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

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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

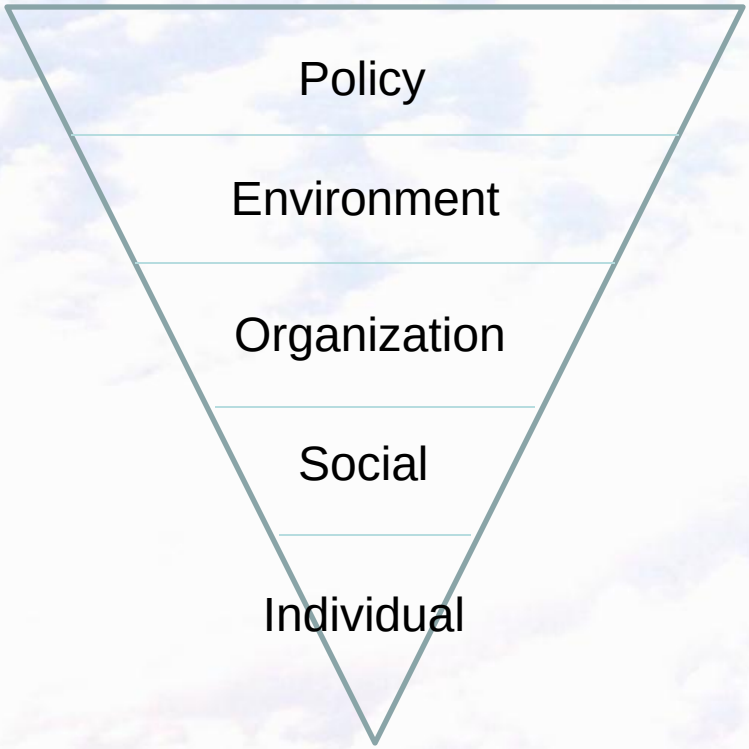
Community Design
Destinations

