

An Ecological Approach to PA Population Research and Using What We Know

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Prevention**

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Any Barriers to Physical Activity Here?



Rationale for more PA-related policy & environment research

- IOM, CDC, Surgeon General, AHA, WHO, National PA Plan, and other groups recommend policy & environment changes as essential for improving PA, diet, obesity.
- Policy & environment changes are being implemented by governments, school districts, and industry.
- Don't we need research to guide and evaluate these efforts?

Elements of An Active Living Community

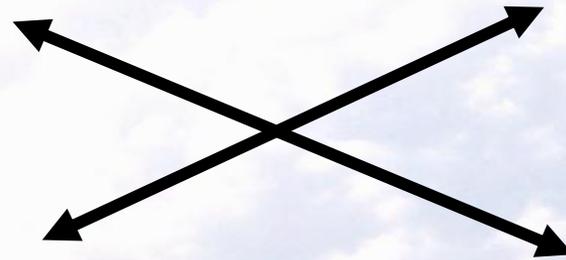
**Community Design
Destinations**



Home



Transportation System

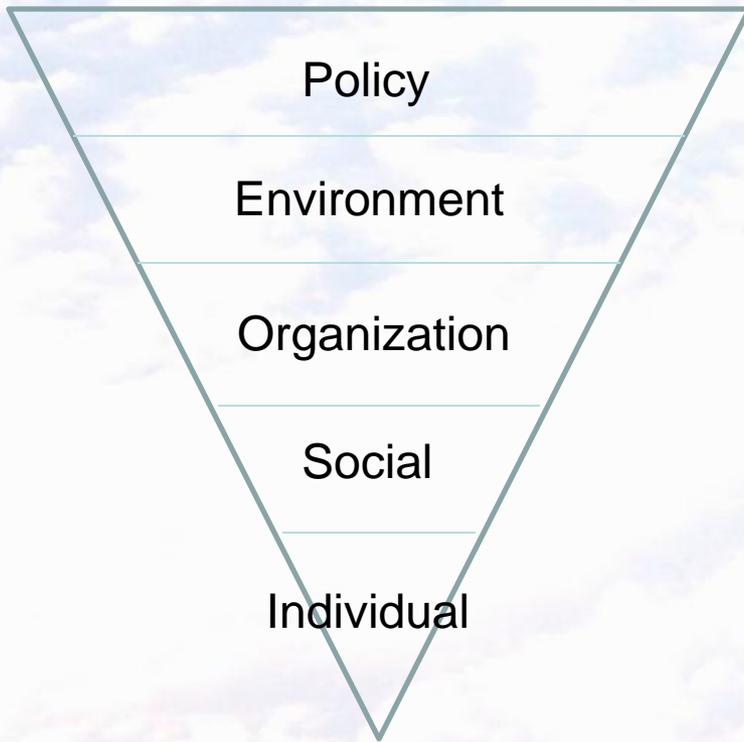


School & Worksite

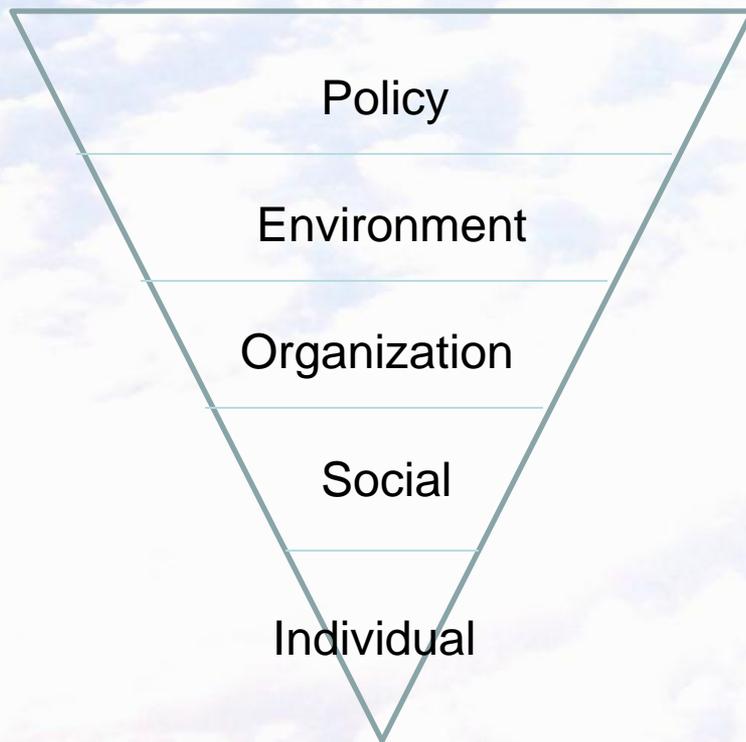


Park & Rec

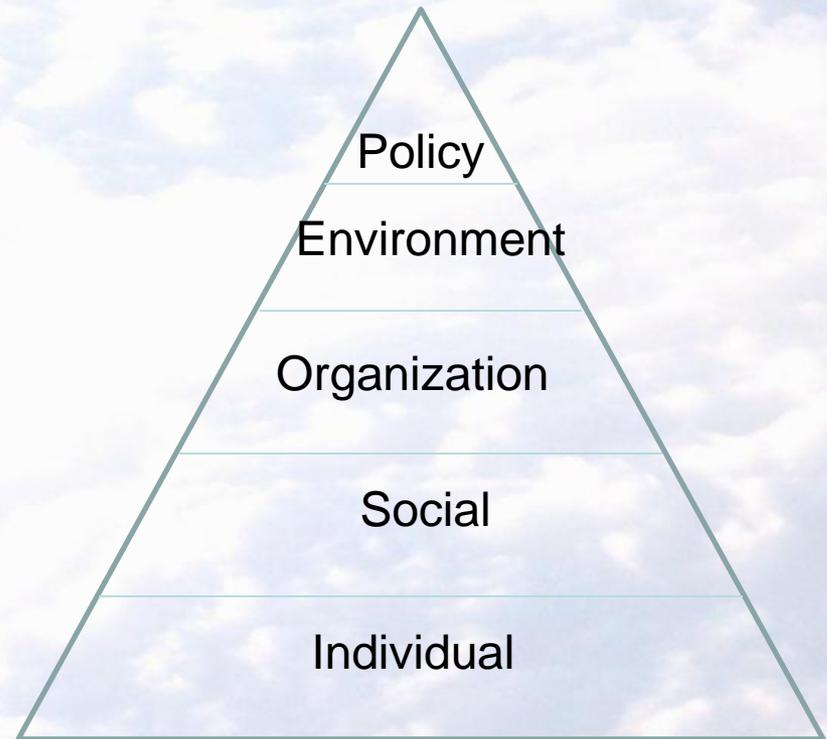




**Expected Impact of
PA Interventions
At Various Levels**



Expected Impact of
PA Interventions
At Various Levels



My Estimate of Relative
Funding Emphasis at
NIH in General

Residential Density

- What we know
 - Component of walkability
 - Generally related to active transport
 - Often political barrier to walkable developments
- What we need to know
 - What are critical levels of density?
 - How to mitigate objections to density?

Mixed Use

- What we know
 - Essential component of walkability—access to destinations
 - Related to active transport for adults and youth
- What we need to know
 - What are simple indicators of mixed use?
 - What are optimal levels of mixed use?
 - What uses drive walking for various subgroups?

Connectivity

- What we know
 - Component of walkability
 - Cul-de-sacs can provide recreation space for children
- What we need to know
 - What are the best simple indicators of connectivity?
 - What are effects of pedestrian connectors in cul-de-sacs?
 - How to balance transport negatives & recreation positives for youth?

