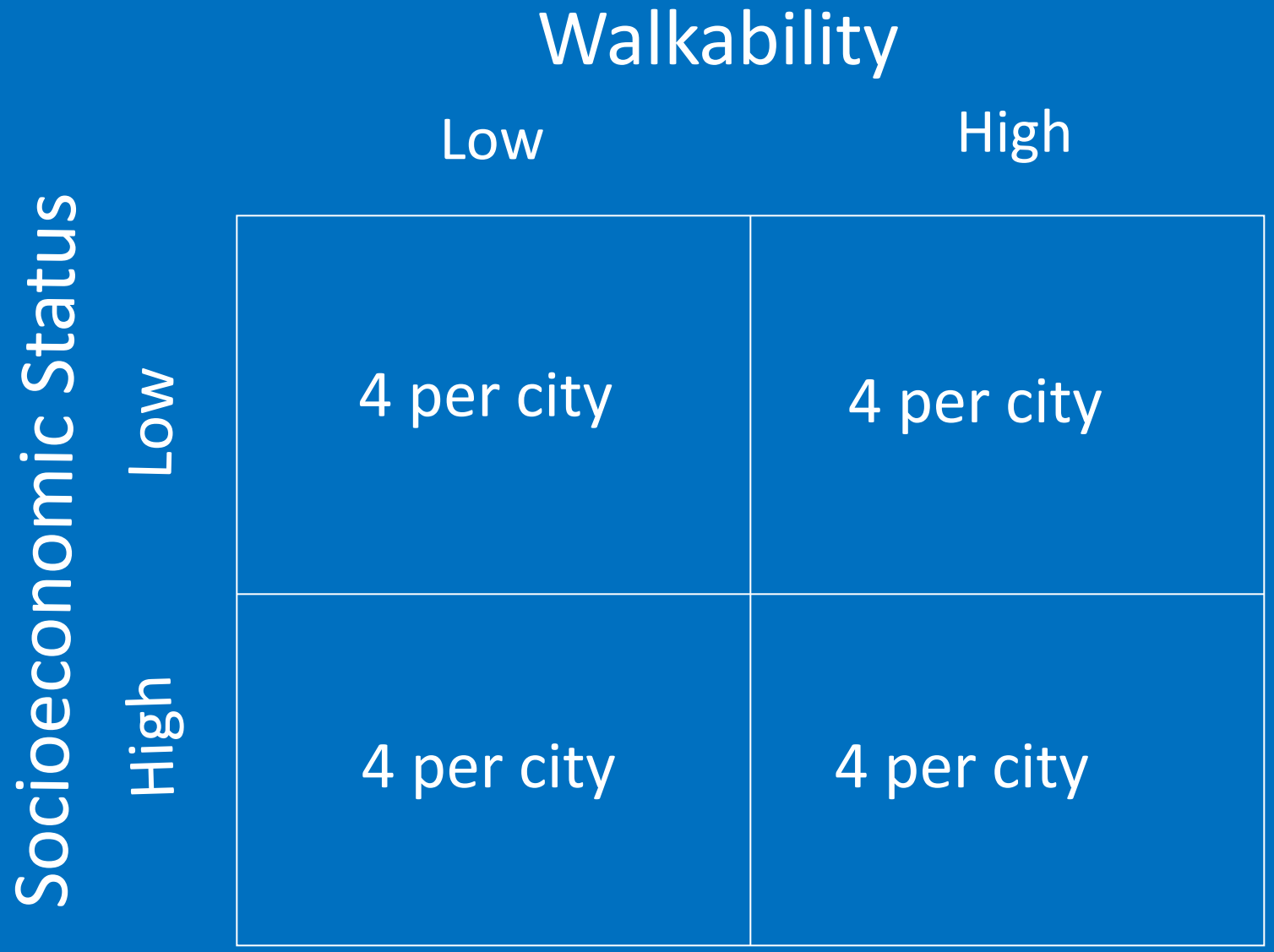
James Sallis, Ph.D.

Brian Saelens, Ph.D.

Lawrence Frank, Ph.D.