Transportation System

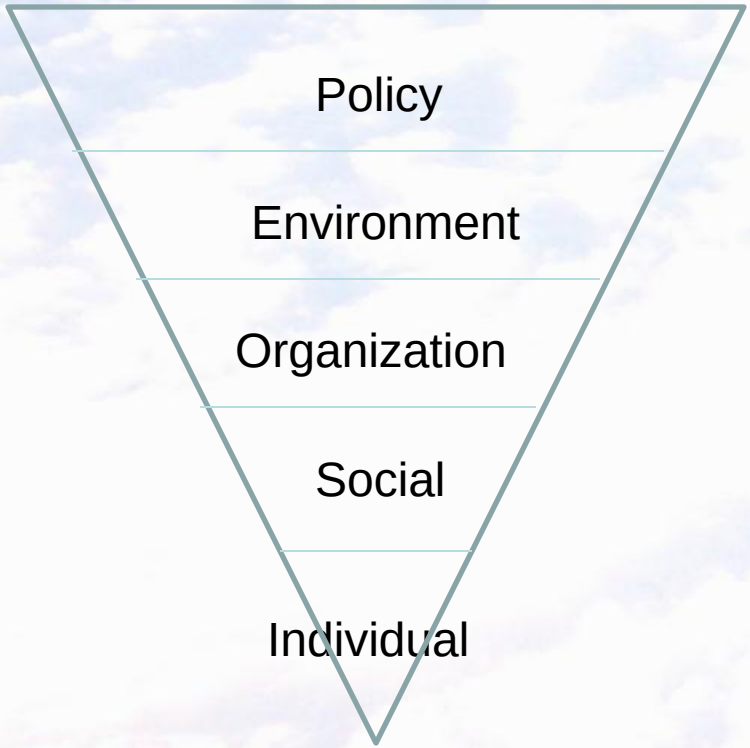
Home

School & Worksite

Park & Rec



Expected Impact of PA Interventions At Various Levels



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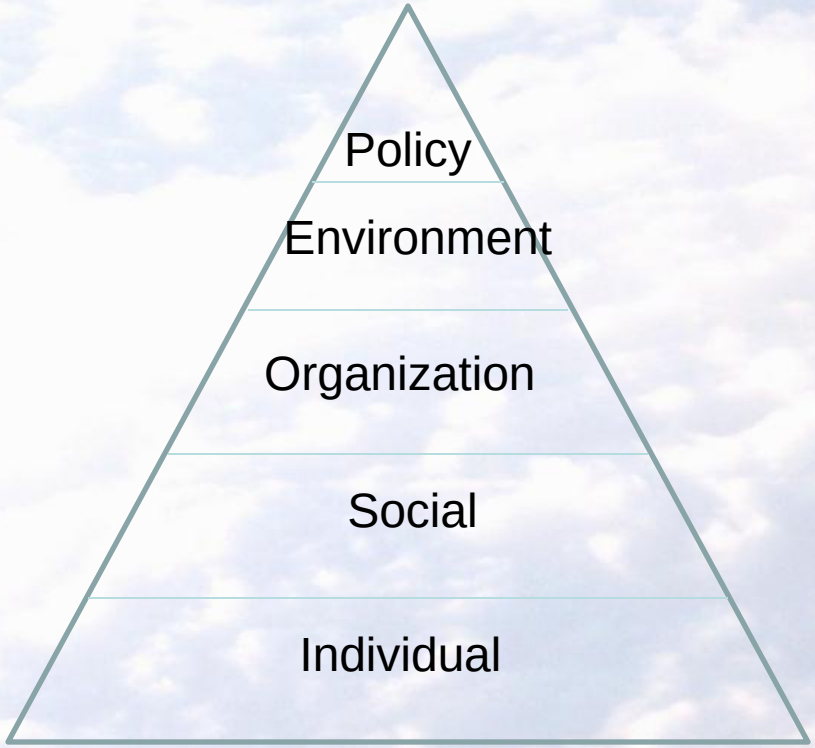


