



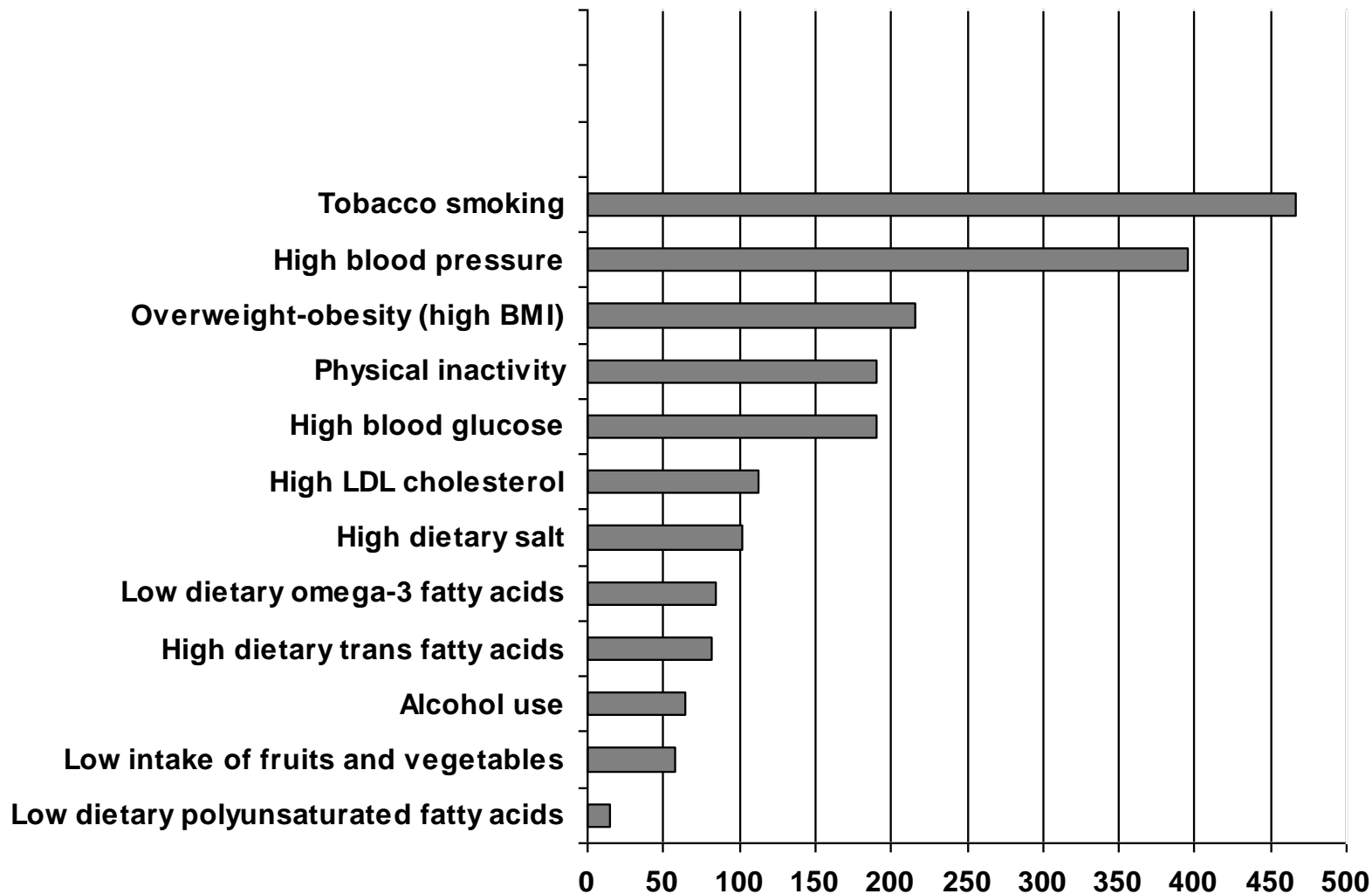
## Active Living Research

Building the Evidence to Prevent Childhood Obesity and Support Active Communities

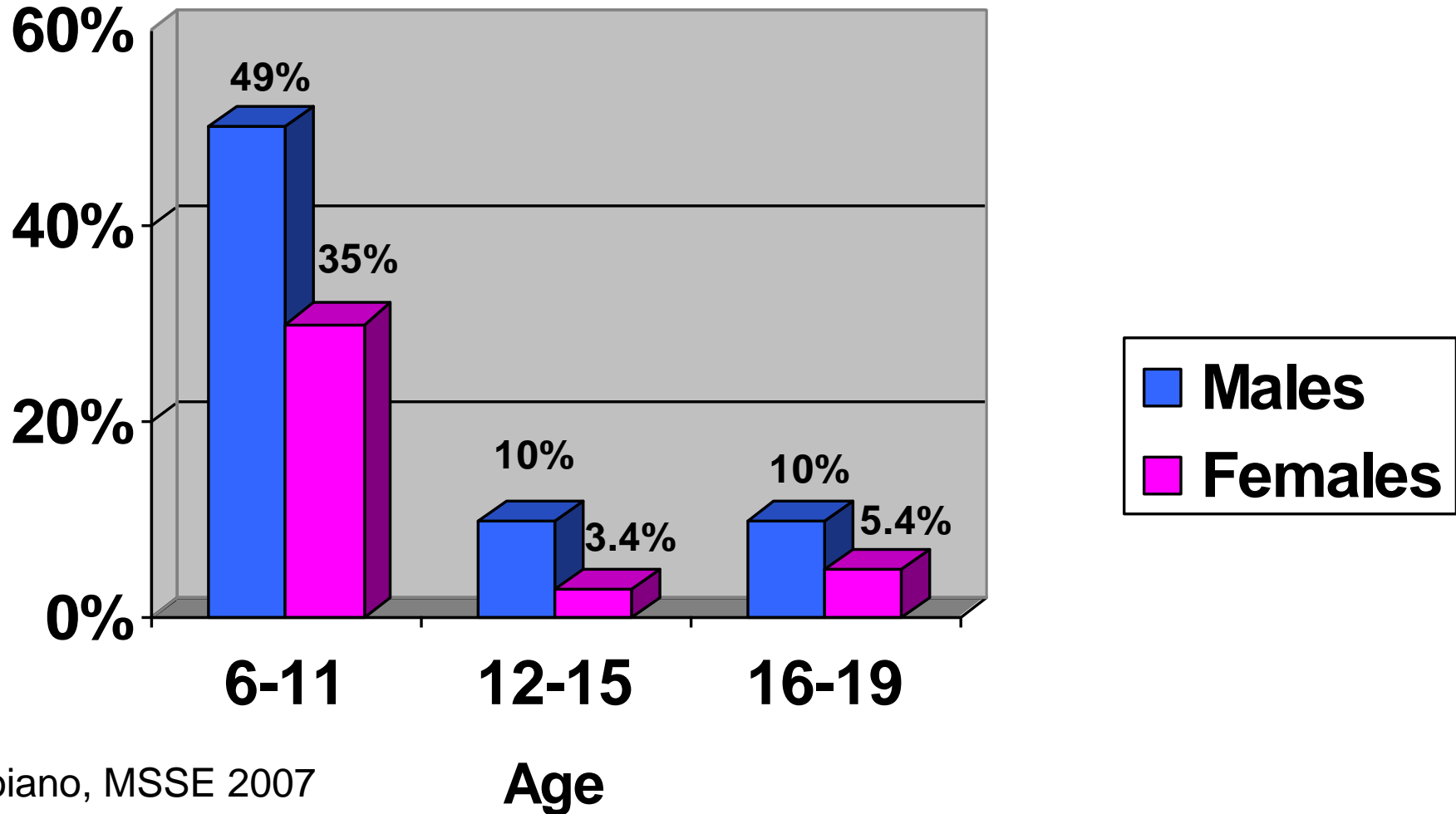
# Welcome to ALR 101

James F. Sallis, Ph.D., Active Living Research, UCSD  
Robert Cervero, Ph.D., UC Berkeley

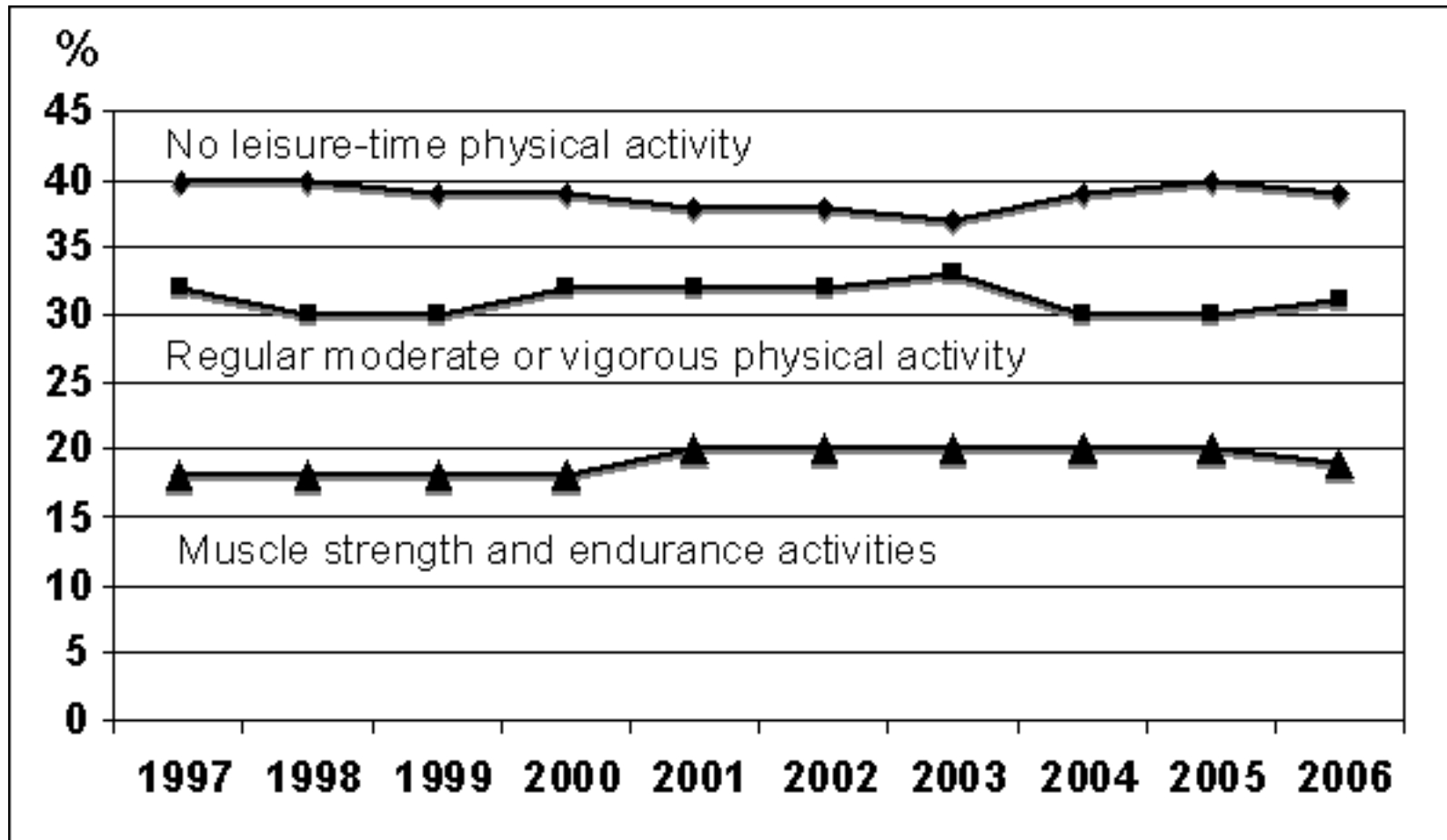
## Deaths (thousands) attributable to individual risk factors in both sexes



**Percentage of youth ages 6-19 meeting 60 min/day  
physical activity guidelines.  
Based on accelerometers. NHANES 2003-4**



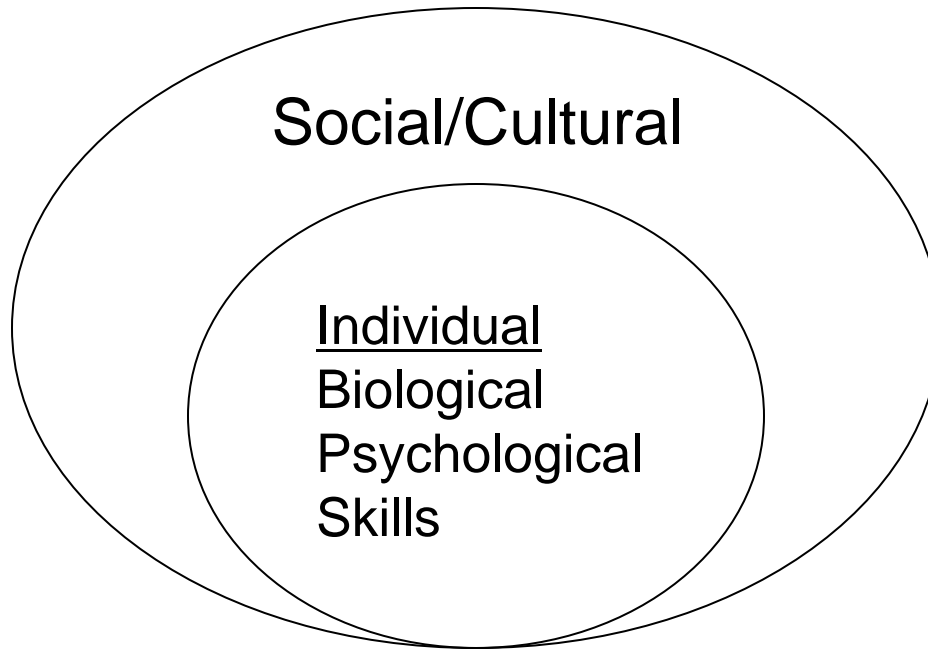
# How are we doing?