And team

NQLS Neighborhood Categories

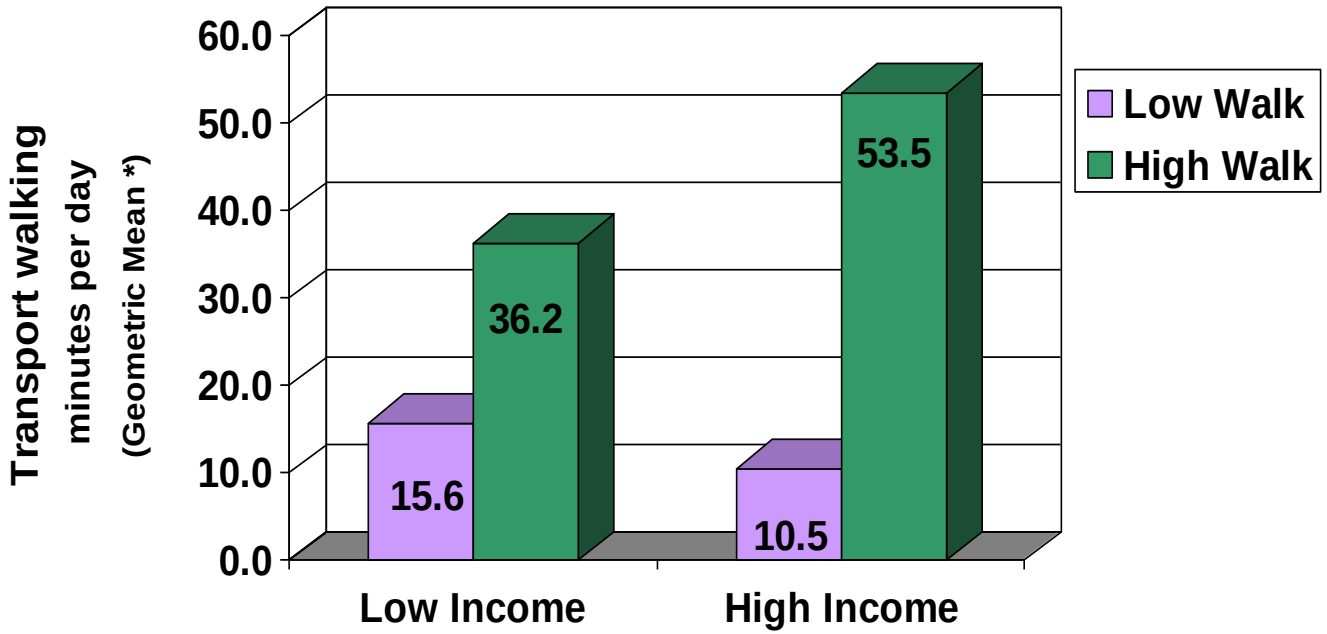


Methods

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

Transport Walking Min/day in Walkability-by-Income Quadrants



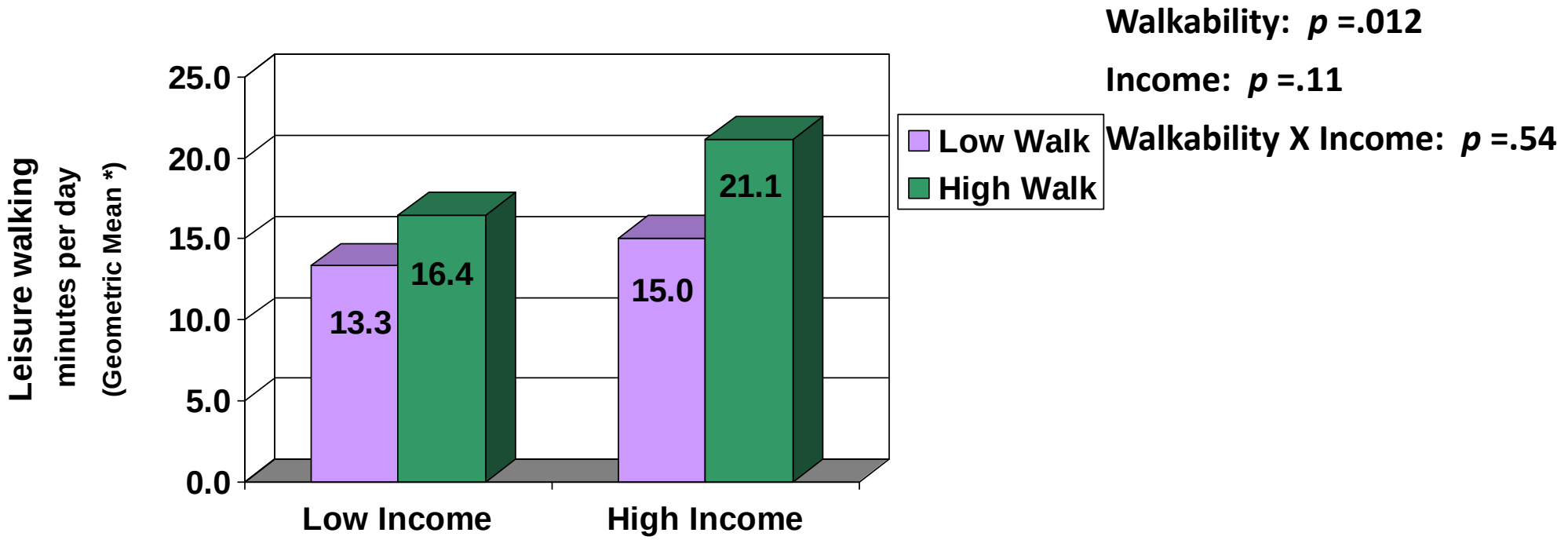
Walkability: *p* =<.0001

Income: *p* =.97

Walkability X Income: *p* =.027

* 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.

Leisure Walking Min/day in Walkability-by-Income Quadrants



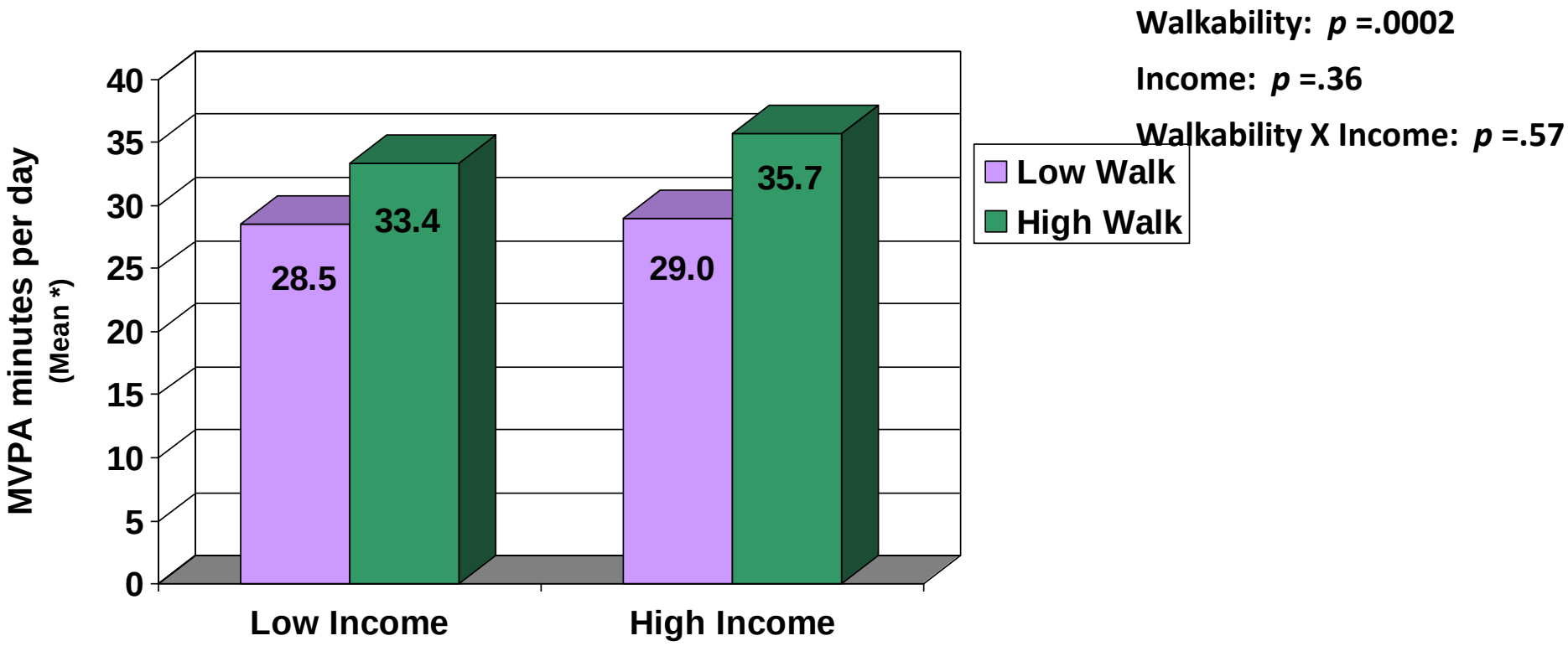
Walkability: *p* =.012

Income: *p* =.11

Walkability X Income: *p* =.54

* 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.

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



Walkability: *p* =.0002

Income: *p* =.36

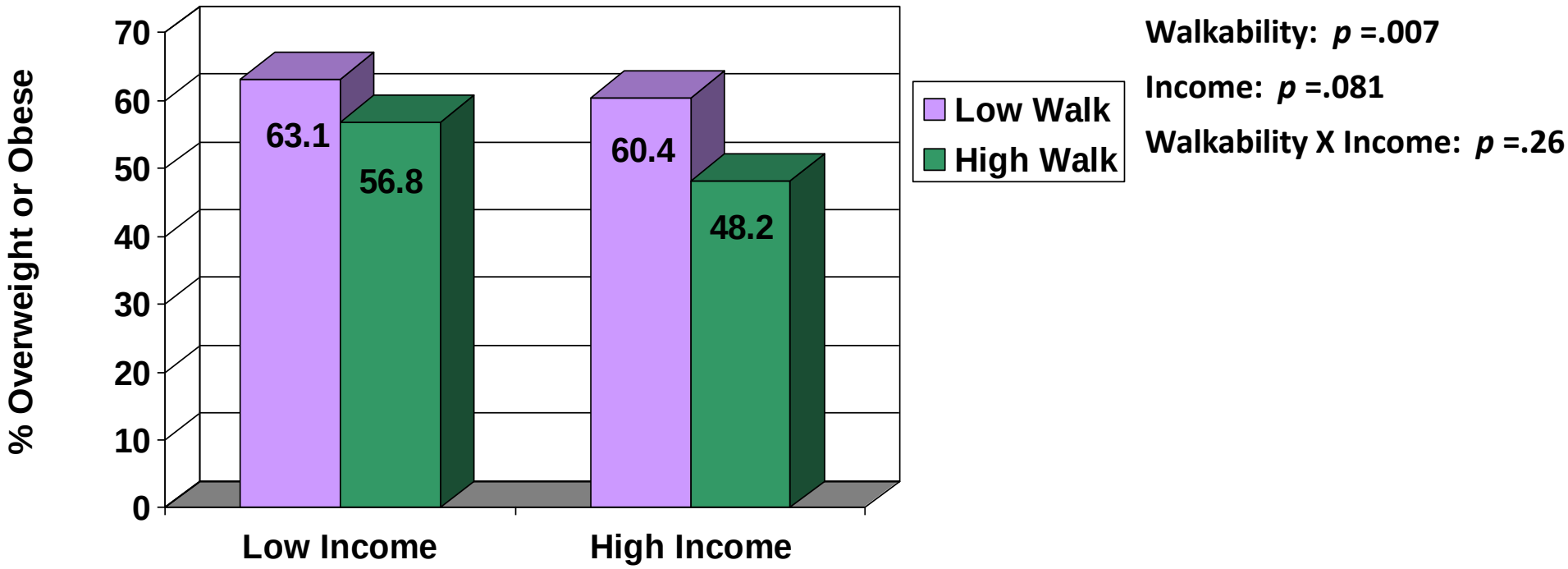
Walkability X Income: *p* =.57

* 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.