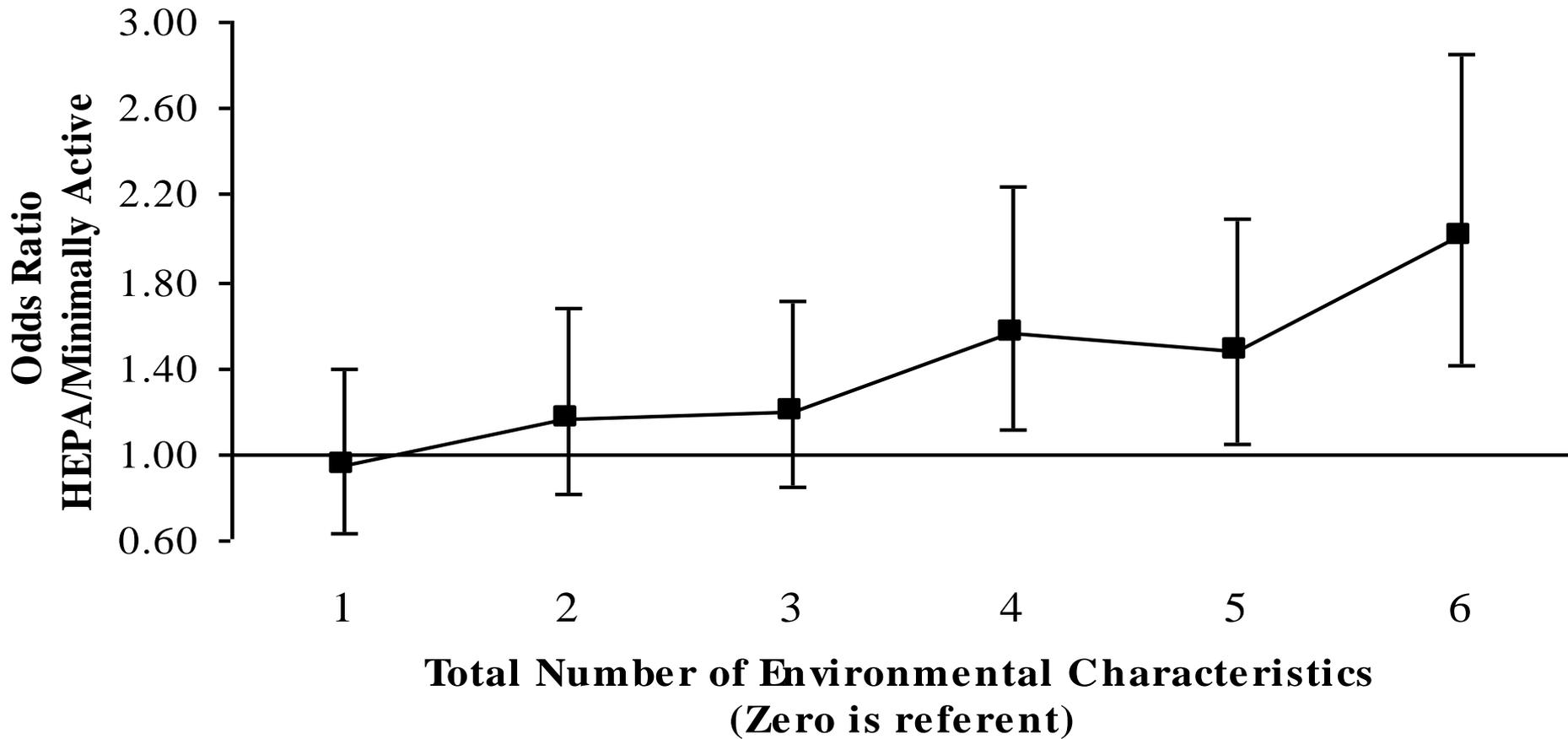
Pedestrian design (floor area ratio)

- What we know
 - Reflects both mixed use & pedestrian design
 - Seldom studied & data seldom available
 - In NQLS, retail FAR was strongest correlate of active transport & total PA
- What we need to know
 - Do FAR results generalize to other settings?
 - Are there other indicators of pedestrian design?