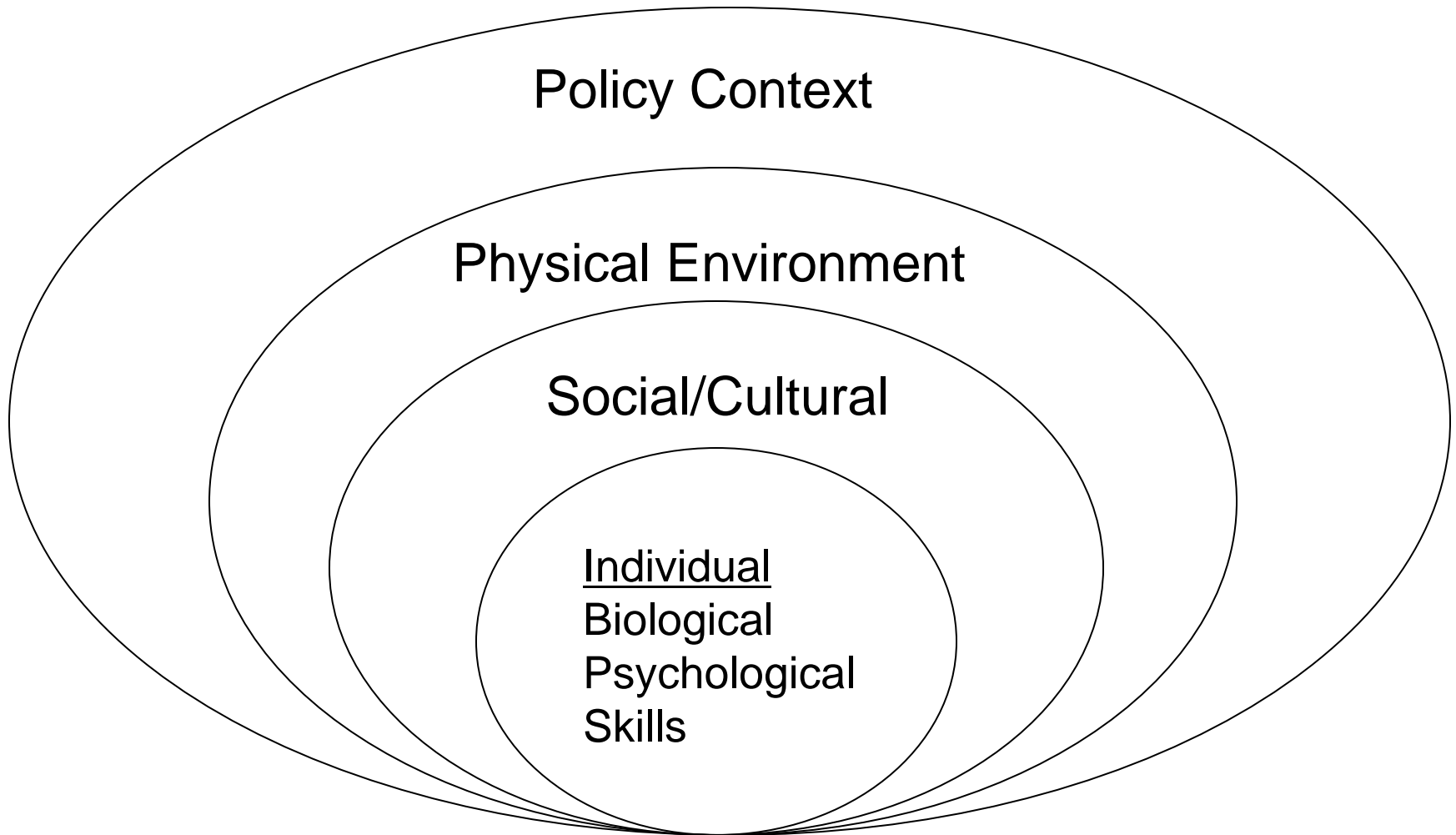
## Reported Physical Activity by Adults in the USA: 1997-2006 The Healthy People 2010 Database

Healthy People 2010 Database (DATA2010) for men and women combined

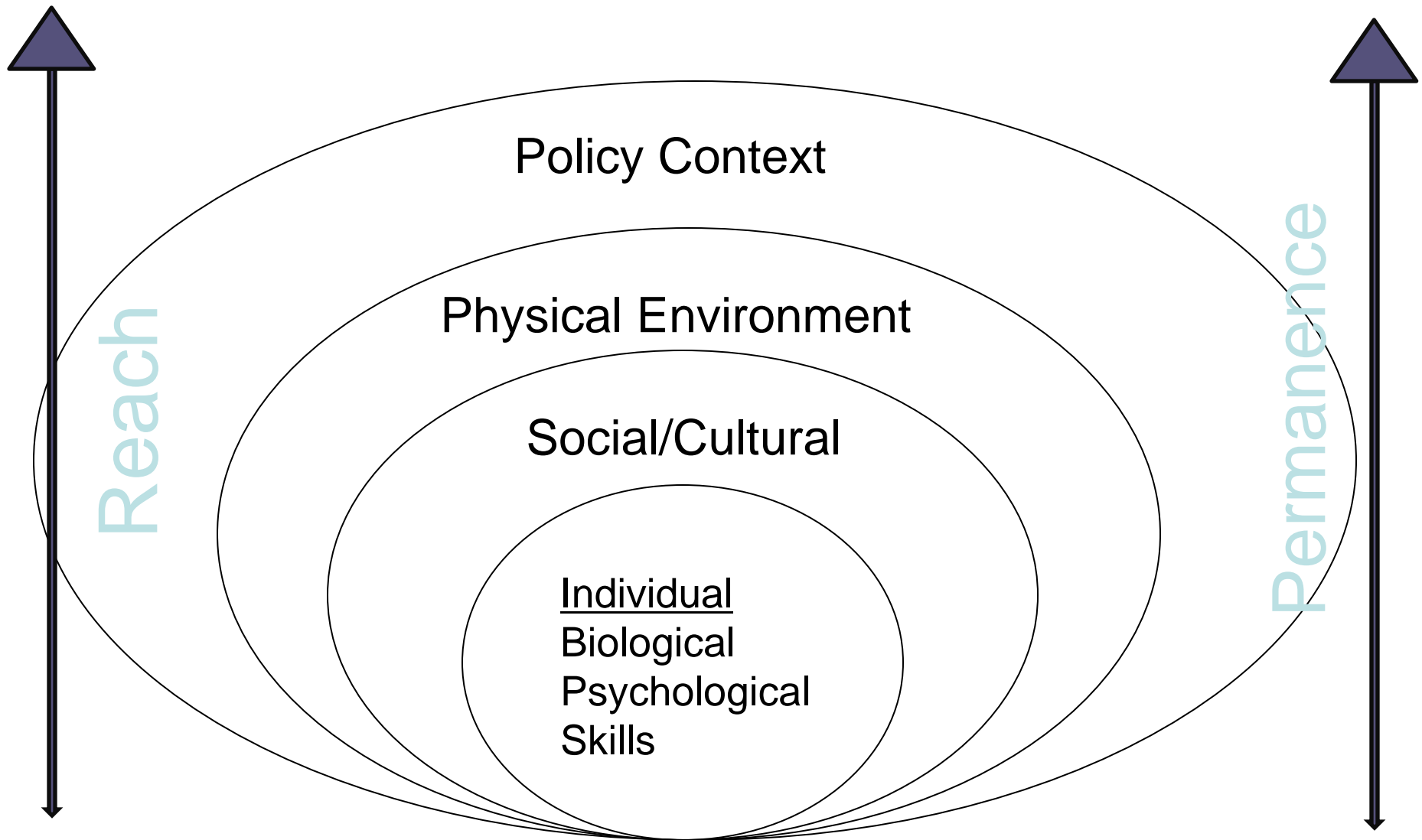
# Most Models of Health Behavior



# An Ecological Model of Health Behavior



# An Ecological Model of Health Behavior



# Practical Policy Rationale for PA Environment & Policy Research

- IOM, CDC, Surgeon General, AHA, WHO, National PA Plan, and many other groups recommend policy changes as essential for improving PA, diet, and obesity.
- Policy initiatives with the intent to change PA and obesity are occurring in governments, school districts, and industry.
- Evidence is needed as a basis for this work



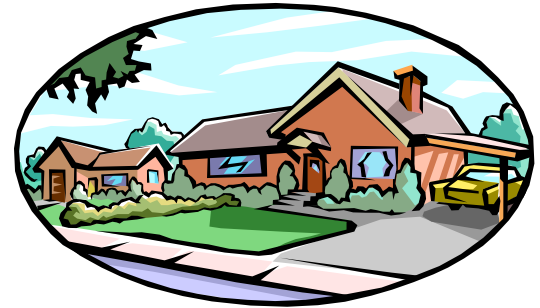
# Elements of An Active Living Community

**Comm Design  
Destinations**



**Transportation System**

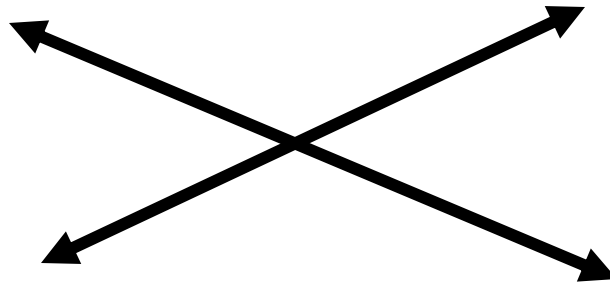
**Home**



**School & Preschool**



**Park & Rec**



# Active Living Research

## Goals: 2001-20012

- Establish a strong research base
  - Administer a \$28 million research budget
  - Contribute to reversing childhood obesity
  - Focus on ethnic, racial, & income groups at highest risk of obesity
- Build a transdisciplinary & diverse field of researchers
- Stimulate & inform policy change

# Building Evidence

- Calls for proposals 1-10 & Rapid Response
  - Funding rates, 8%-25%. Higher for dissertations
  - Approximately 220 grants funded
  - No more CFPs to be issued
- Conference
  - Highly competitive abstract selection
  - Best papers in journal supplement with wide distribution
- Website
  - Free access to journals & conference slides
  - Measurement resources
  - Literature searches, reference lists; article database
  - Information for policy makers and media

Evaluation of  
Active Living Research  
2001-20011  
(mostly since 2007)

**Marjorie Gutman, PhD**

**Dianne Barker, MHS**

*“ALR has probably done more to move this whole field of active living forward than anything before or anything that has come since....”*

# Number of Competitive Grants by Topic Area

Note: Grants could be coded in multiple categories.