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* =.007

Income: *p* =.081

Walkability X Income: *p* =.26

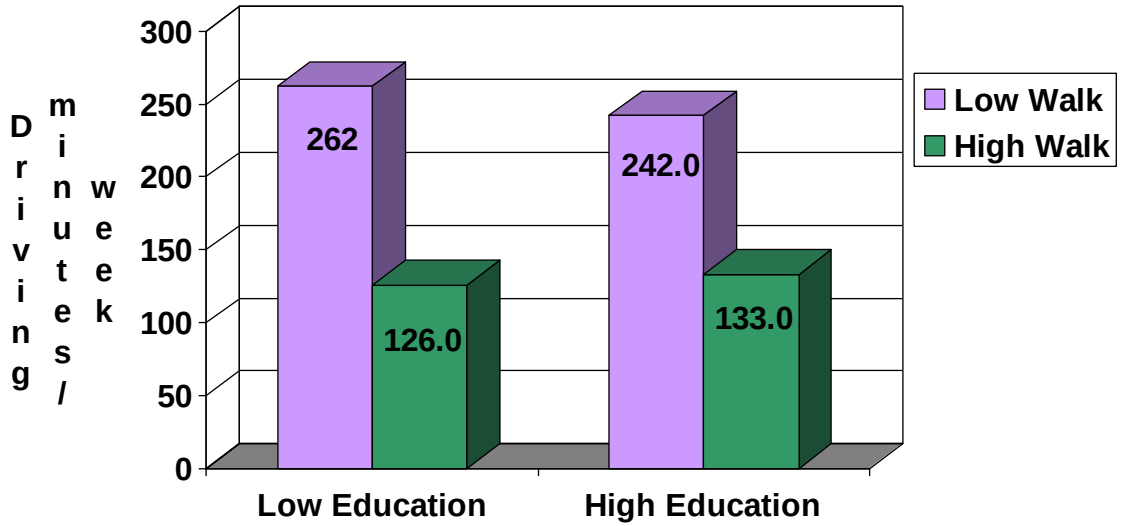
* Adjusted for neighborhood clustering, gender, age, education, ethnicity, # motor vehicles/adult in household, site, marital status, number of people in household, and length of time at current address.

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

Adolescents' Physical Activity as Related to Built Environments: TEAN Study in the US

James F. Sallis, PhD, [1] Terry L. Conway, PhD, [1] Jacqueline Kerr, PhD [1], Brian E. Saelens, PhD,[2] Lawrence D. Frank, PhD,[3,4] Karen Glanz, PhD, MPH,[5] Donald J. Slymen, Ph.D., [1] Kelli Cain, MA,[1] James C. Chapman, MSCE, [4]

[1]San Diego State University; [2]Children's Hospital Seattle; [3]University of British Columbia; [4]Urban Design 4 Health; [5] University of Pennsylvania

Funded by NIH/NHLBI 2007-2011; Grant HL083454

Participants

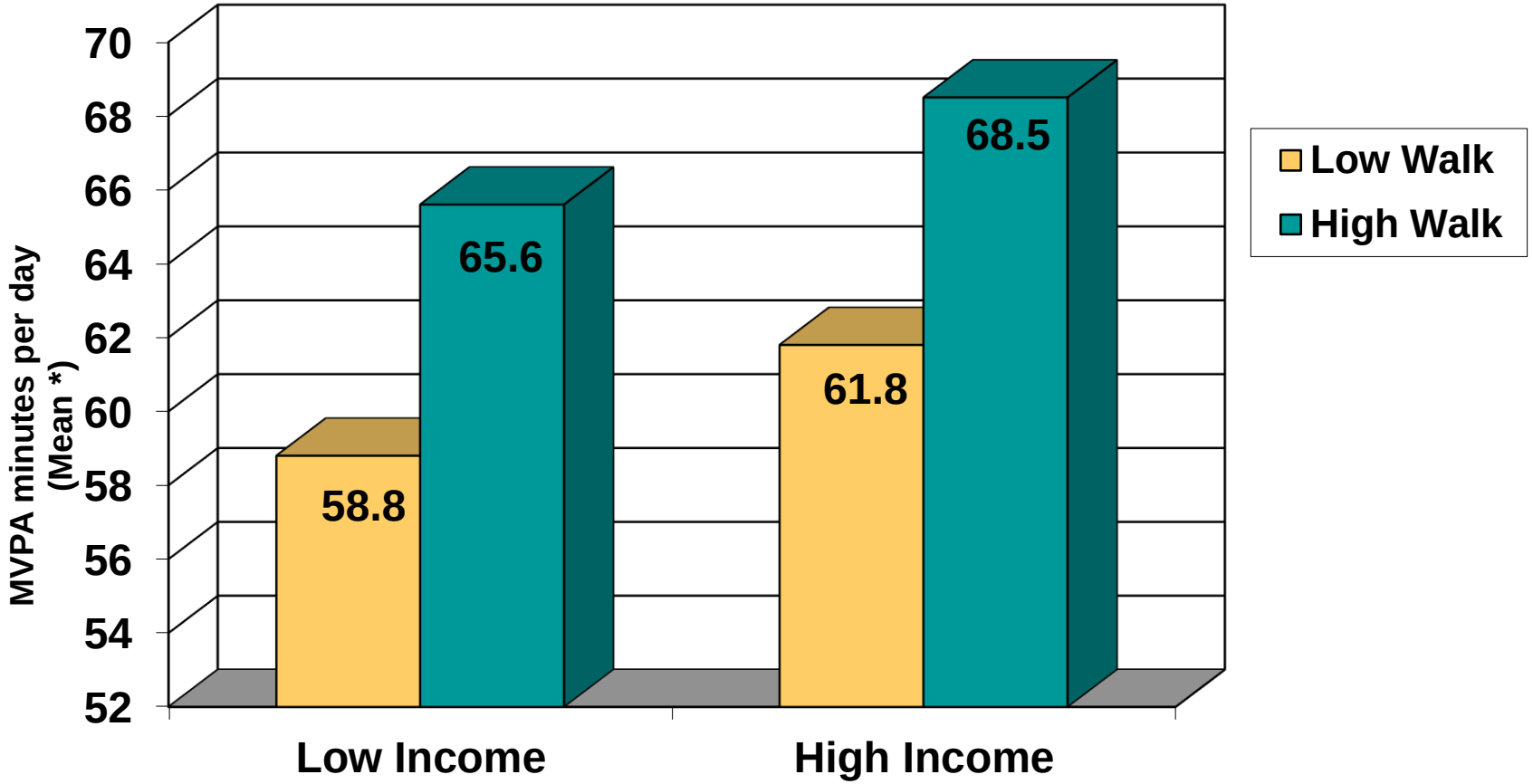
- Adolescents aged 12-16 recruited from randomly selected households in target block groups
- Seattle and Baltimore regions
- 38% response rate
- N=928 youth available for analyses
- 49.7% were boys and 50.3% girls
- 31% racial/ethnic minority