My Estimate of Relative Funding Emphasis at NIH in General

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

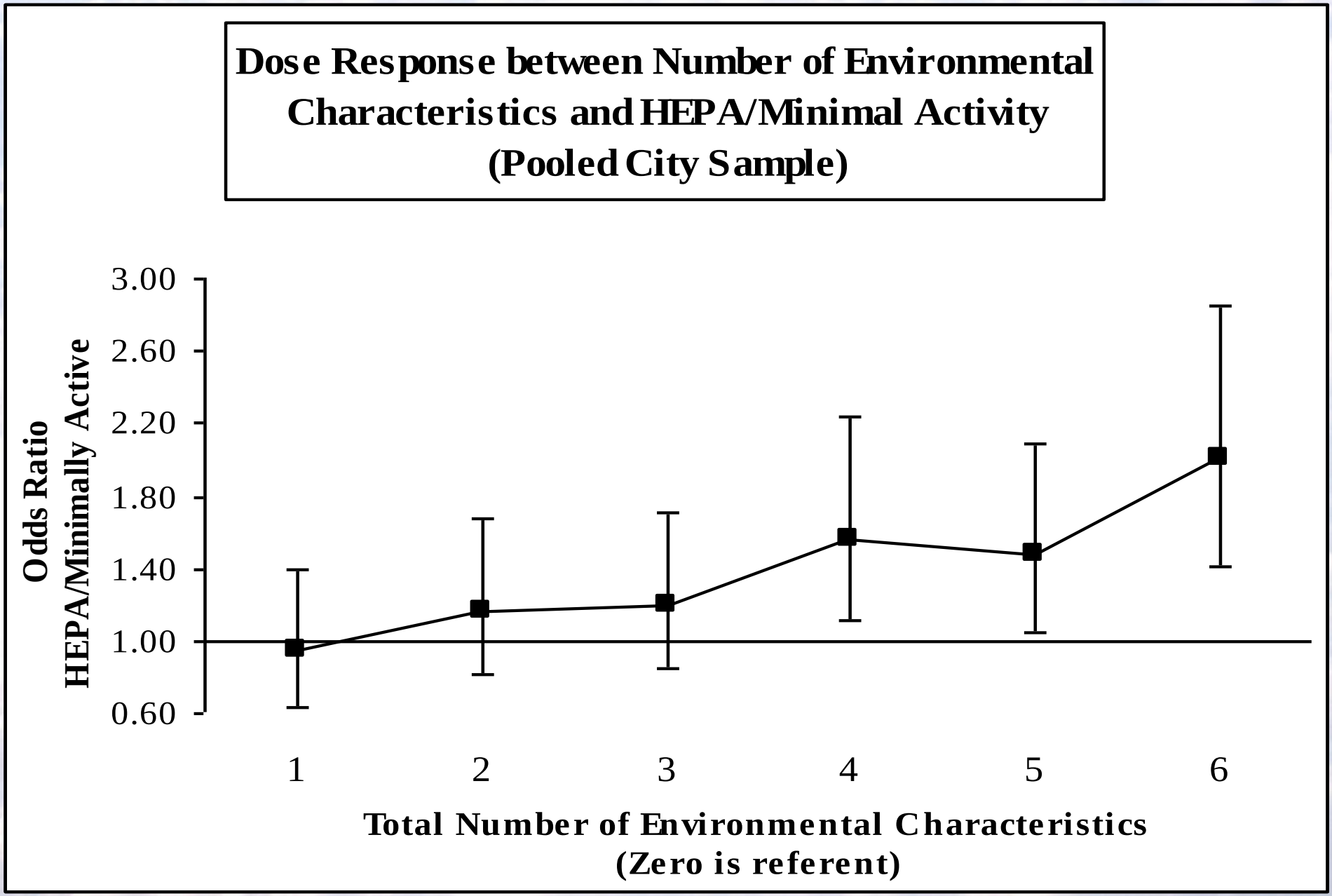
- What we know
  - Component of walkability
  - Cul-de-sacs can provide recreation space for children
- What we need to know
  - What are the best simple indicators of connectivity?
  - What are effects of pedestrian connectors in cul-de-sacs?
  - How to balance transport negatives & recreation positives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