	ALR I (n=91)	ALR II (n=117)
Built Environment	65	46
Health, Economics, Policy Process	4	29
Recreation	24	26
Schools	18	65
Social Environment, including crime, disorder	11	31

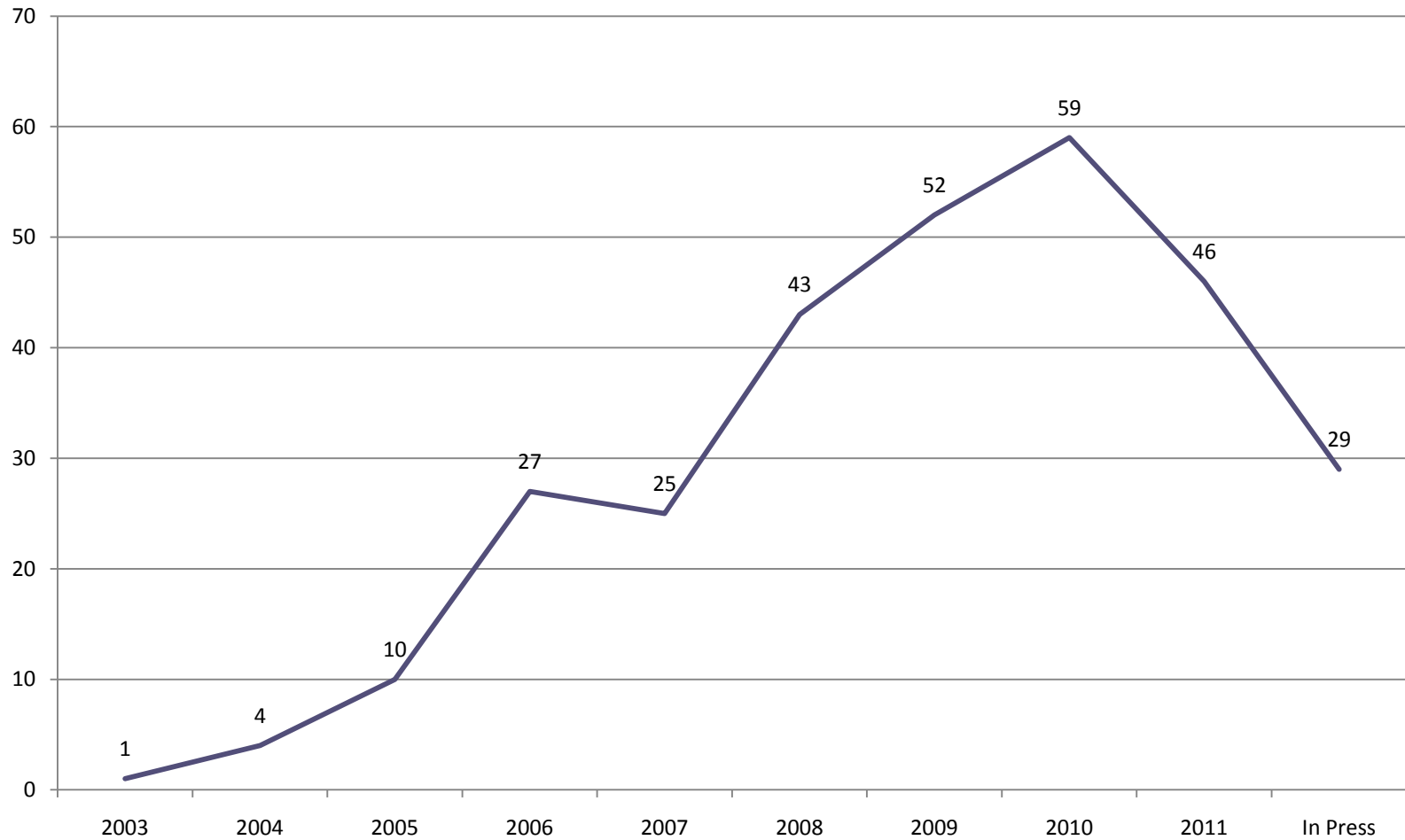
- In the 2006 evaluation, 26% of grantees were people of color.
- In the 2011 evaluation, that increased to 34%
- ALR supported 12 New Connections grantees 2007-2011

## 2011 NPO Grantee Survey Respondents by Race/Ethnicity

Grantee Race/ethnicity	%
American Indian/Alaska Native	2
African American	9
Asian	10
Latino/Hispanic	9
Multiple race/ethnicity	3
White	66

# 296 Publications from ALR Grants by Mid-2011

## ALR Grantee Publications



# Field Building: Cultivating New Relationships

- Architecture
- Environment & Behavior
- Geography
- Landscape Architecture
- Parks & Recreation
- Planning
- Transportation
- Criminology
- Economics/Law/Policy
- Advocates/Polycymakers





## Building a Transdisciplinary Field

- Multidisciplinary advisory committee
- Recruiting non-traditional partners through talks at conferences
- Broad distribution of Calls for Proposals
- Seminar Program with many organizations to bring speakers from other fields
- Principal Investigators from 25+ fields

**ALR Conference Evaluations:  
75-95% rated 4 or 5**

**Conference Goals**

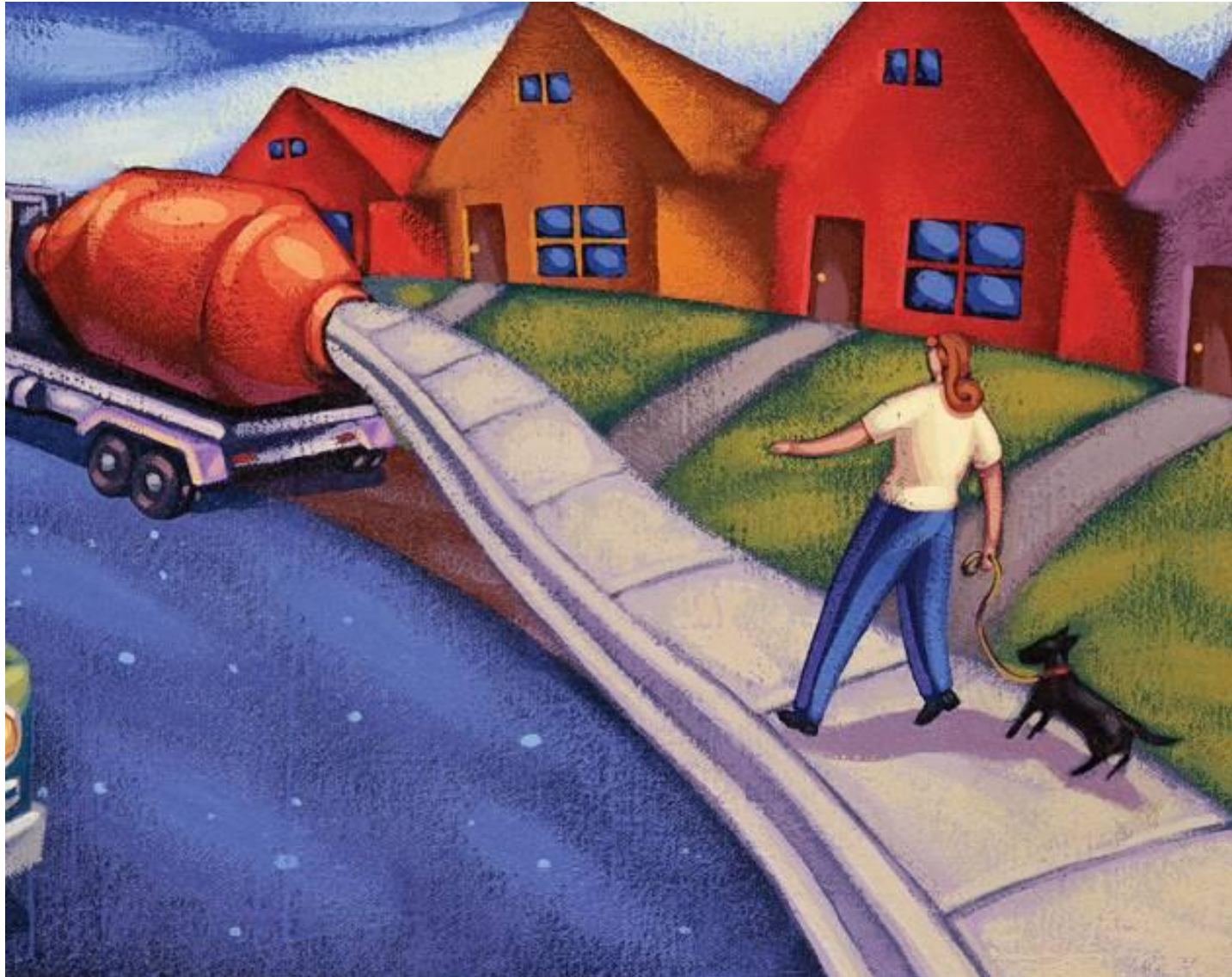
Stimulated ideas likely to lead to changes in my research

Learned new concepts from another discipline likely to enhance my work

New contacts might lead to collaboration

Builds capacity to conduct transdisciplinary studies

# Research is not easy to put into practice



# Translating Research into Policy

- Regular input from policy makers on research priorities & communication strategies
- CFPs for case studies & policy studies—targeting policymakers
- Research briefs for policymakers & advocates
- Sessions at ALR Conference with policymakers to show how they use research
- Research Translation Grants to communicate results from ALR grants
- Lay summaries of ALR journal articles & grants

# ALR research is making a difference in communities

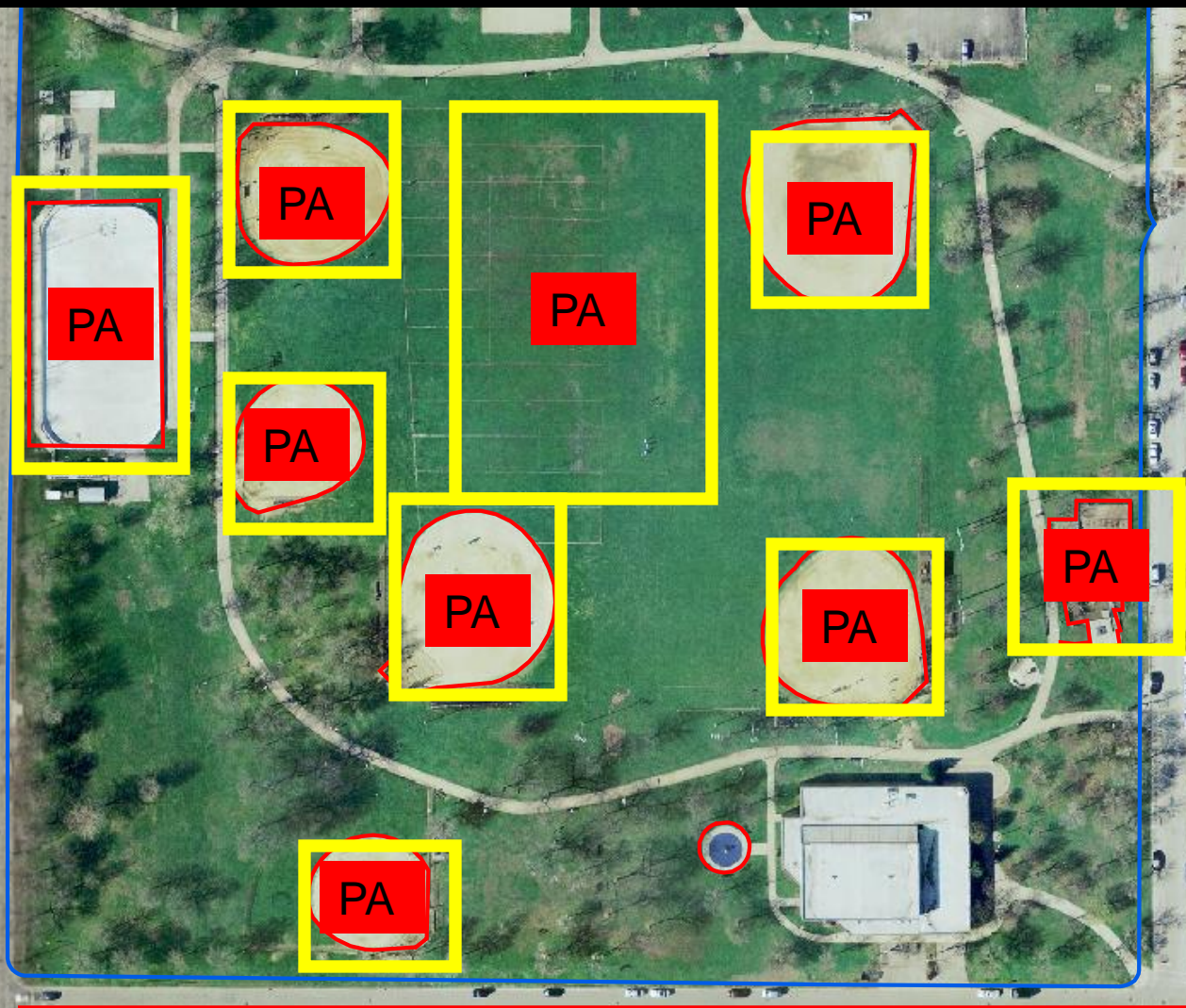
- Study of environmental factors related to active living in rural youth helped obtain Safe Routes to School Funding in Mississippi communities
- Evaluation of family fitness zones in parks led to Trust for Public Land support for 40 more installations in LA County
- Study finding poor pedestrian access to parks in DeKalb County, GA, led parks director to build sidewalks and realize “access is as important as acres”
- Study on use of federal transportation funds across states with varying policies led Transportation 4 America to recommend changes in federal transportation law