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=.001; *p* =.981



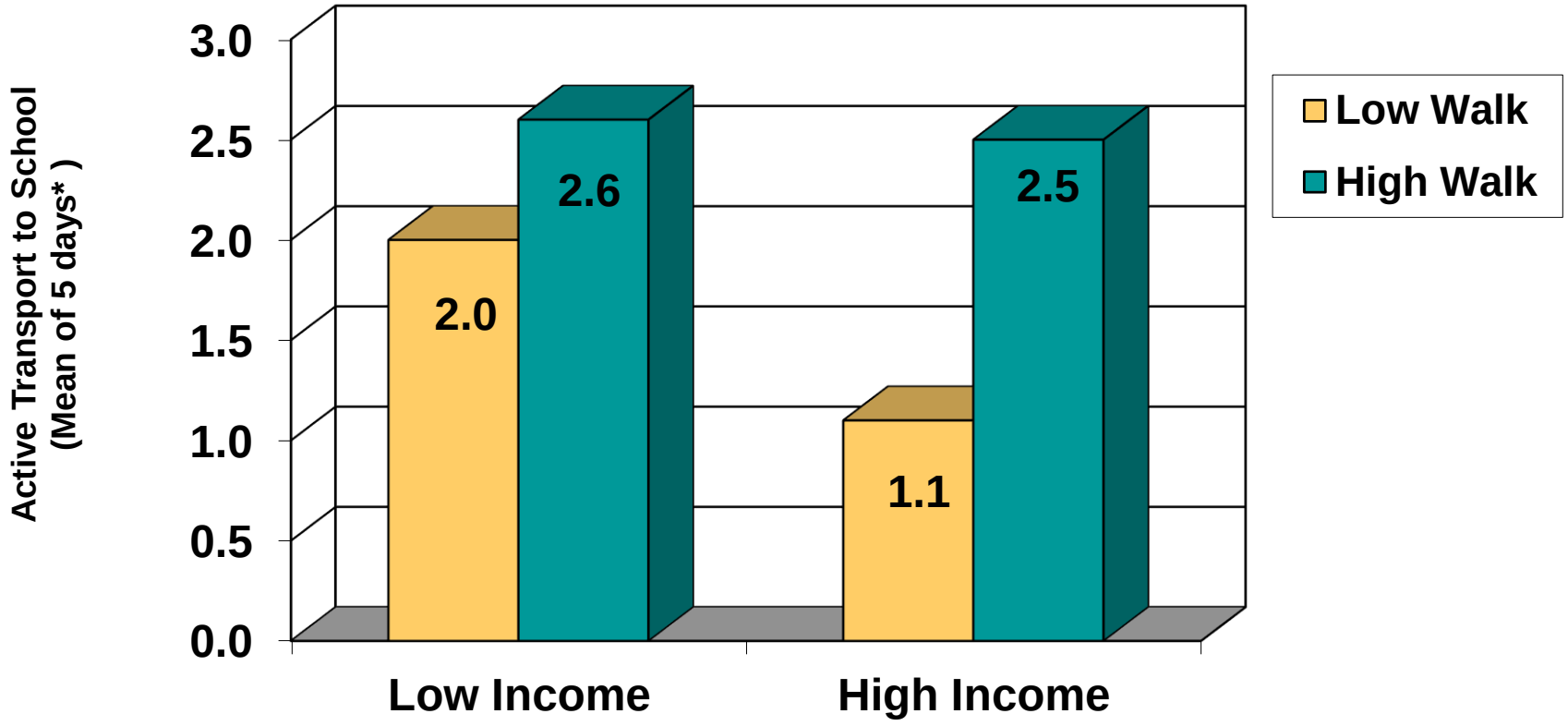
* Adjusted for gender and age

Active Transport to School† in Walkability-by-Income Quadrants

Walkability: F=21.2; *p* =.000

Income: F=4.02; *p* =.045

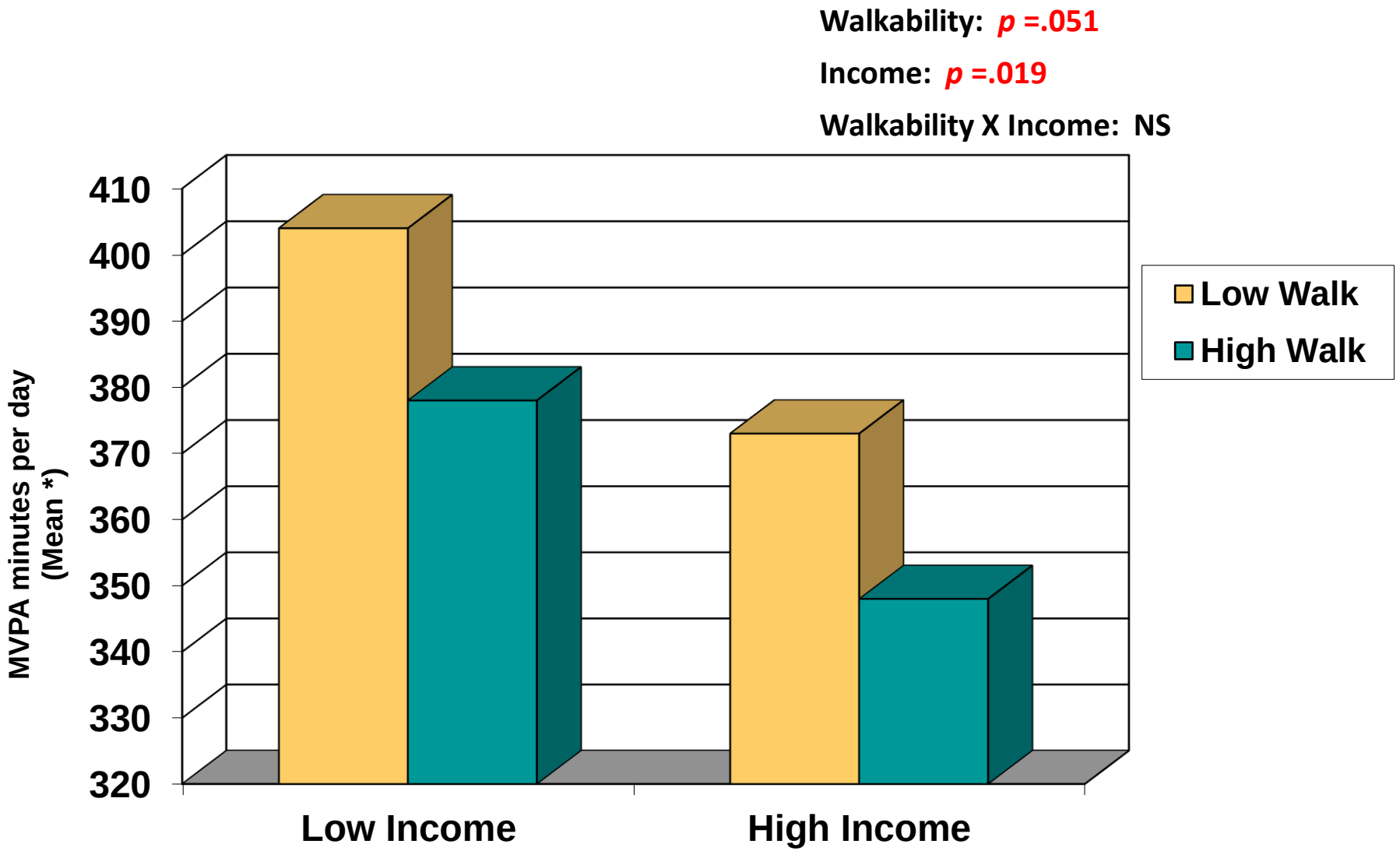
Walkability X Income: F=3.5; *p* =.062



† Includes walking, biking, and skateboarding to and from school

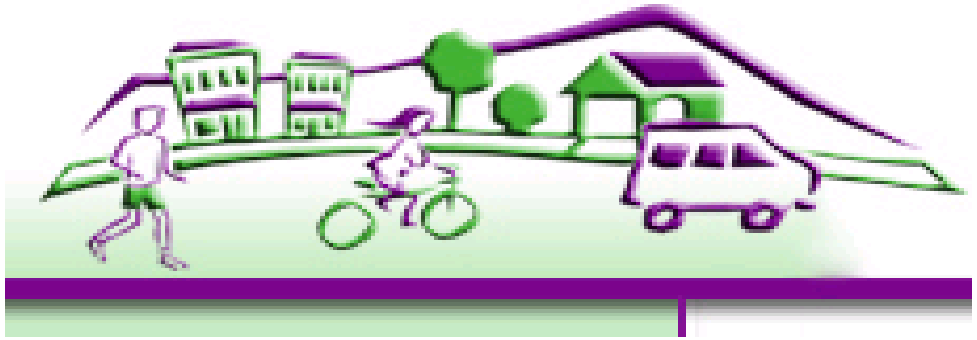
* Adjusted for gender and age

Sum Min/schoolday of 6 Types of Sedentary Behaviors in Walkability-by-Income Quadrants



* Adjusted for demographics, clustering

Neighborhood Environments, Physical Activity, and Function Among US Older Adults: Findings from the Senior Neighborhood Quality of Life Study (SNQLS)



Abby King, PI.