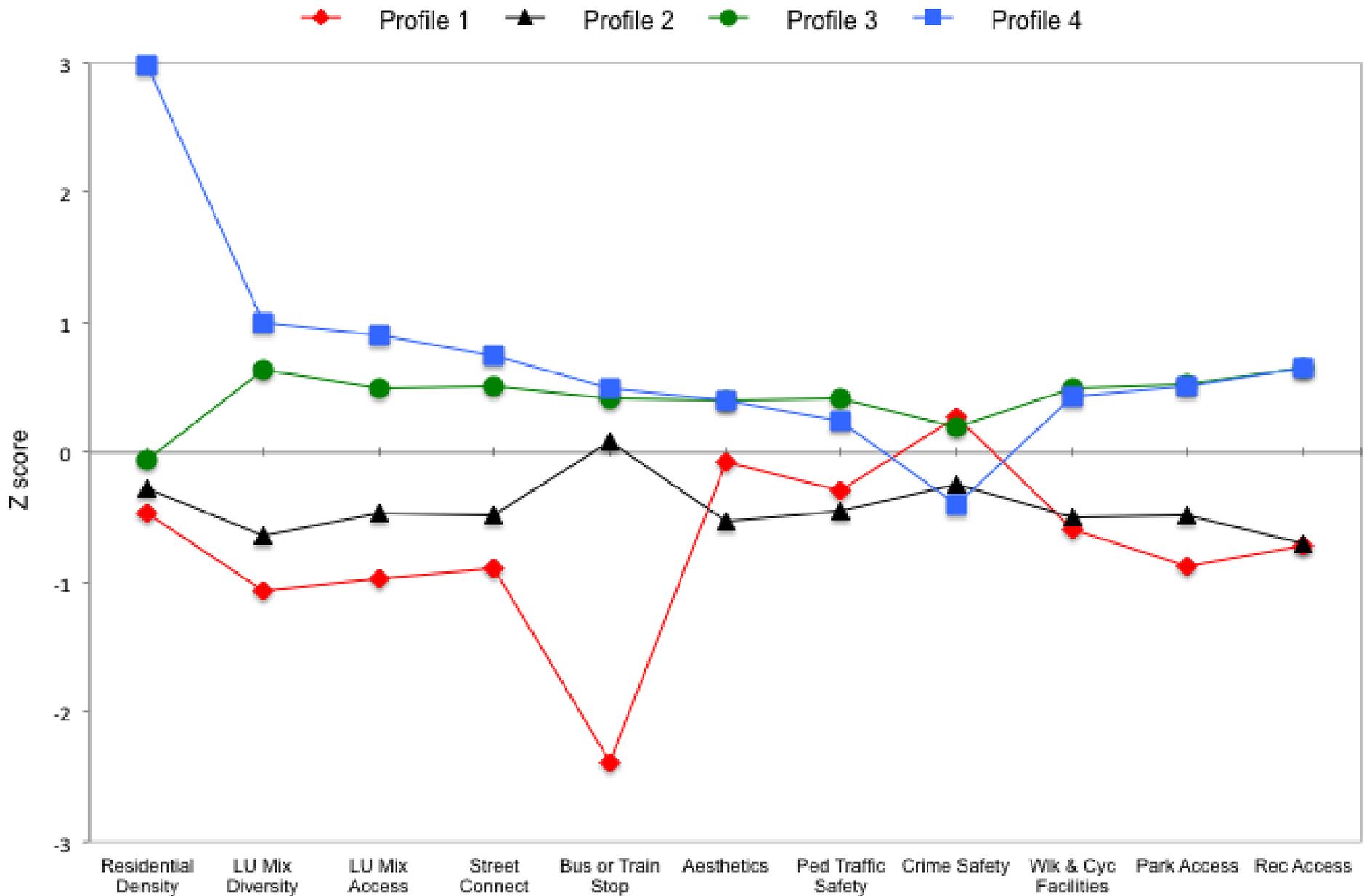
Patterns of environmental attributes

- What we know
 - Considering multiple attributes appears to strengthen associations with PA
 - Findings using latent profile analysis with NQLS data are encouraging
- What we need to know
 - What are optimal ways of assessing patterns?
 - How generalizable are patterns across subgroups and locations?