# How can parks be designed to optimize active living?

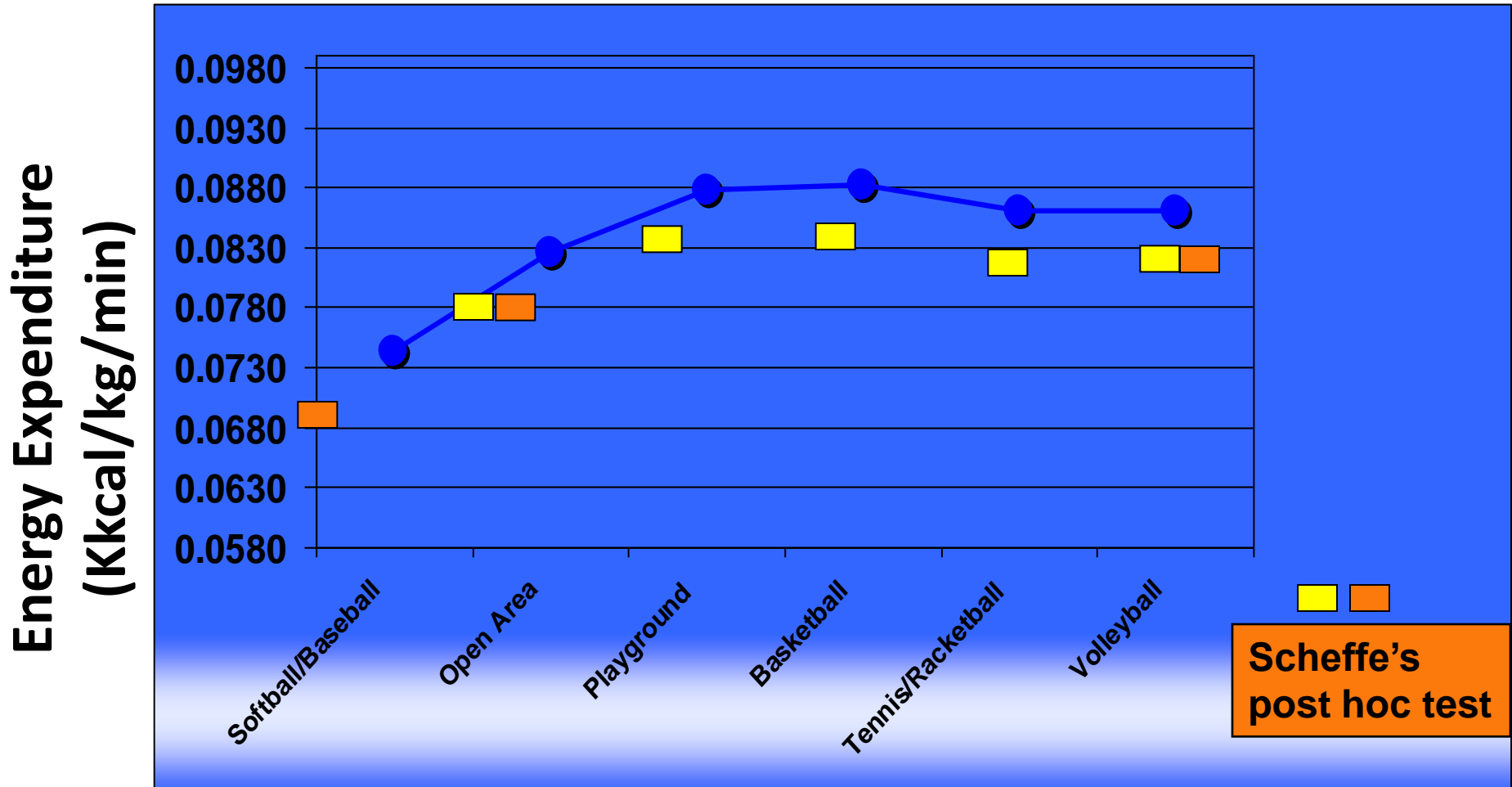


# Myron Floyd, NC State U

Type of activity zones in parks  
Are related to PA



# Mean Energy Expenditure by Park Activity Zones



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



# ALR-funded studies hitting the big TIME

**TIME** Partners  
with  
**ON.**

« GO BACK TO ARTICLE

PRINT

## Back Off, Mom. Parents Who Hover Impede Kids' Activity

By MEREDITH MELNICK Friday, September 16, 2011

Parents, if you want your kids to get more exercise, you'd be wise to get out of their way.

In a new [study](#), published in the *American Journal of Preventive Medicine*, researchers sought to observe how kids play in parks. Their overarching goal was to help park designers create public spaces that would better entice kids to run around and exercise. But along the way, the authors discovered something else: the single biggest barrier to children's physical activity had less to do with park design itself and more to do with the hovering presence of a parent.

Children whose parents hung around monitoring them closely were only about half as likely to engage in high levels of physical activity as kids whose parents granted more freedom, the researchers found.

**MORE:** [The Growing Backlash Against Overparenting](#)

"It's a catch-22 for today's parents, unfortunately. Many parents are worried about the safety of their children, so they tend to hover," said study co-author Dr. Jason Bocarro, associate professor of parks, recreation and tourism management at North Carolina State University, in a [statement](#).

September 16, 2011



What PE is—  
too often

What PE should be



# ALR research is making a difference in schools

- Evaluation of converting schoolyards to community parks in low-income Denver neighborhoods helped achieve passage of a \$48M bond issue to convert all schoolyards in Denver
- Study of School Wellness Policies on physical activity in rural Colorado Schools led to a \$1.8M grant from CO Health Foundation to improve PE in 14 schools in San Luis Valley
- Presentation of an evaluation of MA policy requiring 60 minutes of physical activity in preschools led to NC legislature passing a similar law. Grantee got CDC contract to develop a guide for states on how to develop similar policies

# Research Briefs & Syntheses, 2007-2011

- Parks
- Economic benefits of open space & walkable communities
- Growing demand for walkable communities
- Transportation policies
- Active travel to school
- Power of Trails
- Active education
- School PA policies
- Playgrounds
- Environmental disparities
- Recess
- 3 briefs on parks disparities from UC Berkeley Research Translation Grant

# Examples of ALR Policy Input

- Supported ALR grantees to testify at Congressional hearing on transportation
- Participated in House staff briefing on physical activity, PE, & academic achievement
- Additional briefings with Congressional & DOE staff on reauthorization of EASA & transportation bills
- ALR is considered a “co-author” of New York City’s Active Design Guidelines
- ALR brief was sent to all members of transportation committees
- Sallis spoke at Mississippi Health Summit, made proposals to CA Governor, & presented to NCSL, NASBE, NACCHO, IOM, and others

# Our research is being used

9, 2010

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USA TODAY interview

## First lady says: 'Let's move' on child obesity



By Alex Brandon, AP

Getting the program rolling: Michelle Obama helps students from Washington's Bancroft Elementary School harvest sweet potatoes from the White House garden Oct. 29.

Obama's mission: End problem in a generation

Today, the self-described "mom in chief" is launching Let's Move, a campaign to help other parents deal with a national health problem she describes in epic terms.

The goal: to eliminate childhood obesity in a

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By Thomas Frar

USA TODAY

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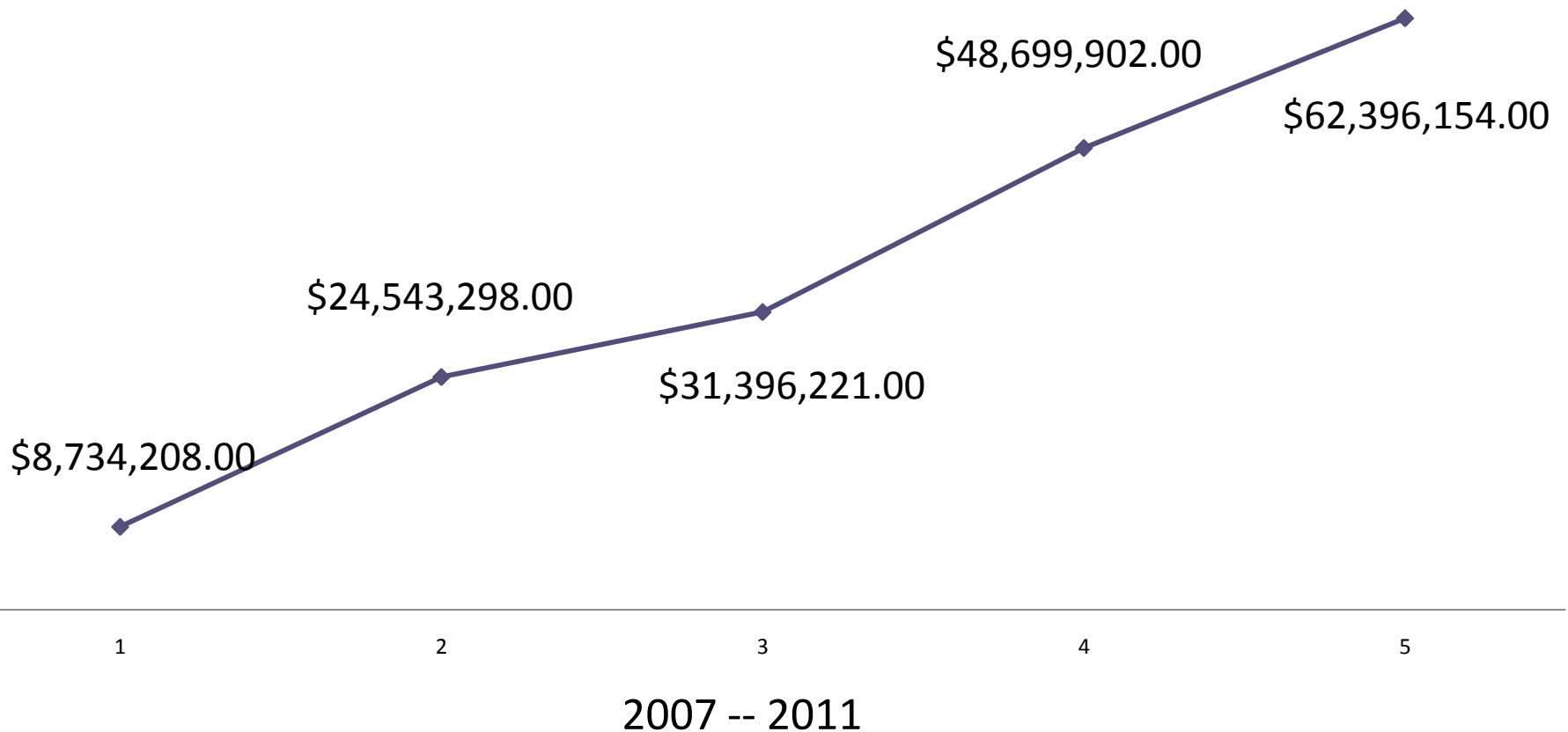
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- Let's Move
- CDC: Communities Putting Prevention to Work (\$200M)
- CDC: Community Transformation Grants (\$100M)
- Health Dept capacity
- Foundation projects

# Cumulative amount for funds ALR helped grantees receive from other agencies. Based on \$27M in grants



# Results of ALR Evaluations

Objective	2006 Progress	2011 Progress
Knowledge Base	Major	Major
Transdisciplinary Field	Major	Major
<b>Contribution to Policy</b>	<b>Minor</b>	<b>Major</b>
Financial Capital	Minor	Major
Niche	Unique	Unique

Our key goal from 2007-2011 was to improve translation of research to policy



# Strategic Goals for a Redesigned ALR 2012-2015

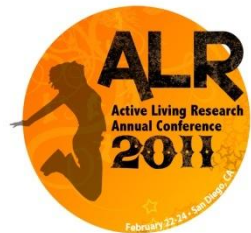
- Contribute to rapid and sustainable change to meet the Foundation's built environment and school physical activity policy priorities and advocacy targets
- Contribute to reducing disparities in physical activity opportunities and childhood obesity
- In the redesign we will use existing research conducted by ALR and others to contribute to the new policy and advocacy strategies; to build capacity of researchers to be more effective translators of research; and to support commissioned analyses that are timely and directly relevant to the advocacy targets.
- ALR's focus will be on using the valuable research we have, not building new evidence

An Active Living Program supported by The Robert Wood Johnson Foundation  
and administered by San Diego State University.