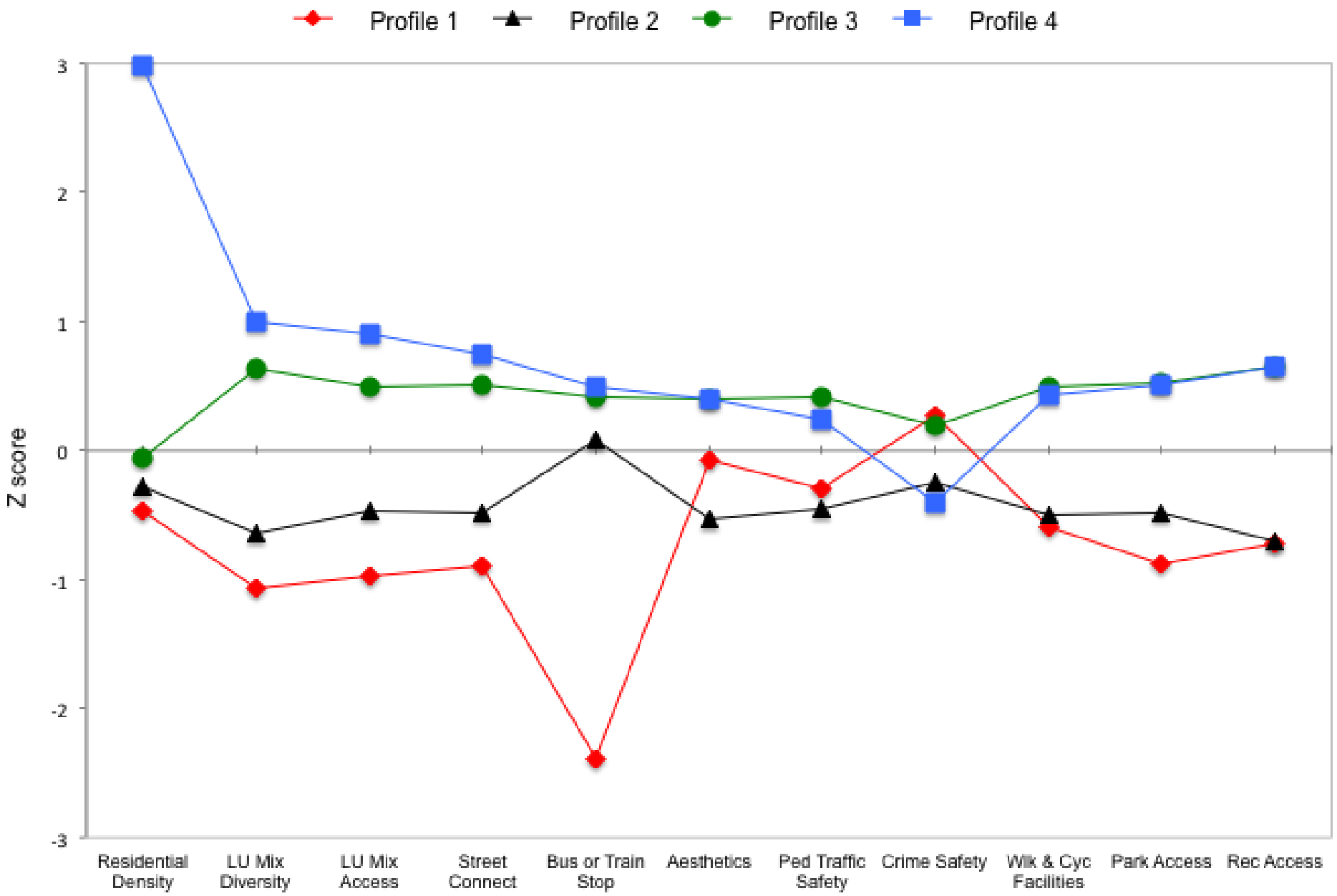
Patterns of environmental attributes

- 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?