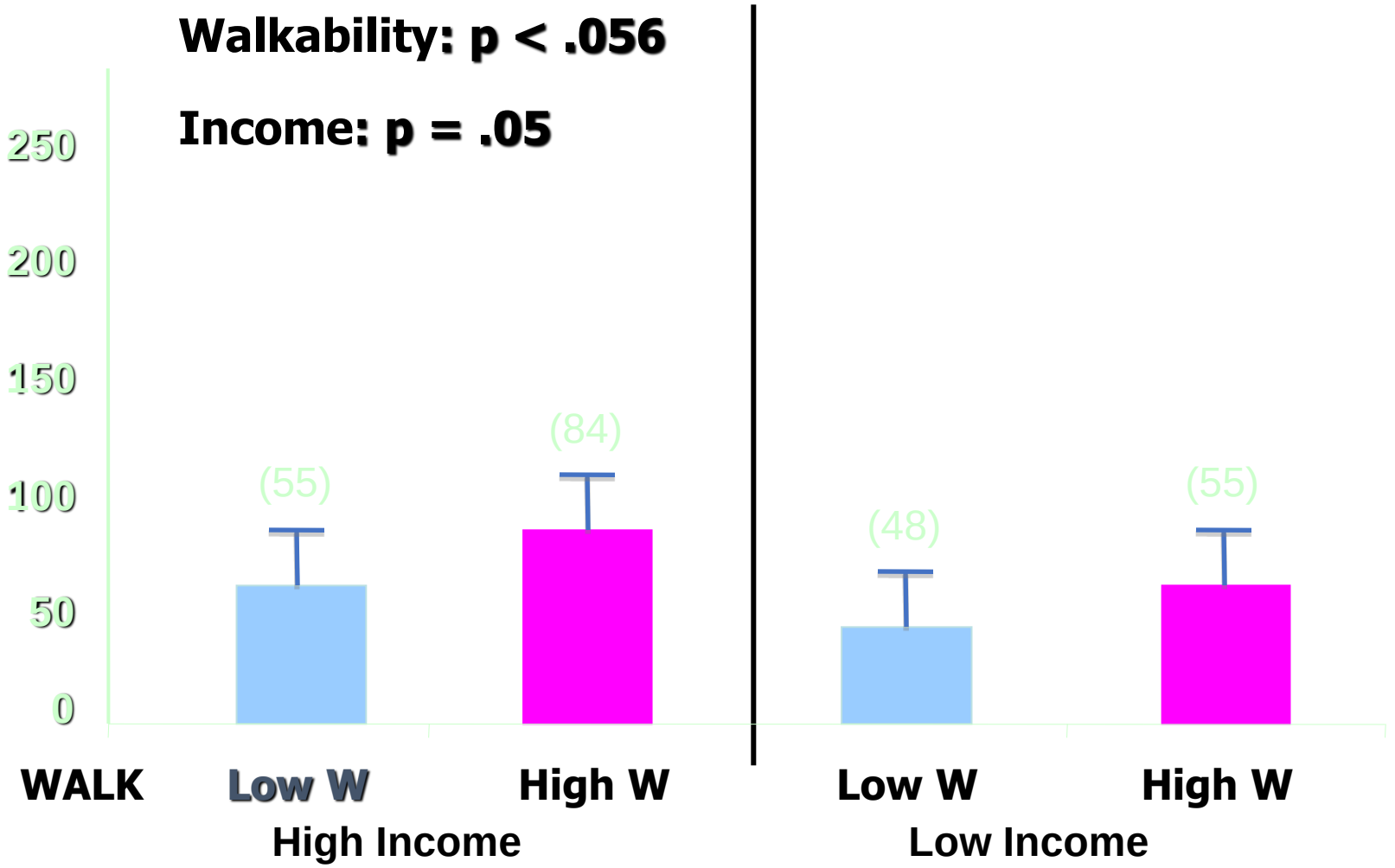
Funding from National Heart, Lung, & Blood Institute

King, Sallis, Frank, Saelens et al., 2011, *Soc Sci Med, 73, 1525-1533*

SNQLS

Accelerometry-based MVPA (Min/week)

(Adjusted for Time, Region, Demographics)

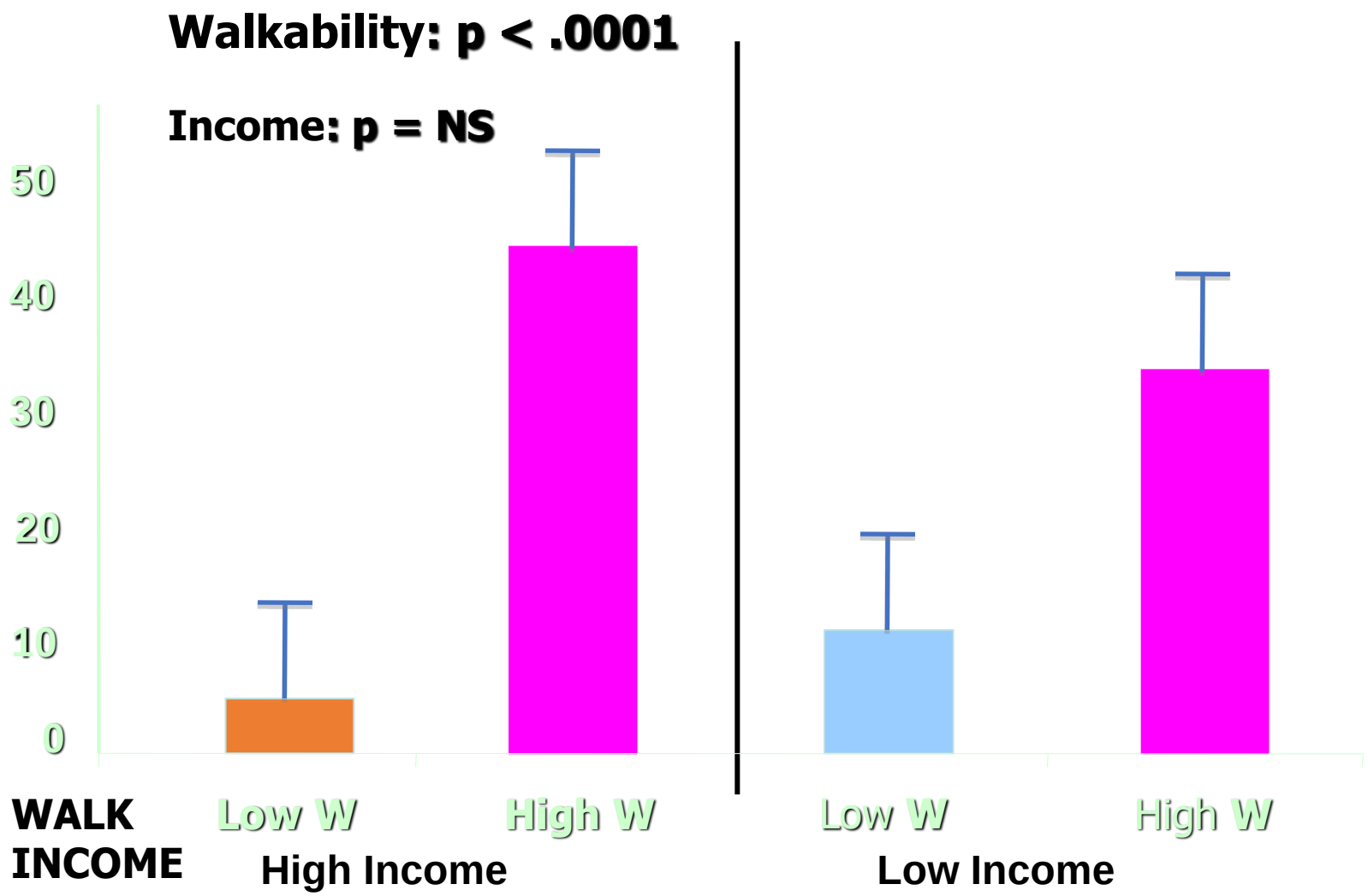


King, Sallis, Frank, Saelens et al., 2011, *Soc Sci Med*

SNQLS

Walk/Bike for *Errands/Transport* (Min/wk)