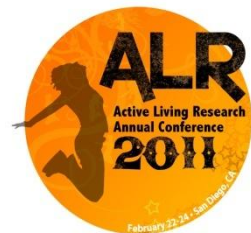
[www.activelivingresearch.org](http://www.activelivingresearch.org)

## Additional Information Not Presented



## The ALR Website Is Being Used (visits to home page 58, 415). Visits to Specific Pages under Tools and Resources. 2008-2010

Web site Page	Total
Tools and Measures	<b>27,076</b>
ALR Literature Database	<b>12,338</b>
Research Syntheses, Summaries and Briefs	<b>11,764</b>
Journal Special Issues	<b>10,793</b>
Resources for Policy Makers and Advocates	<b>5,597</b>
Resources for Media	<b>1,358</b>



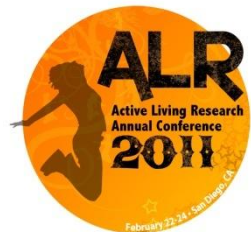
## Research Translation Grants - Topics Funded

### Built Environment

- Active Transport to and from School for Urban Youth
- Community Use of Schools in Underserved Communities
- Reducing Disparities in Access to Parks and Recreational Programs
- Effect of Park Settings and Design on Park Usage by Children

### School PA Opportunities

- Middle School Sport Policies; intramural vs extramural
- Adoption of Evidence-based Physical Education in Elementary Schools



# Commissioned Analyses - Topics Invited

- Youth sports and afterschool policies with a simulation of different policy options focused on low-income children
- Case studies on the passing of complete street policies
- Cost analysis of bike boulevards and other bicycling facilities
- Documenting promotion of sedentary behavior in youth through the media
- Estimating extent to which transportation policies can promote active living
- Local regulatory incentives and barriers for development that encourage active living



## What we know through ALR-funded research on built environment

- **Baltimore**
- Interviews with African American high school students
- Key environmental barriers to PA
  - Lack of places for PA
  - Crime, violence, drugs
  - Unsafe places for PA



### BALTIMORE CITY'S PARKS AND RECREATION CENTERS: AN UNDERUTILIZED RESOURCE FOR URBAN TEENS

Baltimore City's system of more than 300 city parks and 45 recreation centers offers urban youth 6,000 acres of green space and plentiful ways to exercise their bodies and minds.

The opportunities for physical activity found at parks and recreation centers are more important than ever for Baltimore's youth. Obesity rates in the city are rising, especially among adolescents. Eighteen percent are overweight, according to the 2007 Youth Risk Behavior Surveillance Survey. Moreover, green spaces may help young people think more clearly and

cope more effectively with life's stresses.

Baltimore City youth are not using indoor and outdoor public spaces for physical activity as much as they could. Only 35 percent of adolescent girls in the BALTS study report they frequent recreation centers, as opposed to 52 percent of boys. Park usage is 54 percent for the girls and 66 percent for the boys surveyed.

The BALTS study of 350 high school students in Baltimore documented what draws teens to Baltimore's parks and recreation centers and what drives them away.

#### ABOUT THIS STUDY

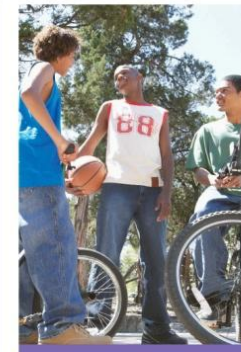
Material for this Issues Focus comes from a survey of 350 youth ages 14 to 18 from two Baltimore City public high schools, 48 in-depth interviews with these youth, and observations of recreational facilities. The study, conducted by Amy Vastine Ries, was part of the Baltimore Active Living Teens Study (BALTS), led by Carolyn Voorhees of the University of Maryland.

{ "There's a lot of glass. There's trash and needles and things. You have to have somebody clean up and walk the entire field before you can do anything. It's really more trouble than it's worth." —Young man, 15 }

#### TEENS SAY PARKS ARE NOT SAFE, PRETTY, OR CLEAN

	% agree
Parks are not safe.*	38
There are unsafe people at parks.	49
Parks are not pretty.*	38
Parks are not clean.*	50
Parks have the facilities that I like to use.	45
Parks are poorly maintained.	45
Parks get a lot of use*	44

\*Item has been reversed



#### ALMOST HALF OF TEENS HAVE USED PUBLIC RECREATION CENTERS

	% agree
I use recreation centers for physical activity.	42
Recreation centers are open when I want to use them.	40
It is too expensive to use recreation centers.	15
Recreation centers have facilities I like to use.	60

#### ACKNOWLEDGEMENTS

The Center for Adolescent Health is a member of the Prevention Research Centers Program, supported by the Centers for Disease Control and Prevention

cooperative agreement number 1-U48-DP-000040. Additional funding for this project is provided by The Charles Crane Family Foundation, The Sigmund and Barbara K. Shapiro Fund, the Robert Wood

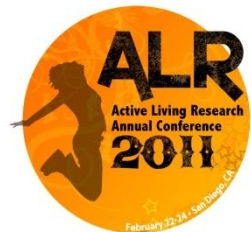
Johnson Foundation Active Living Research Program (Grant # 55761 and Grant # 52338).

Authors:  
Jayne Blanchard, Amy Vastine Ries, PhD

# What we already know through ALR-funded research on PA/PE in schools around the country

## Mississippi and Tennessee:

- Wellness policies are actively resisted because of schools' exclusive focus on academic achievement
- Physical Education (PE) is marginalized by all actors in education
- High school PE teachers are much more concerned about varsity sports than PE





# What we already know through ALR-funded research on PA/PE in schools around the country

## Texas

### Evaluation of State Law on PA and Coordinated School Health Policy

- 97% of principals & district officials are aware of physical activity requirements
- 179 average minutes of structured student physical activity per week
  - Exceeding the 135 minutes required by the bill
- Strong implementation of policy was due to support from local community organizations



# What we already know through ALR-funded research on PA/PE in schools around the country

## Denver

- Schoolyards at 47 low-income schools have been redesigned with community input and transformed into community parks.
- The volume of schoolyard use and activity levels were significantly higher at schools with renovated schoolyards.



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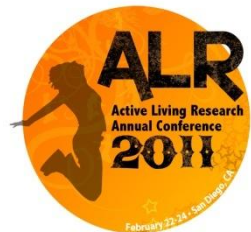
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# What we already know through ALR-funded research on built environment around the country

## ▪ Austin, TX

- Barriers to active transport to school
- Parents' perception of barriers, many about traffic, were significant for all settings
- Built environment & safety were stronger barriers for low-income communities



# What we already know through ALR-funded research on built environment around the country

## ▪ Nationwide

- Federal transportation funds for pedestrian and bicycling facilities
  - Counties with low education & persistent poverty less likely to receive pedestrian and bike funding
  - Between 1990 & 2004: 10,000 projects implemented in 62% of counties
  - Investment \$3.17B



# What we already know through ALR-funded research on built environment around the country

## ▪ Rural Mississippi, Kentucky, South Carolina and California

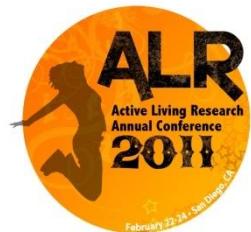
- Input from children & parents
- Barriers to activity
  - no shoulders on roads
  - heavy truck traffic
  - no access to school grounds
  - lack of parks
  - lack of safety, crime and wild animals



# Rapid-Response Grants - Key Findings

## Around the Country

- Fitness Zones can be cost-effective in increasing physical activity in parks, especially for small parks
- Low-income children in a smart growth community likely to be more physically active near their home than children living in traditionally designed communities
- Emphasizing outdoor and social settings can lead to more enjoyable, lengthy, and intense physical activity experiences



# Rapid-Response Grants - Key Findings

## Hawaii

Top factors that would motivate parents to let their child walk or bike to school:

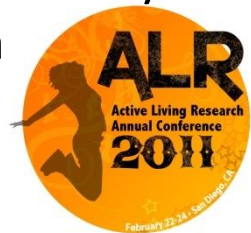
- improved condition of sidewalks or pathway
- improved safety of intersections and crossings
- crossing guards
- reduce speed of traffic and amount of traffic
- adults to walk or bike with





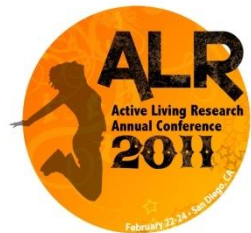
# ALR Seminars to Policy & Practice Groups 2007-2011

- Indian Health Service
- American Educational Research Association
- State of Environmental Justice in America
- American Society of Criminology
- Urban Affairs Association
- Society for Research on Child Development
- Community Indicators Consortium
- New Partners for Smart Growth
- National Planning Conference
- National Initiative for Children's Healthcare Quality
- National Medical Association
- National Hispanic Medical Association
- ProWalk/ProBike
- National Council of La Raza
- Education Commission of the States
- National Society for Physical Activity Practitioners in Public Health



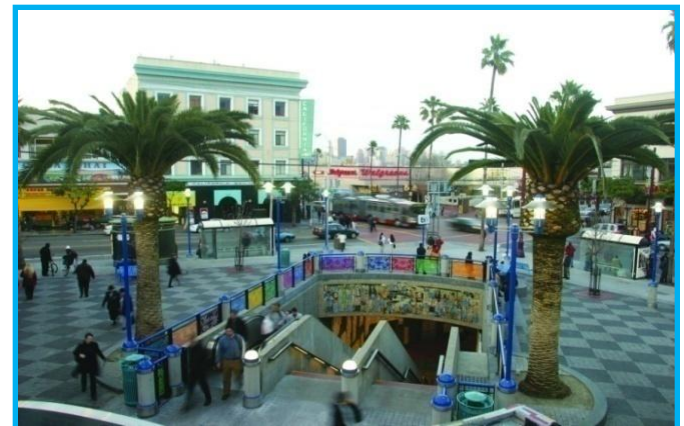
## ALR Features Diverse Leaders (2007-2012)

- 4 of 5 ALR Conference Chairs
- 21 of 43 ALR Conference Program Committee Members
- 8 ALR Conference Keynotes and Featured Panels
- 4 Authors of ALR Briefs & Syntheses

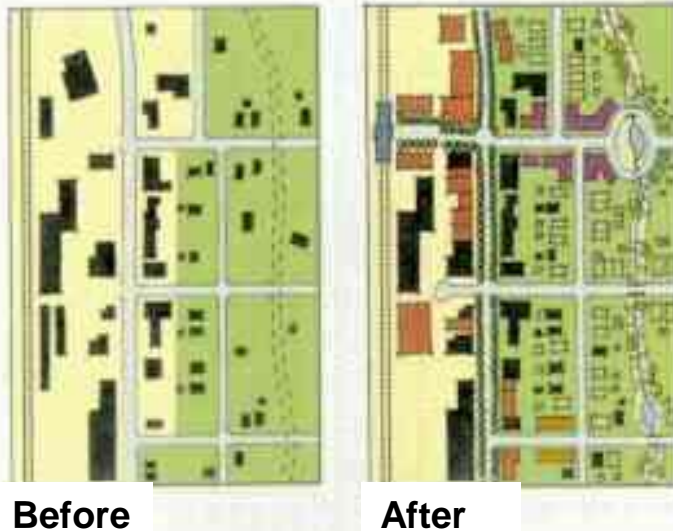
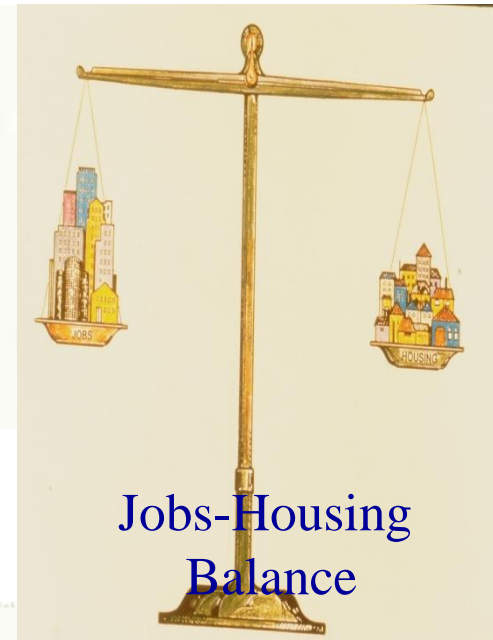