Sallis. Am J Prev Med. 06/09

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



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

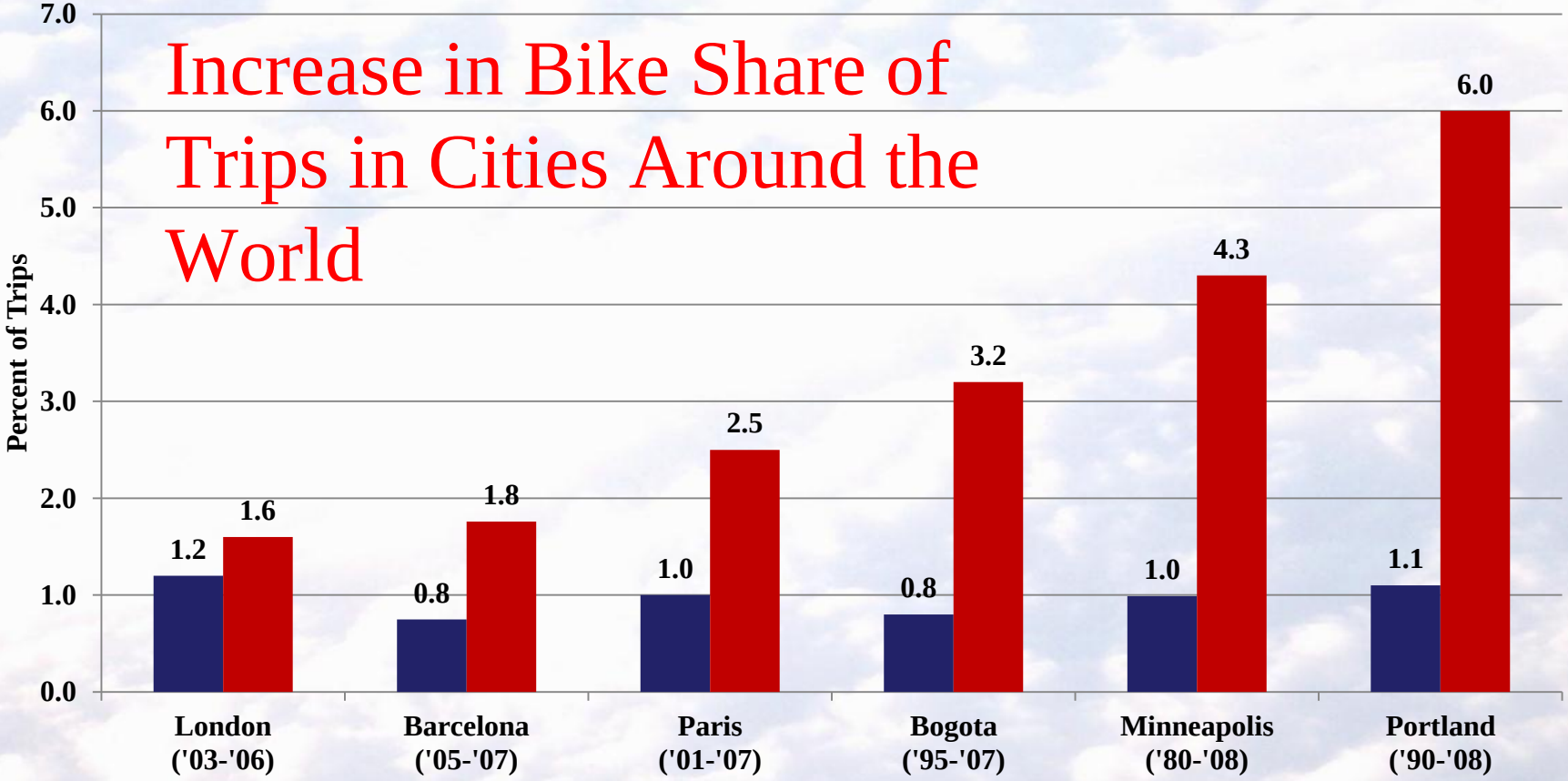
	Seattle Region			
	Low Walk / Transit Sparse[a]	Low Walk / Rec Sparse[b]	Mod. Walk / Rec Dense[c]	High Walk / Rec Dense[d]
	Mean	Mean	Mean	Mean
MVPA min/d	31.99[a,b]	34.69[a,b,c,d]	37.14[b,c,d]	40.78[b,c,d]
IPAQ transport walking min/wk	9.75[a]	18.63[b]	43.15[c,d]	76.04[c,d]
IPAQ leisure min/wk***	43.07[a,b]	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,]