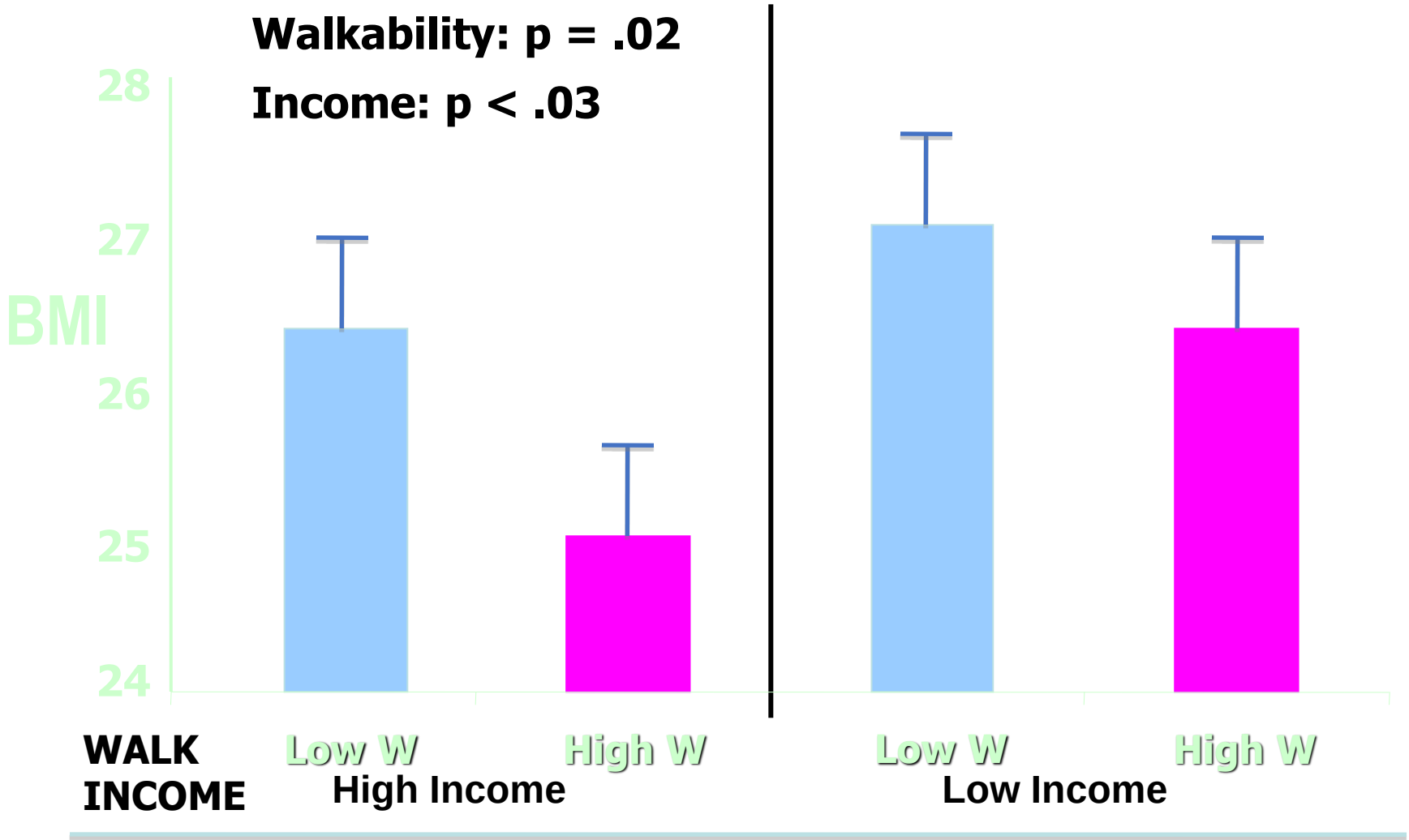
(Adjusted for Time, Region, Demographics)



King, Sallis, Frank, Saelens et al., 2011, *Soc Sci Med, 73, 1525-1533*

Body Mass Index (BMI)

(Adjusted for Time, Region, Demographics)



King, Sallis, Frank, Saelens et al., 2011, *Soc Sci Med, 73, 1525-1533*

Conclusions

- In 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

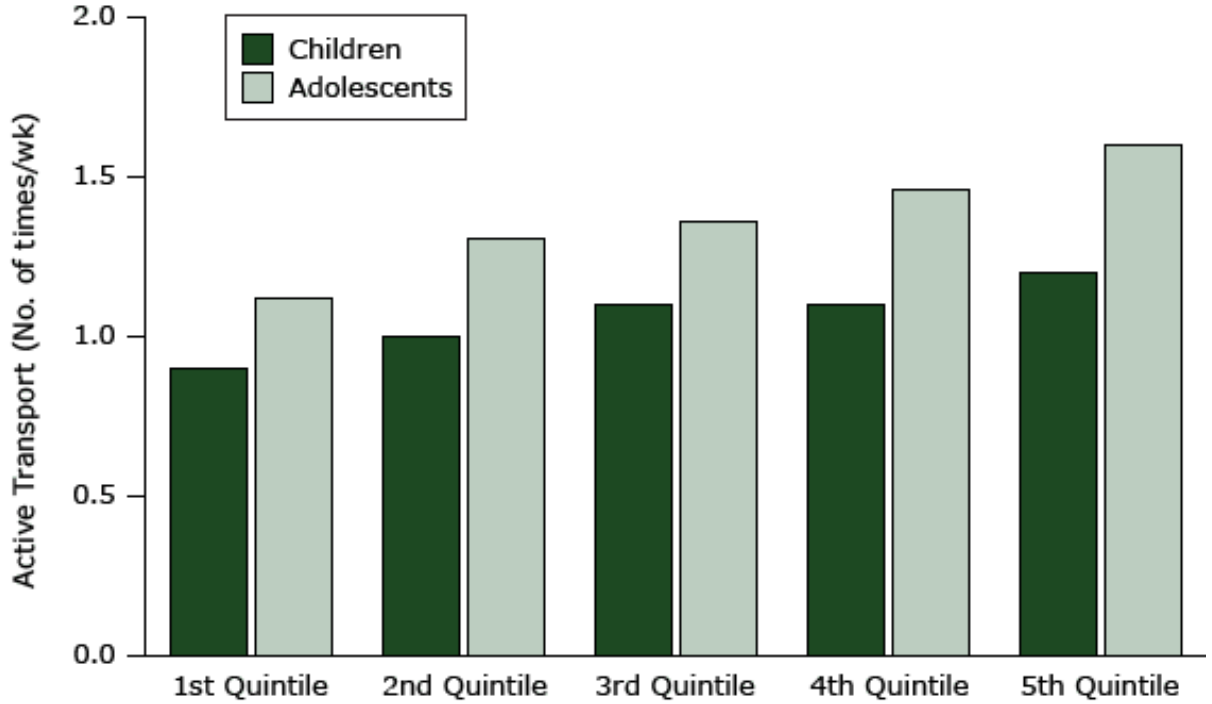
MICRO level: Design of streetscapes matters