 - How can we assess patterns of attributes for clear communication?

Dose Response between Number of Environmental Characteristics and HEPA/Minimal Activity (Pooled City Sample)



Adams. Prev Med. 2011. Four latent neighborhood profiles for Seattle region.



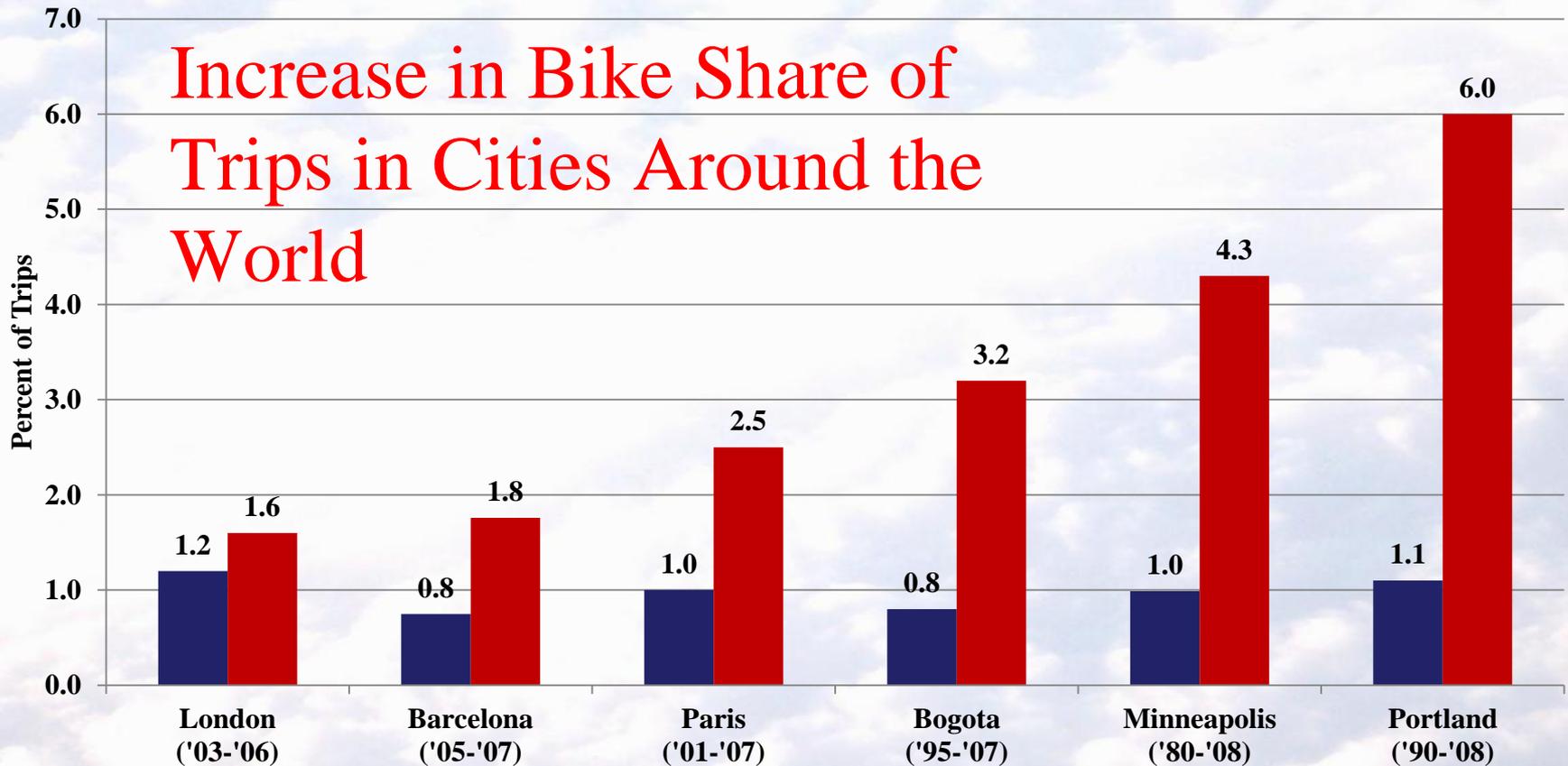
Adjusted means for physical activity and body mass variables by latent profile.