Adams et al. Prev Med 2011

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

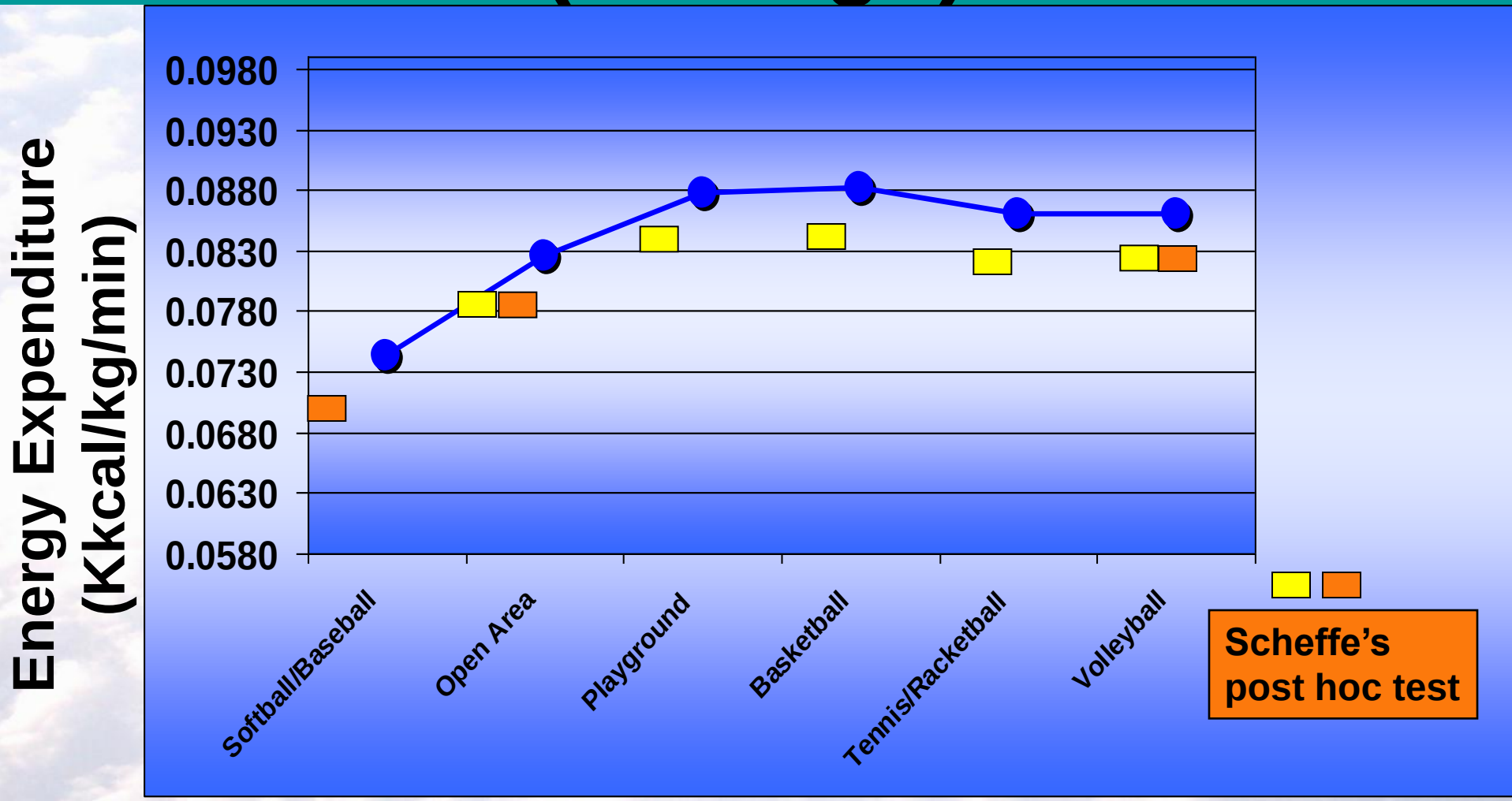


Source: Pucher, Dill, and Handy, "Infrastructure, Programs, and Policies to Increase Bicycling," *Preventive Medicine*, Jan 2010, Vol. 50, S.1, pp. S106-S125.

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)