MAPS-Mini

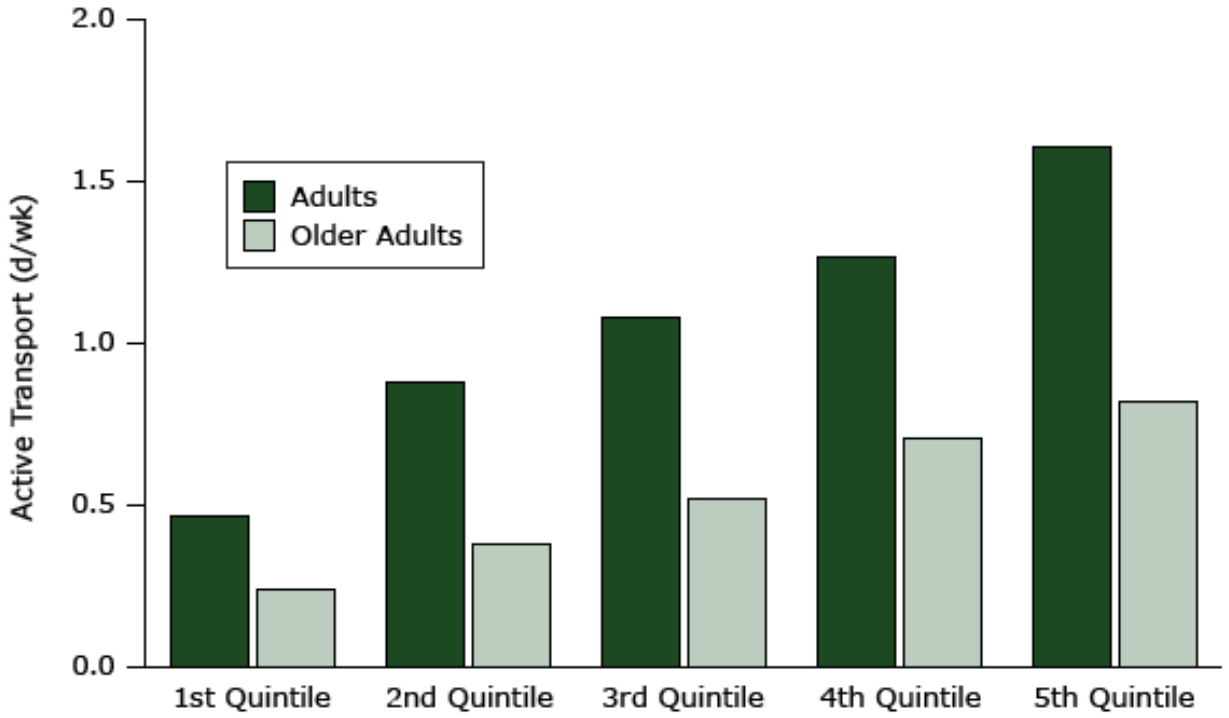
- **15-item**, evidence-based tool designed for practitioners and advocates
- Developed from 120-item original MAPS
- Items were selected based on:
  - Correlations with physical activity
  - Guidelines and recommendations
  - Modifiability within realistic budgets & time frames
- Requires minimal training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

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

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



Dose-response of MAPS-Mini total scores and active transport Frequency for 4 age groups



CITIES & HEALTH
https://doi.org/10.1080/23748834.2020.1783479

Routledge
Taylor & Francis Group

COMMENTARY AND DEBATE

Activity-friendly neighbourhoods can benefit non-communicable and infectious diseases

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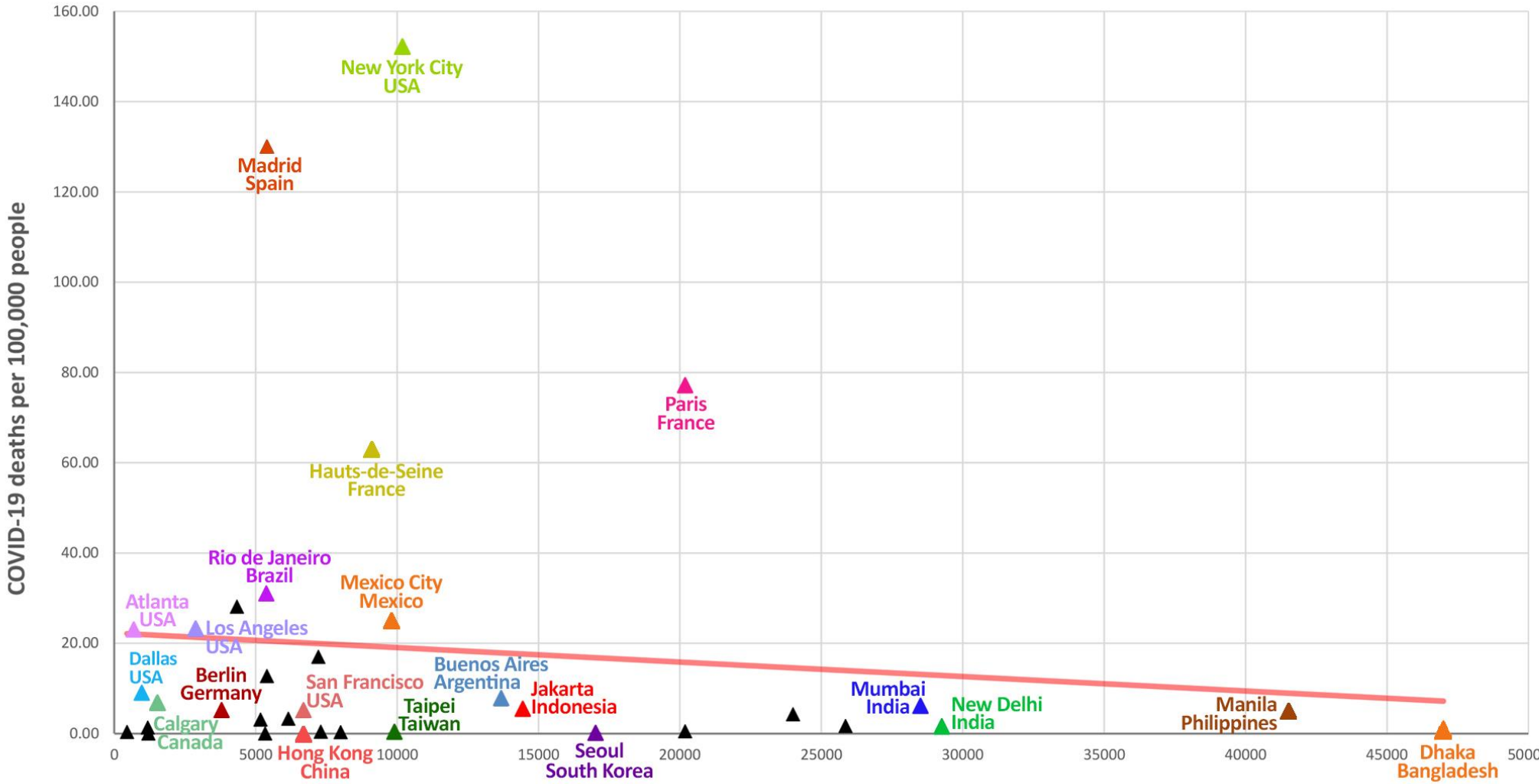
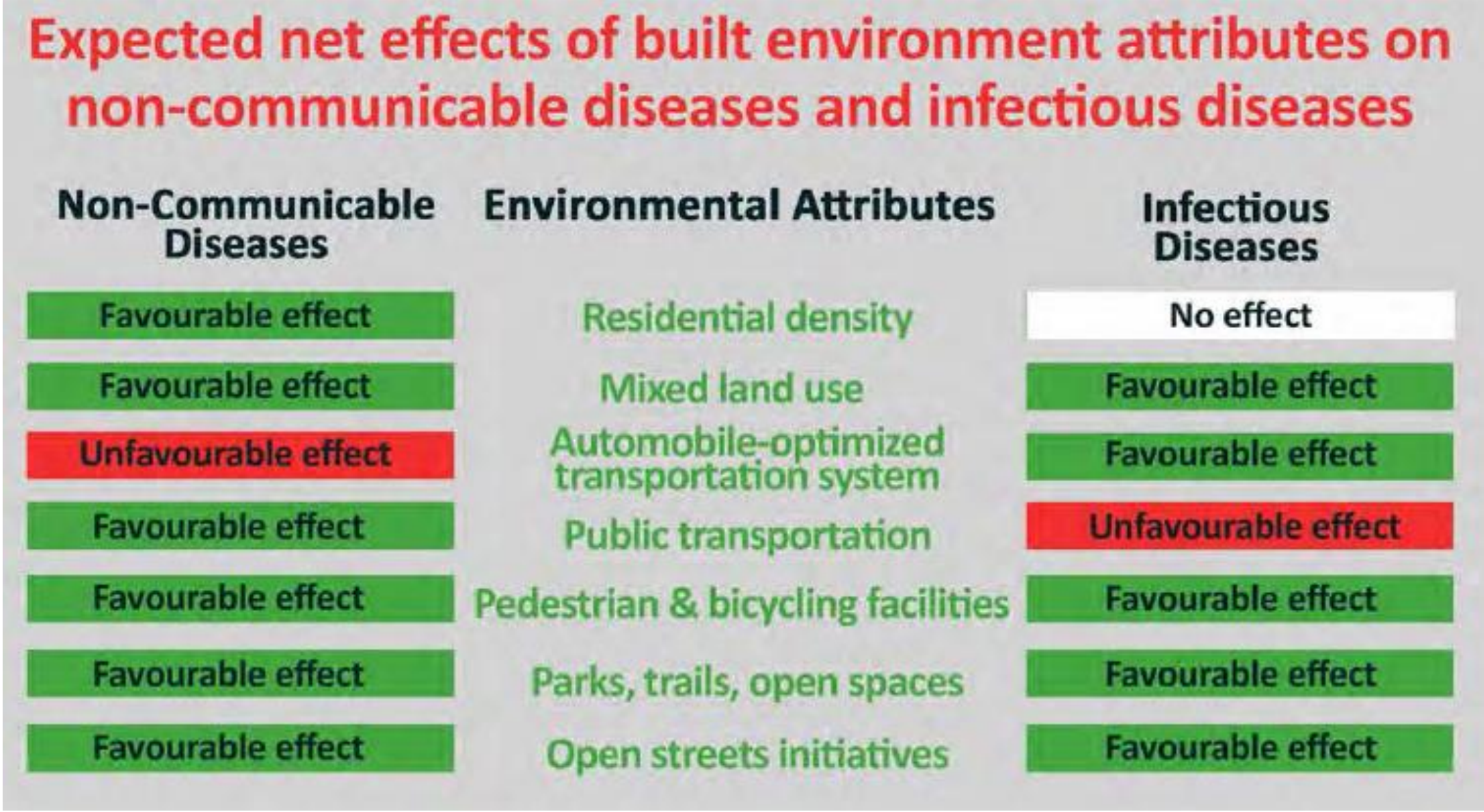