	Low Walk / Transit Sparse^a	Seattle Region Low Walk / Rec Sparse^b	Mod. Walk / Rec Dense^c	High Walk / Rec Dense^d
	Mean	Mean	Mean	Mean
MVPA min/d	31.99^{a,b}	34.69^{a,b,c,d}	37.14^{b,c,d}	40.78^{b,c,d}
IPAQ transport walking min/wk	9.75^a	18.63^b	43.15^{c,d}	76.04^{c,d}
IPAQ leisure min/wk***	43.07^{a,b}	58.91^{a,b}	86.31^{c,d}	117.91^{c,d}
BMI*	26.92^{a,b,c}	27.44^{a,b}	26.01^{a,c,d}	25.32^{c,d}

Promoting Bicycling

- What we know
 - Single interventions are not effective
 - Comprehensive interventions can be effective
- What we need to know
 - Which bicycle facilities are most effective in attracting new cyclists or commuters?
 - What are most cost-effective combinations of approaches?
 - What are the co-benefits (economic, environmental)?

Increase in Bike Share of Trips in Cities Around the World



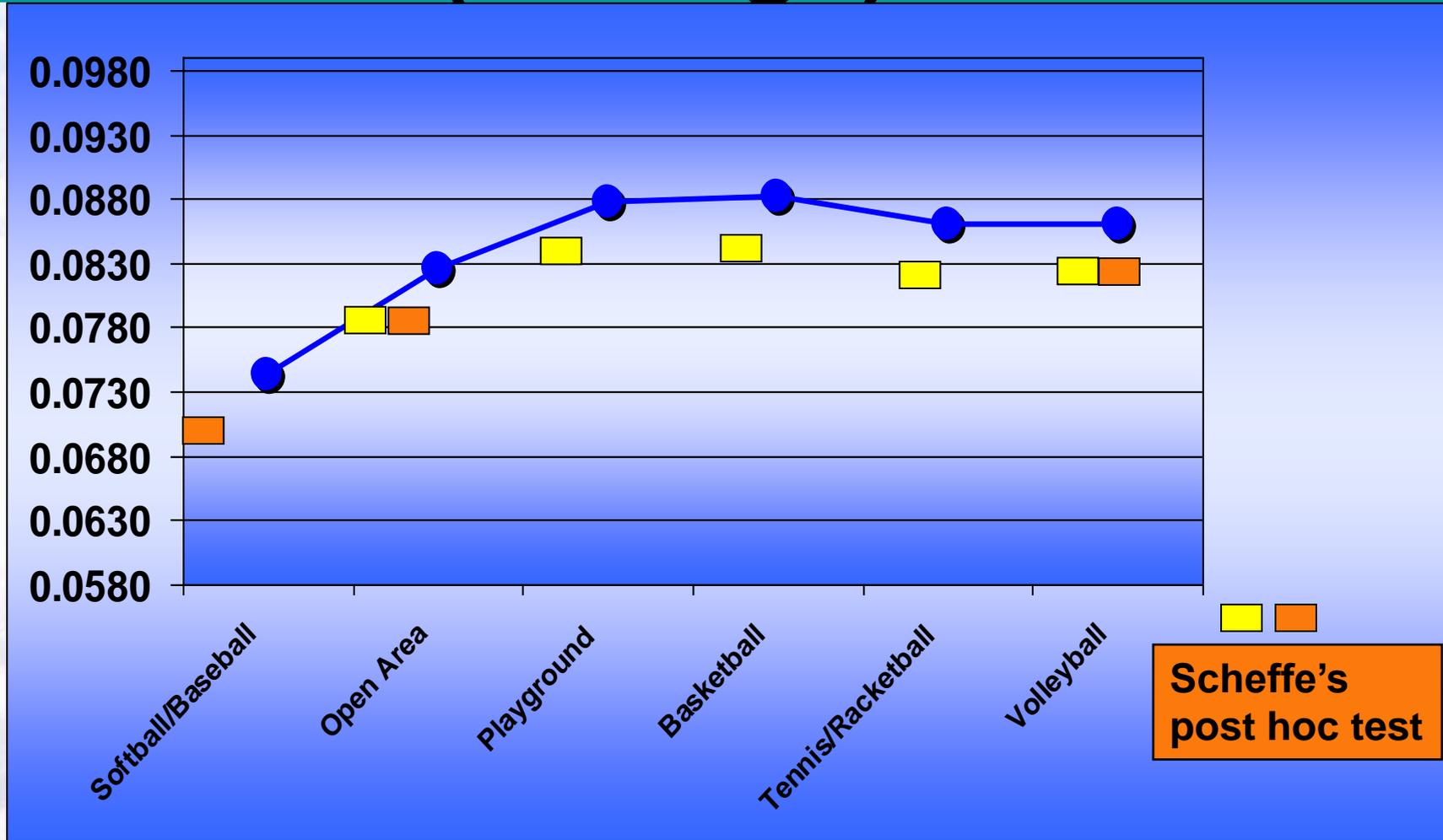
Source: Pucher, Dill, and Handy, "Infrastructure, Programs, and Policies to Increase Bicycling," *Preventive Medicine*, Jan 2010, Vol. 50, S.1, pp. S106-S125.

Access to Recreation Facilities

- What we know
 - Parks related to total PA & active recreation in adults & youth
 - Reasonable evidence about access to private recreation facilities
 - Parks & trails—>higher real estate values
- What we need to know
 - Role of trails in active transport & recreation?
 - Most important park facilities for attracting park visits & PA in parks?
 - How to promote use of and PA in parks?

Mean EE by Park Activity Zones (Chicago)

Energy Expenditure (Kkcal/kg/min)



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

Microscale Attributes: Limited Studies

- Sidewalk presence & quality
- Importance of buffers between sidewalks and traffic
- Aesthetic qualities
- Intersection characteristics, depending on road & land use contexts
- Crime rates & perception
- Need simpler observational measures of streetscape & park attributes

Route Observations & Transport PA

MAPS Score	Children	Adolescents	Adults	Seniors
Destinations & Land Use – Positive (+)				
Destinations & Land Use – Negative (-)	—			
Destinations & Land Use –Overall (+ MINUS -)				
Streetscape –Positive (+)				
Streetscape –Negative (-)				
Streetscape – Overall (+ MINUS -)				
Aesthetics & Social – Positive (+)	—	—	—	—
Aesthetics & Social – Negative (-)	—			—
Aesthetics & Social – Overall (+ MINUS -)	—			—
ROUTE OVERALL				