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	■	■	■	■

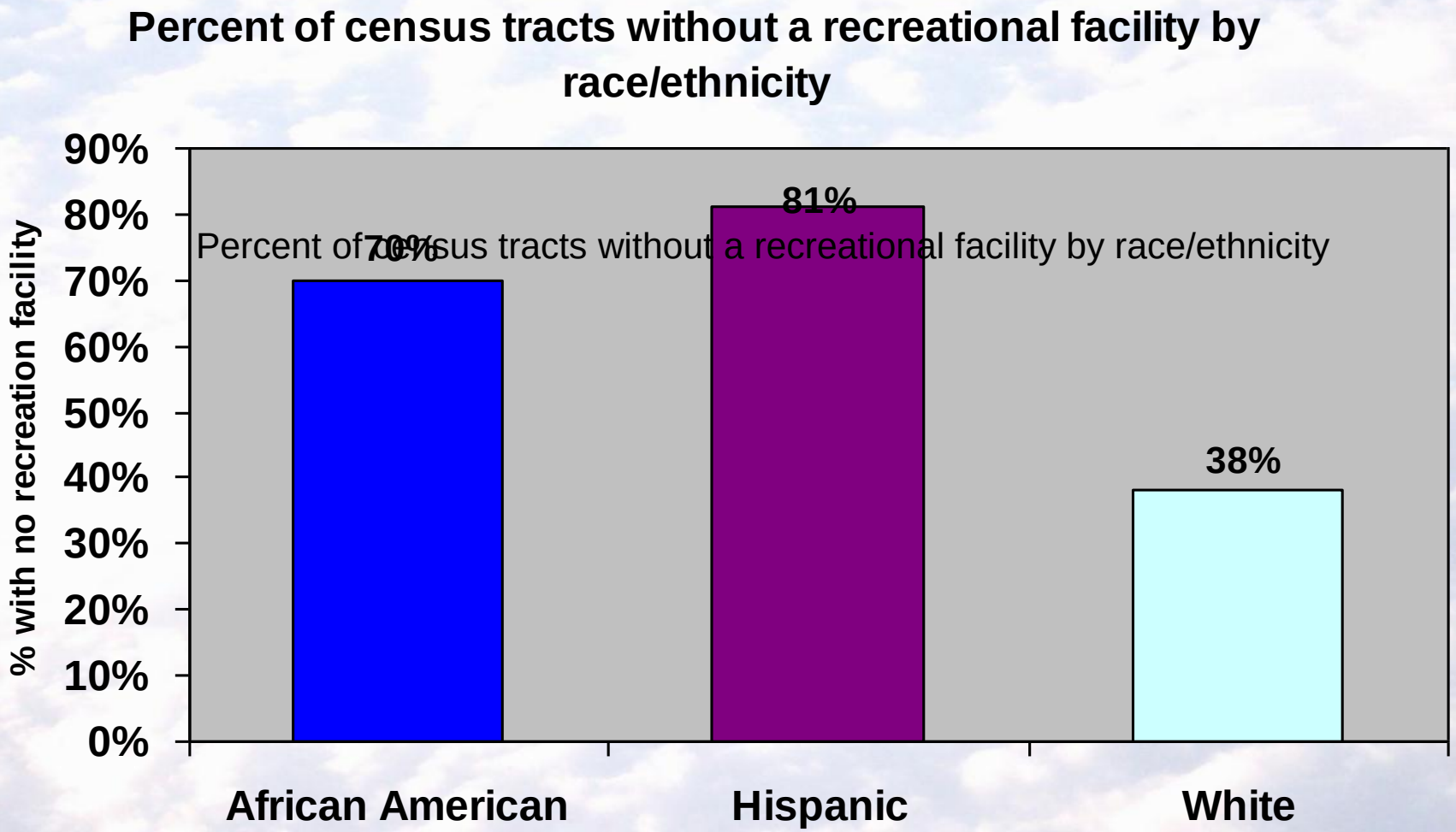
Significant Correlations range from .073- .350