Data source: COVID-19 case data have been compiled from The New York Times Coronavirus Map: Tracking the Global Outbreak, European Center for Disease Prevention and Control (ECDC) - Our World in Data report, and official statistics released by government departments in respective countries.

Population data from World Bank.

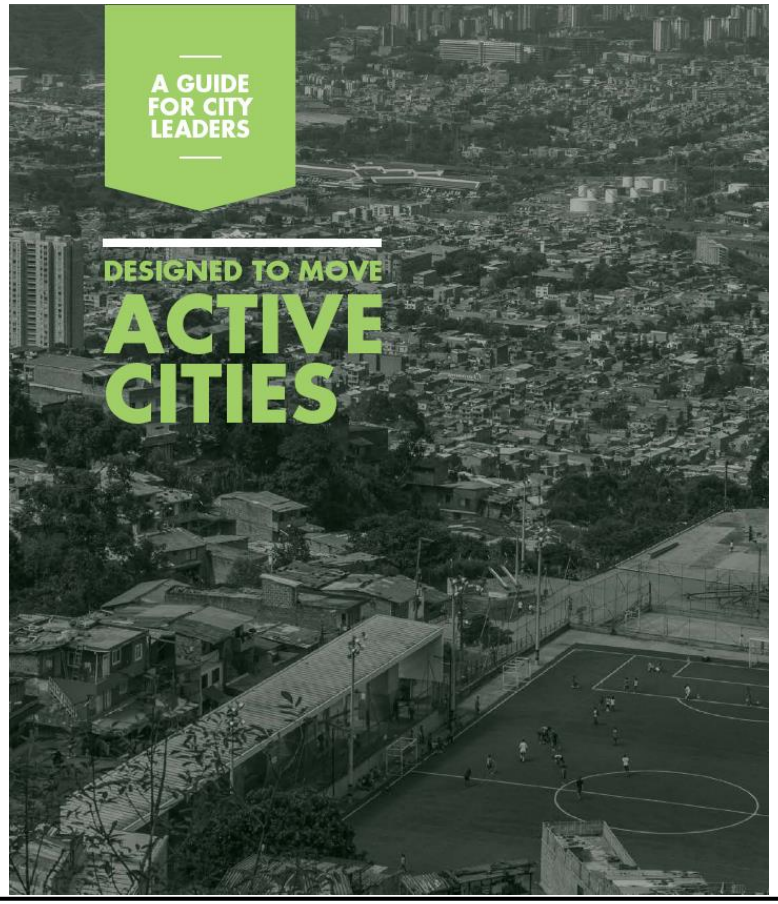
Data are based on reports from early June 2020 at the time of preparation. At times, officials revise reports or offer incomplete information.

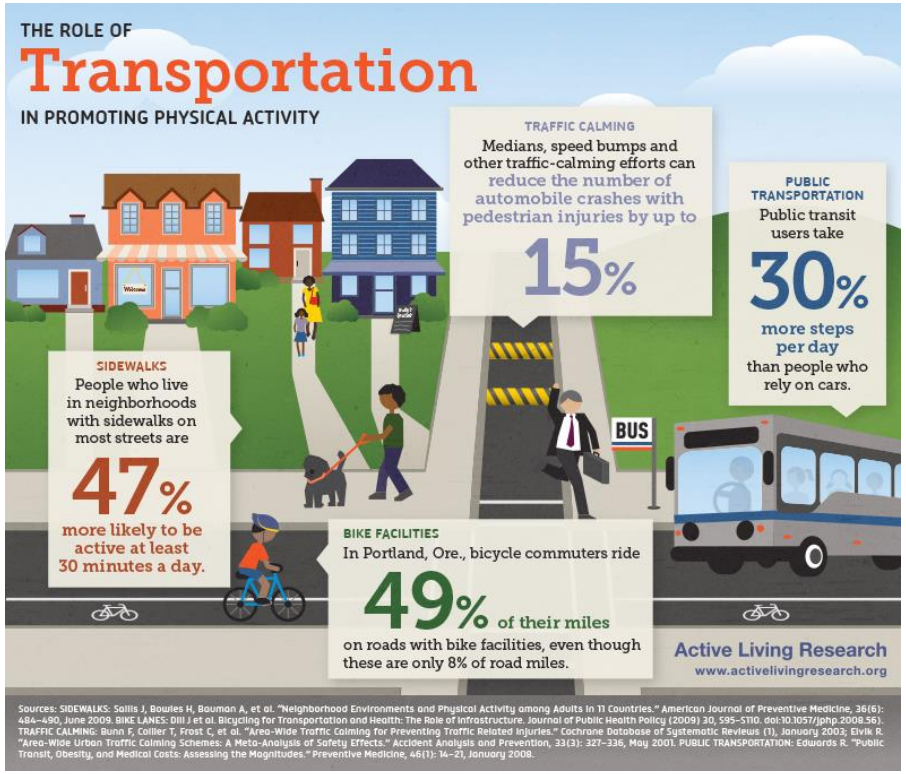
Figure 1B. Scatter plot of population density and per capita COVID-19 deaths



Expected net effects of built environment attributes on non-communicable diseases and infectious diseases.
Notes: + = favorable effect; 0 = no effect; - = unfavorable effect
This table represents a simplification because expected unfavourable effects of density and public transport use on IDs can be mitigated by aggressive public health measures.

Resources at www.activelivingresearch.org





http://sallis.ucsd.edu