Significant Correlations range from .073- .350

Spearman's correlations

P<.001

P,.01

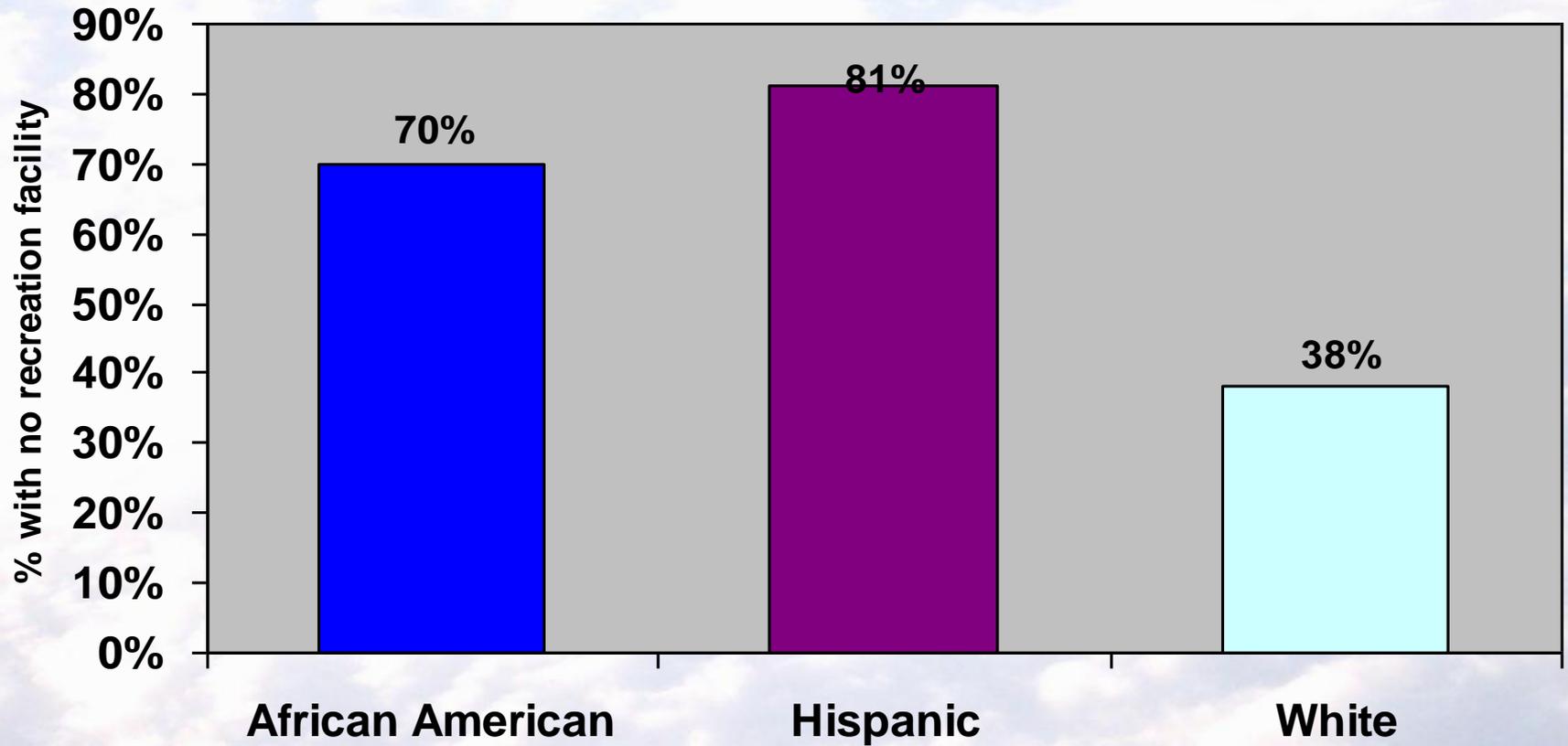
p.05

unexpected
direction

Environmental Disparities

- Emerging evidence of disparities in
 - Crime & perceptions of safety
 - Quality of intersections
 - Aesthetics
 - Park access
 - School PA programs
- What we need to know
 - Disparities by ethnic/racial and SES groups
 - Policies that lead to disparities
 - Park quality
 - Joint use agreements as potential solutions to absence of parks