# Urban Planning & Active Living Research

- Urban planning: long rooted in health concerns...
  - Density & crowding
  - Incompatible uses & exclusionary zoning
  - Sanitation
  - Building codes & public safety
  - Clean air mandates
- Increasingly inclusive & trans-disciplinary
  - Bringing key stakeholders together – developers, citizens, employers, environmental advocates, public health officials



# Diversity & Inclusion

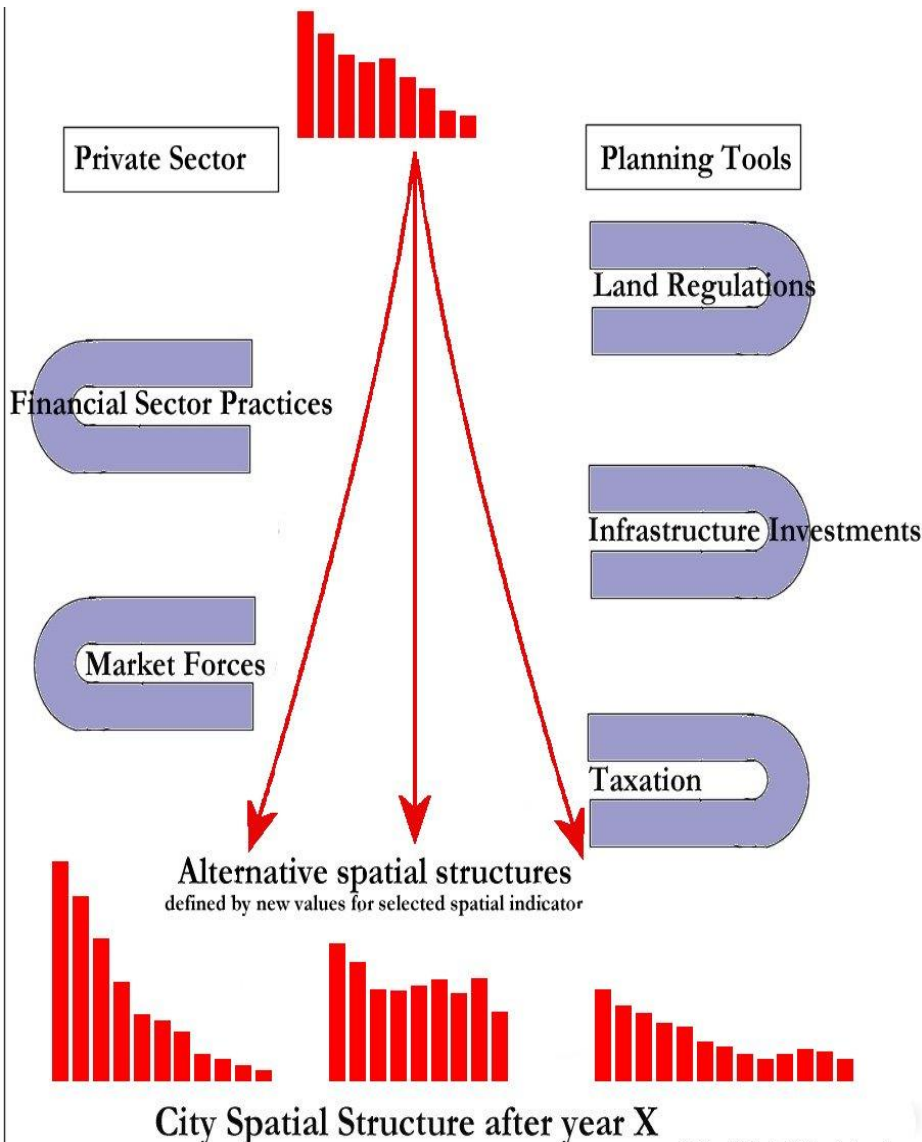


Re-Use & Selective Infill

# Urban Planning: Spheres & Implementation Tools

Private

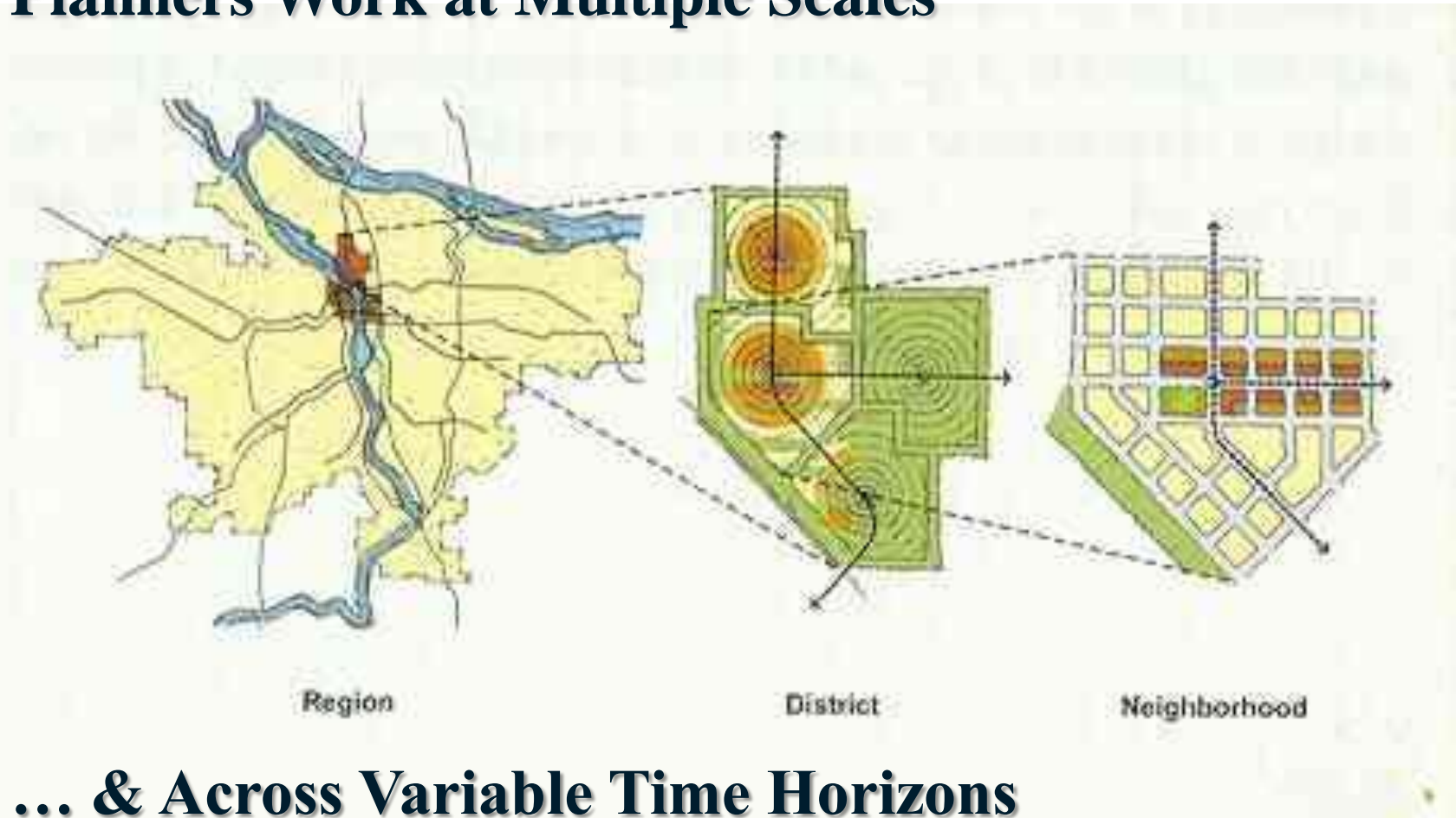
Public



- General Plans/Neighborhood Plans
- Zoning, Subdivision Regulations, Building Codes
- Design Guidelines
- Impact & Environmental Review (NEPA/EIS)
- Land Banking/UGB
- Targeted Infrastructure Investment
- Tax Increment Financing
- Enterprise Zones
- Tax Abatement

# Urban Planning: Temporal & Spatial Contexts

## ➤ Planners Work at Multiple Scales



## ➤ ... & Across Variable Time Horizons

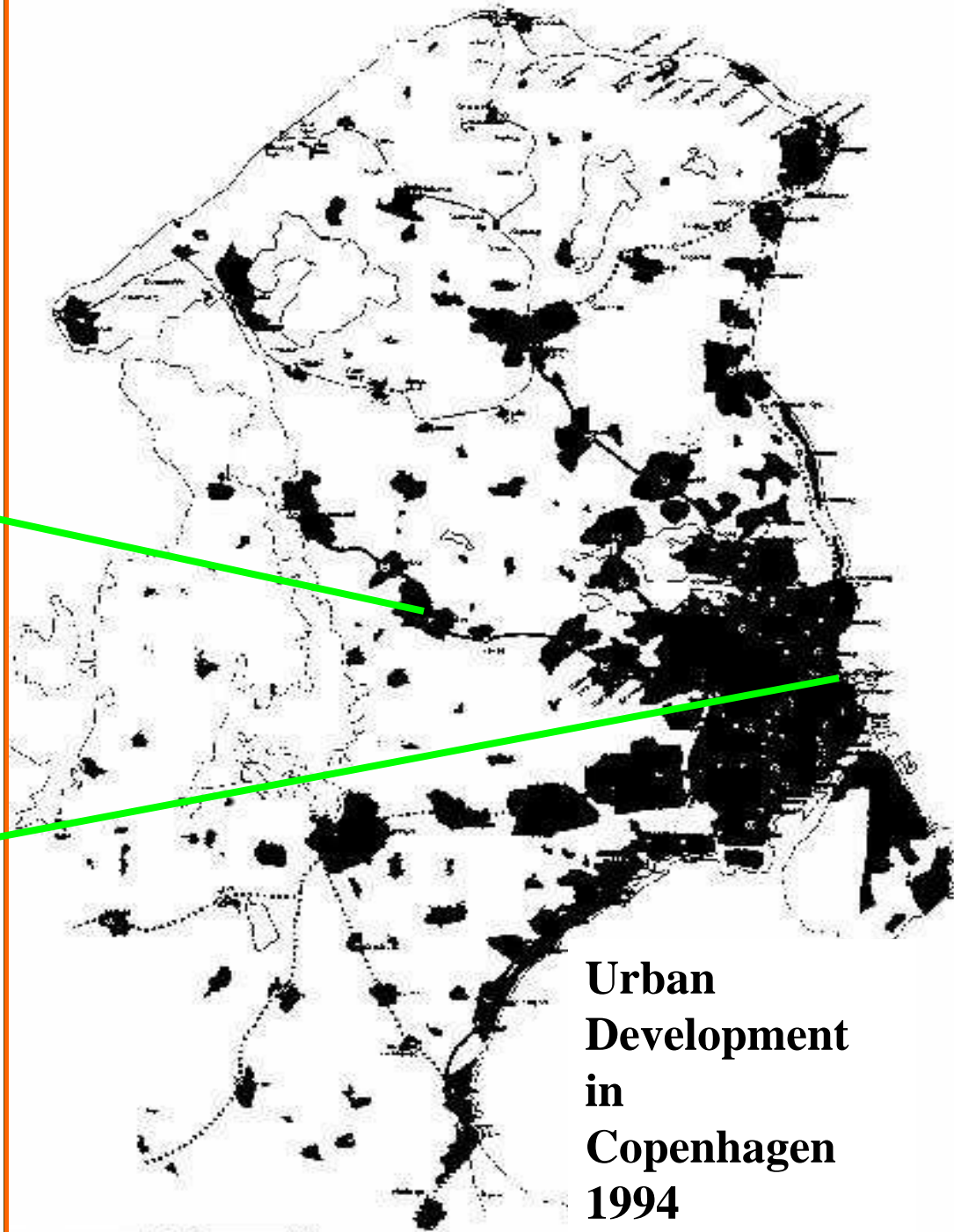
- Managing & regulating existing growth
- Forward-looking: anticipating & guiding future growth