Spearman's correlations

■ P,.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

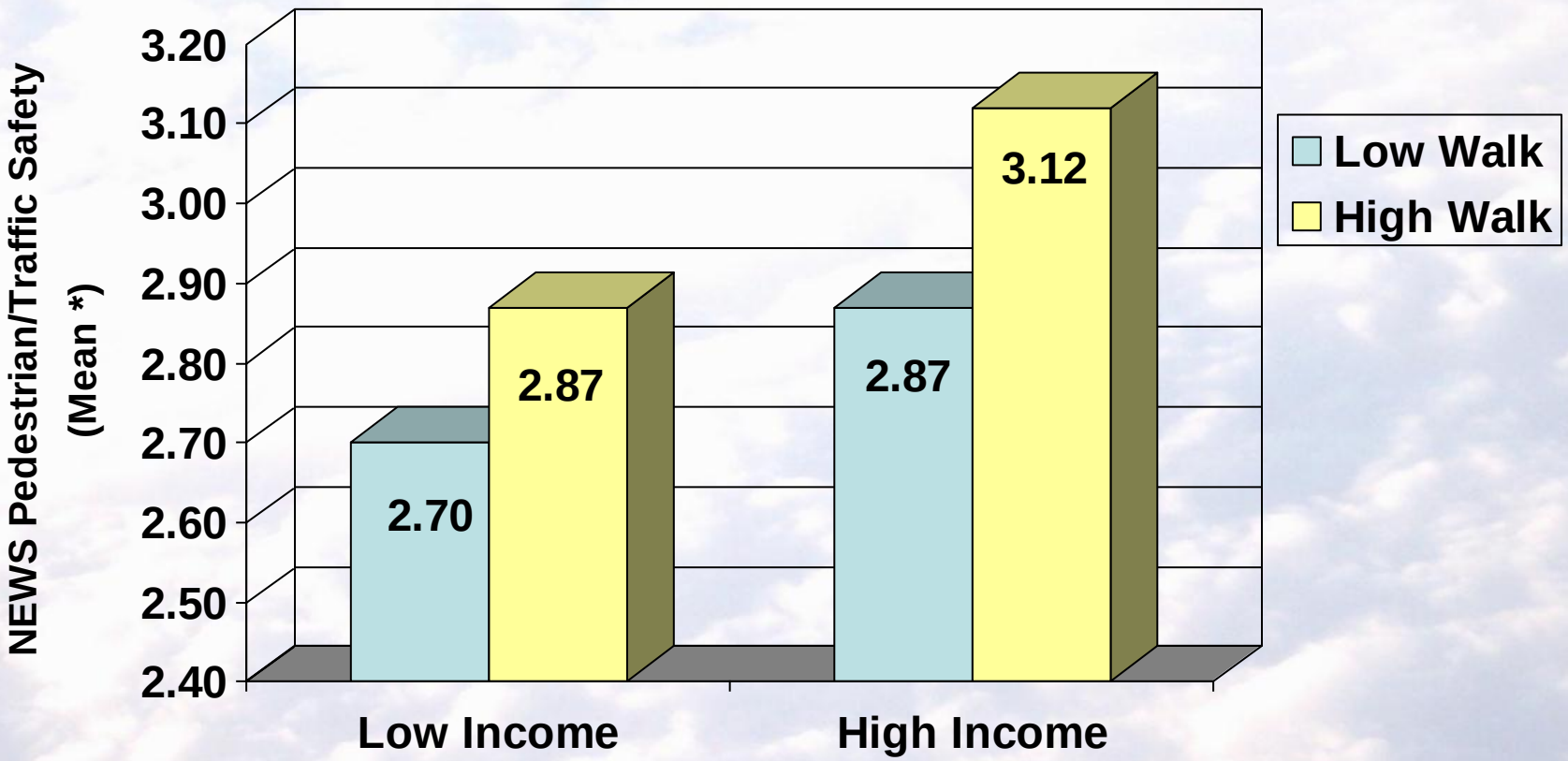


Moore, Am J Prev Med, 2007

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

Phase I

Establish the links between health behavior and CVD

Phase II

Develop measures for accurately assessing health behaviors

→

And apply these Measures in surveillance

Phase III

Identify factors that influence levels of health behaviors

Phase IV

Evaluate interventions to promote health behaviors

Phase IV

Translate research into practice; apply & disseminate effective interventions