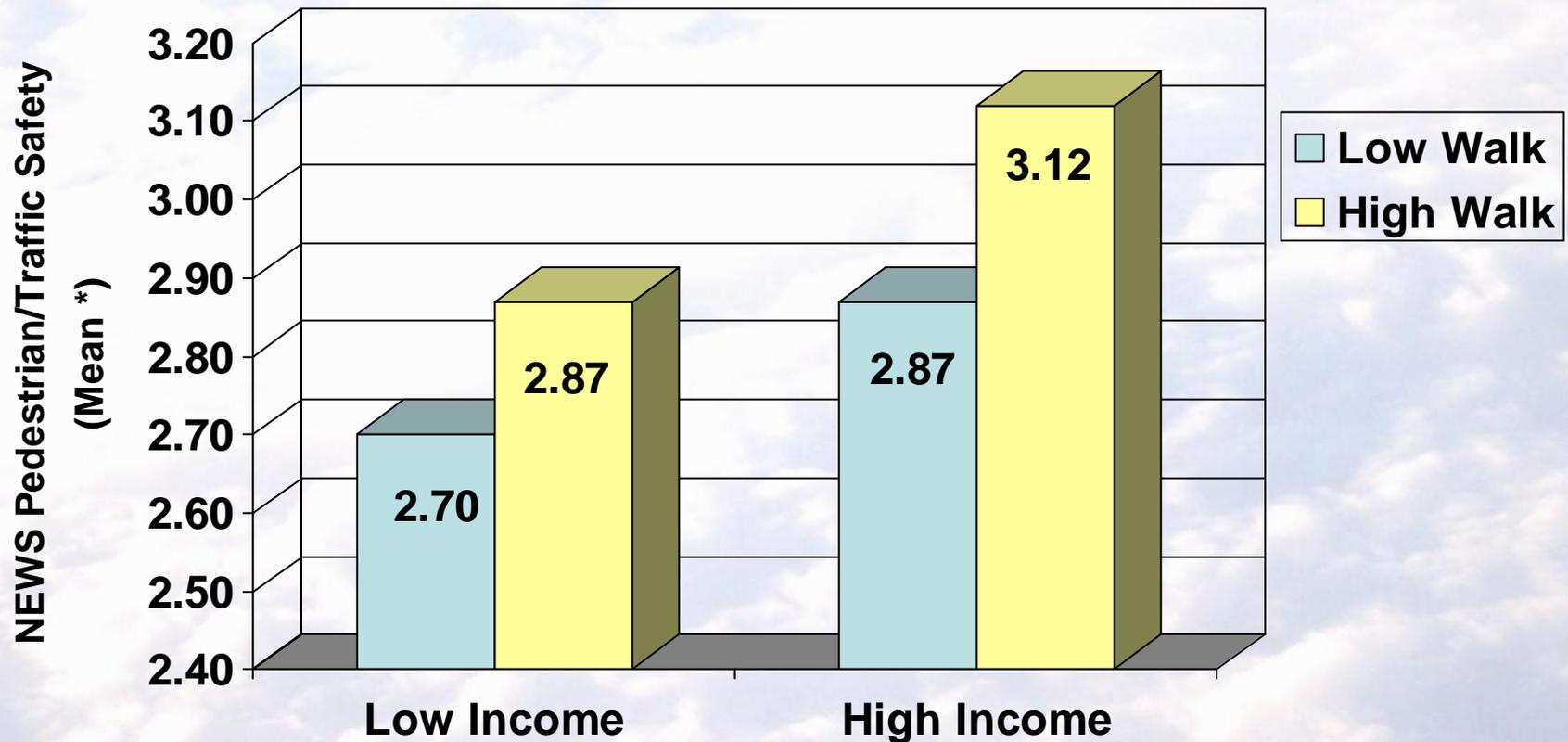
Percent of census tracts without a recreational facility by race/ethnicity



NEWS Pedestrian/Traffic Safety in Walkability-by-Income Quadrants

Income: $p = <.0001$

Walkability X Income: $p = .48$



*All models adjusted for gender, age, education, ethnicity, # motor vehicles/adult in household, site, marital status, number of people in household, and length of time at current address. Neighborhood was included as a random effect to adjust for clustering.

Policy Research

- What factors drive decisions about specific built environment policies (zoning, road standards, transport policies, park funding)
 - Money is always a factor, so economic studies should be prioritized
- Public support for active living policies
- Evaluate strategies to improve implementation of policies

Improved Data Systems Require Collaborating with Non-Health Groups

- Improved measurement & surveillance of policy & environment factors could assist research & policy
- Our priorities are not their priorities
- Need systematic efforts to improve land use, transport, education, crime, & business data for health purposes
- Health agencies will likely need to invest in these data systems

Environments, Policies, & Status of Measures

PA-Related Environment Attribute	Policy Determinant	Status of National Policy Measures
Mixed land use	Zoning	Poor
Street connectivity	Guidelines, standards	Fair
Residential density	Zoning	Poor
Ped/bike facilities	Transport/complete streets	Poor
Traffic volume/speed	Transport	Good
Transit access	Transport	Good
Parks, trails	Park & rec standards & funding	Poor
Private rec facilities	Marketplace	Poor
Aesthetics	Various	Poor
School grounds, siting	Standards, joint use agreements	Poor

More Research Needs

- **Improved rigor**
 - Prospective studies
 - Natural experiments to evaluate environmental & policy changes
- Development of simple environmental measures that community groups can use
- Economic analyses
- How to communicate results to decision makers?

Improving Translation of Research

- Adopt goal of advancing science AND policy
- Policy makers become part of research teams & contribute to study aims & methods
- Train researchers in translation activities
- Supplement data with stories, case studies
- Lay summaries of articles, reviews, & grants
 - Make results more accessible
- Research translation grants
 - Provide incentive for translation

Resources at <http://www.activelivingresearch.org>



The Behavioral Epidemiology Framework