# COPENHAGEN

## From Vision to Plan ... to Execution



"Strøget"



Urban  
Development  
in  
Copenhagen  
1994

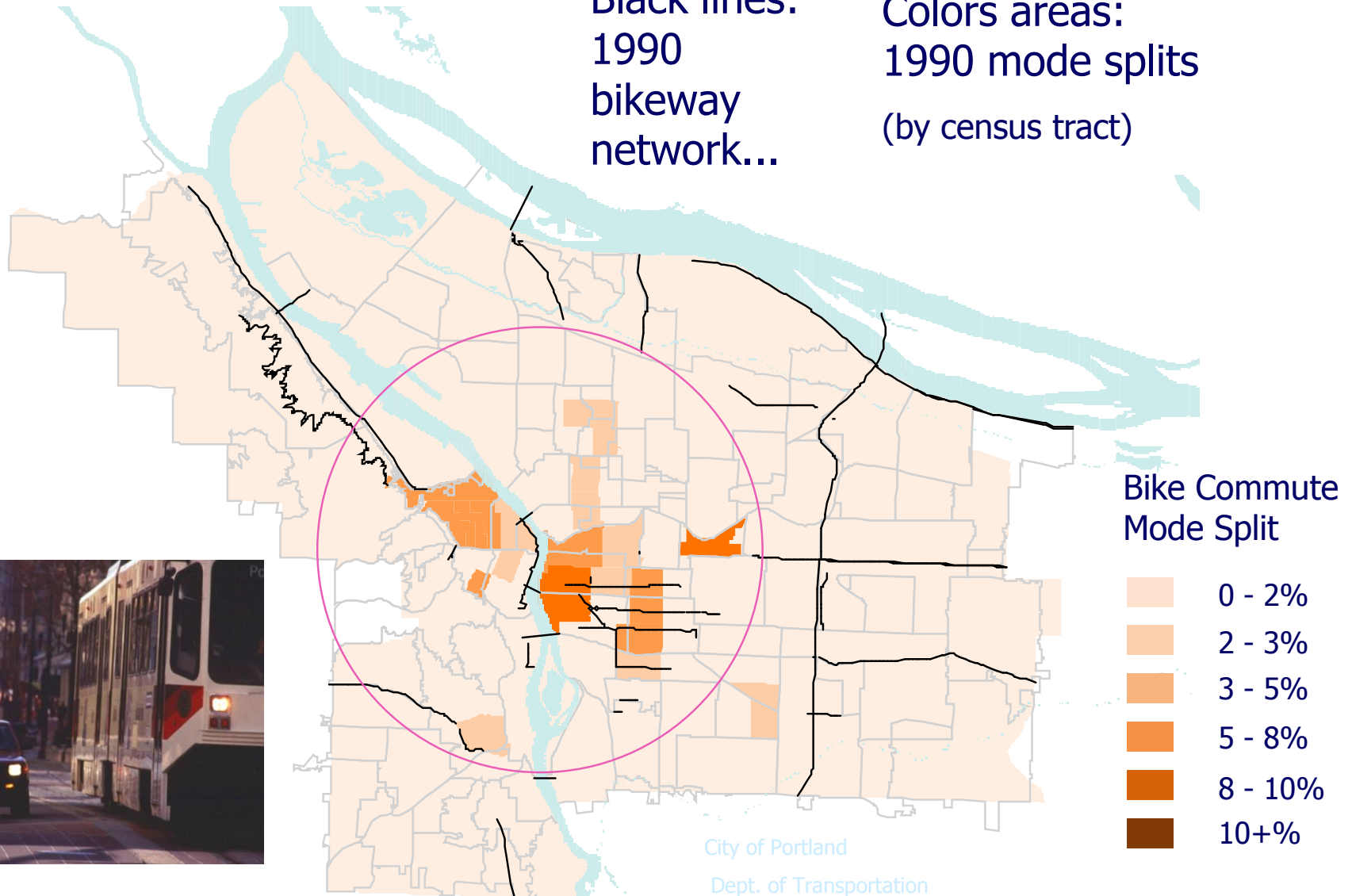
# BUILDING A NETWORK

Bike lanes encourage bike commuting:

## Portland, Oregon 1990

Black lines:  
1990  
bikeway  
network...

Colors areas:  
1990 mode splits  
(by census tract)





# BUILDING A NETWORK

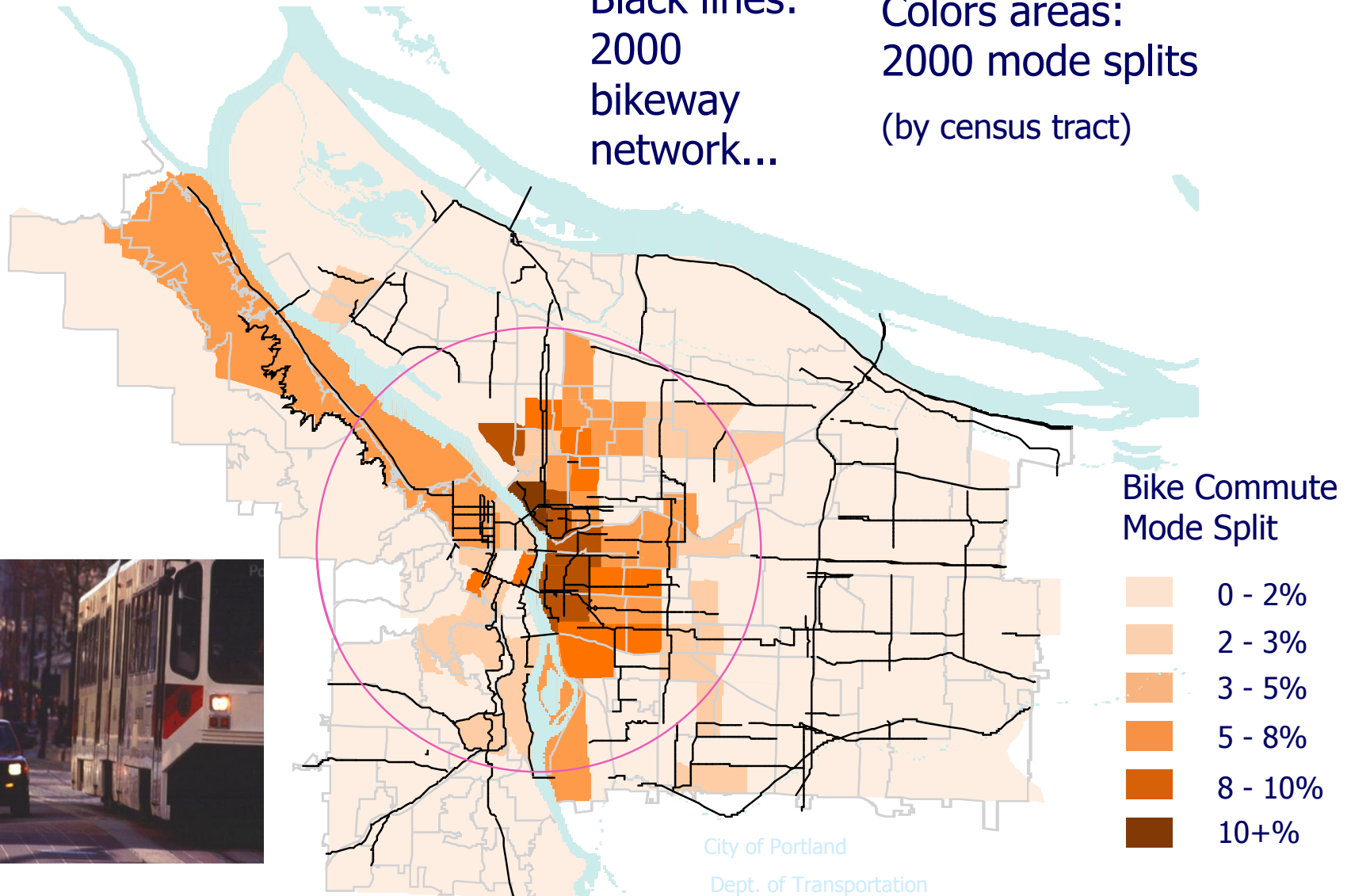
Bike lanes encourage bike commuting:

**Portland, Oregon 2000**

**Build It &  
They Will Come**

Black lines:  
2000  
bikeway  
network...

Colors areas:  
2000 mode splits  
(by census tract)



# Neighborhood Grocery Store Access

1/4 Mile Isochrones, Imputed from City Block Data

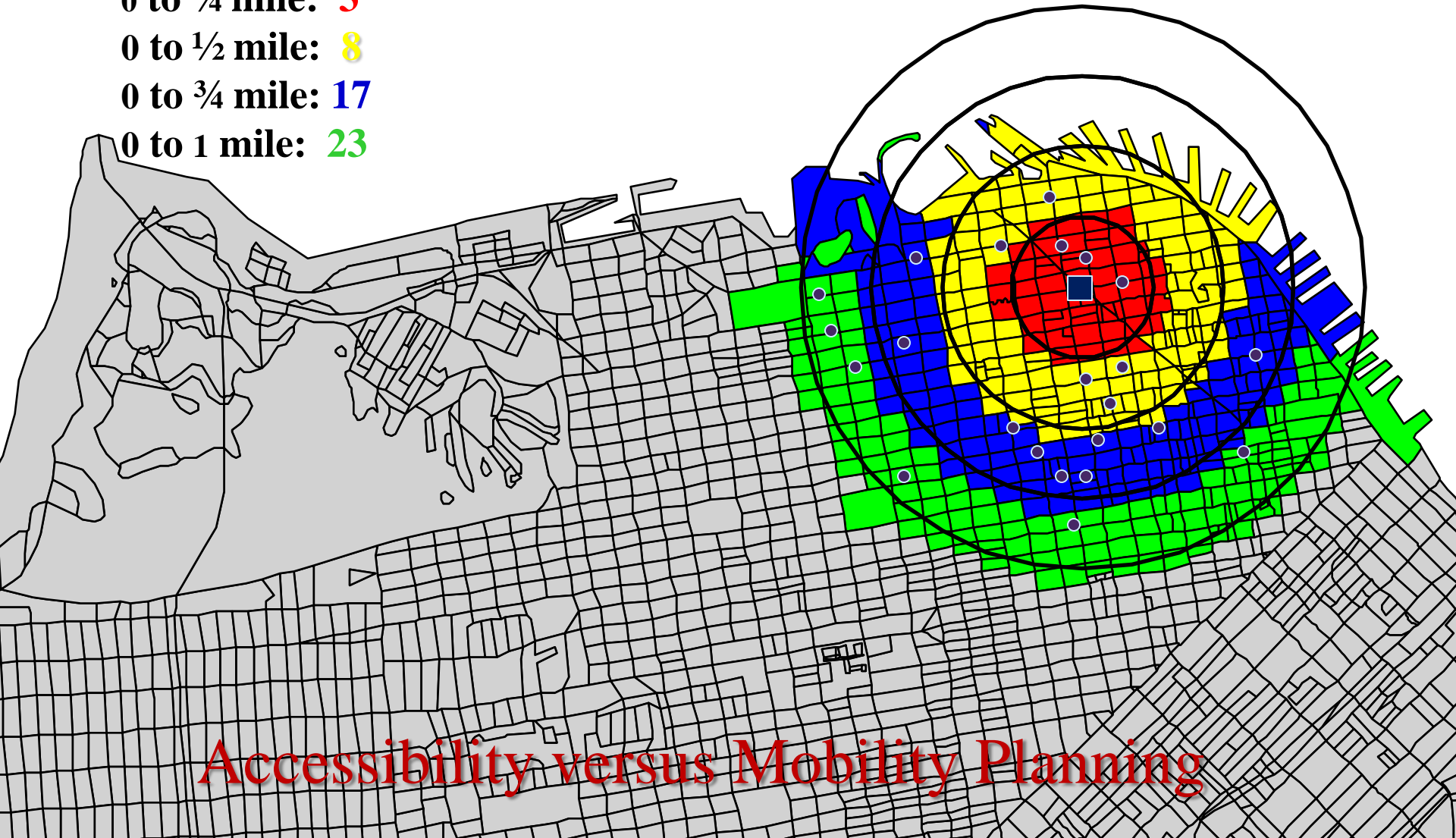
No. of Convenience Retail Stores (< 5000 ft.<sup>2</sup>) within Isochrone

0 to 1/4 mile: **3**

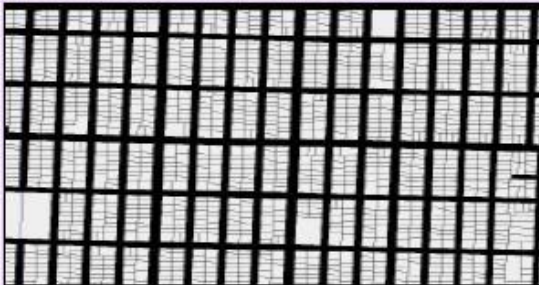
0 to 1/2 mile: **8**

0 to 3/4 mile: **17**

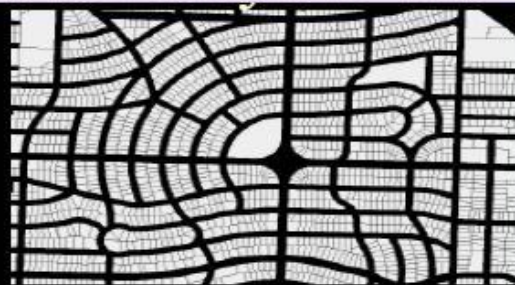
0 to 1 mile: **23**



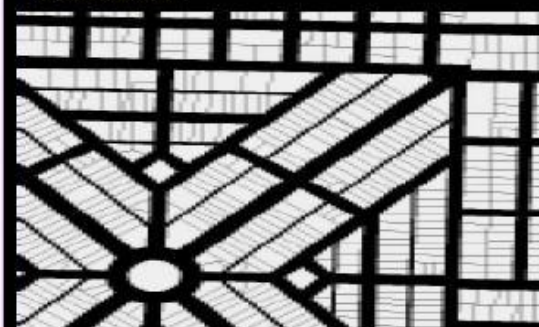
Accessibility versus Mobility Planning



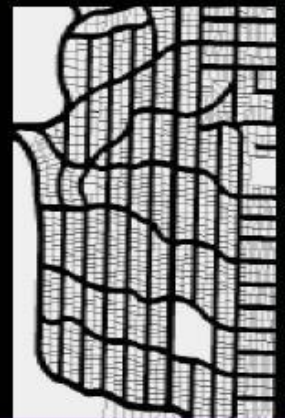
Gridiron



Curvilinear



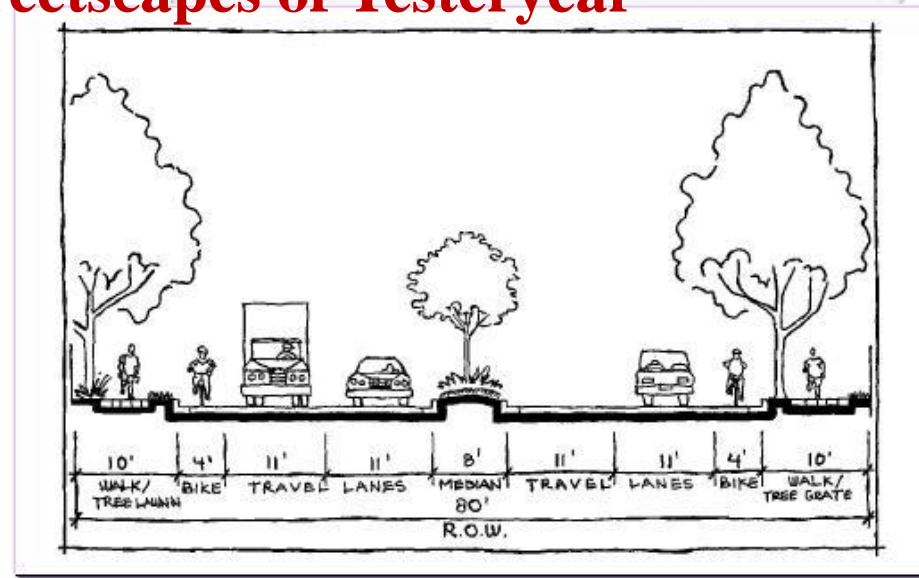
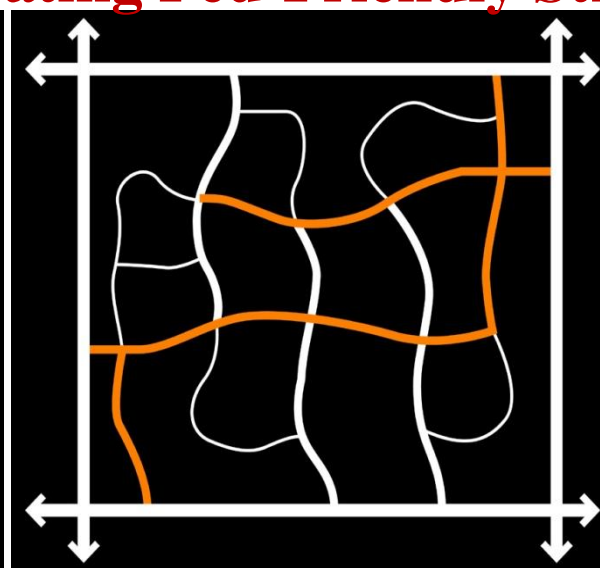
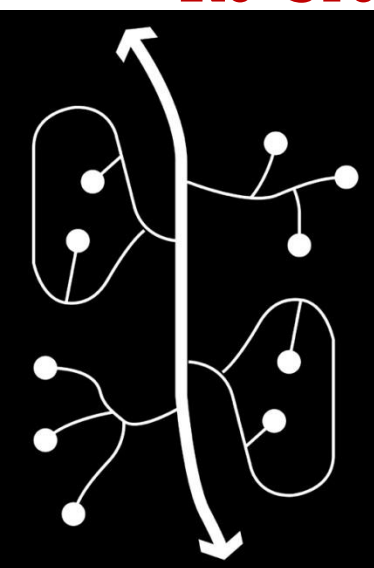
Radial



Organic



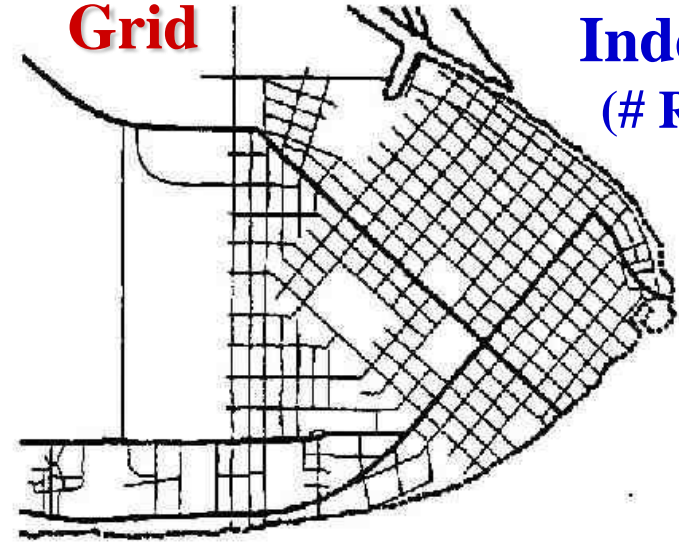
## Re-Creating Ped-Friendly Streetscapes of Yesteryear



# Measuring Connectivity

## Connectivity

### Grid



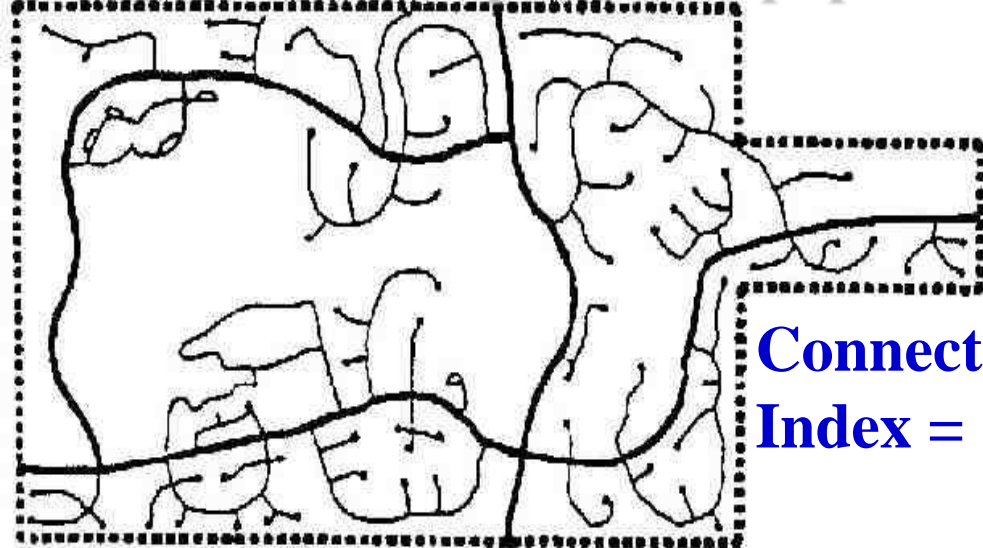
$$\text{Index} = \frac{(\# \text{ Roadway Links})}{(\# \text{ Nodes})} = 1.7$$

## Traditional Urbanism

## New Urbanism

	ELMWOOD (1905)	KENTLANDS (1989)	LAGUNA WEST (1990s)
Street Patterns			
Intersections			
Lineal Feet of Streets	18,000	24,000 (alleys 7,000)	19,000
Number of Blocks	23	24 (w.o. alleys 14)	16
Number of Intersections	20	41 (with alleys)	20
Number of Access Points	17	22	14
Number of Loops & Cul-de-sacs	1	10	15

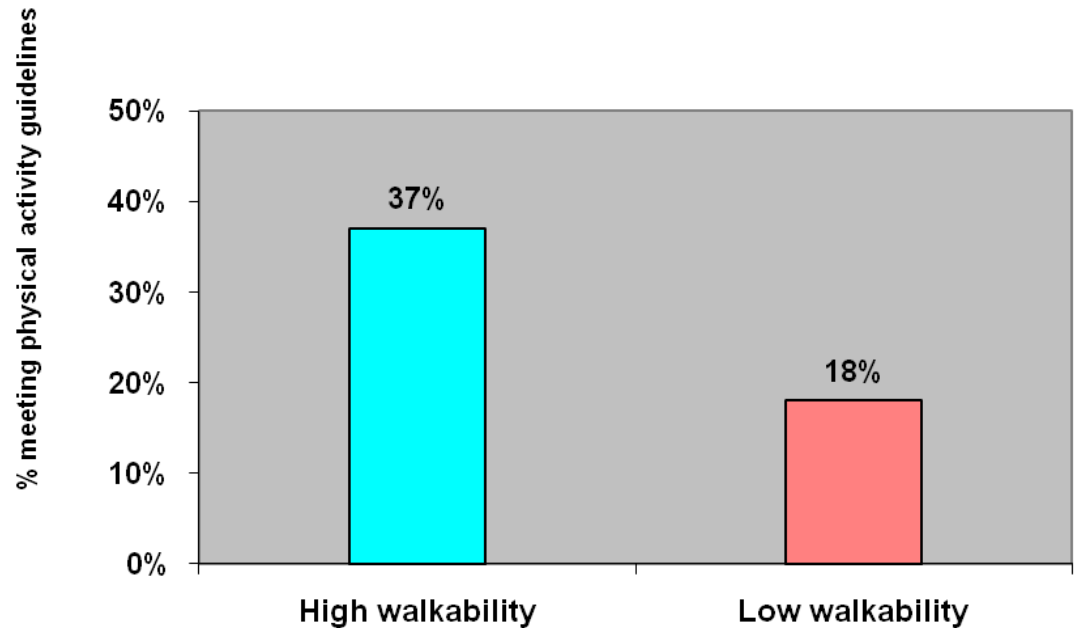
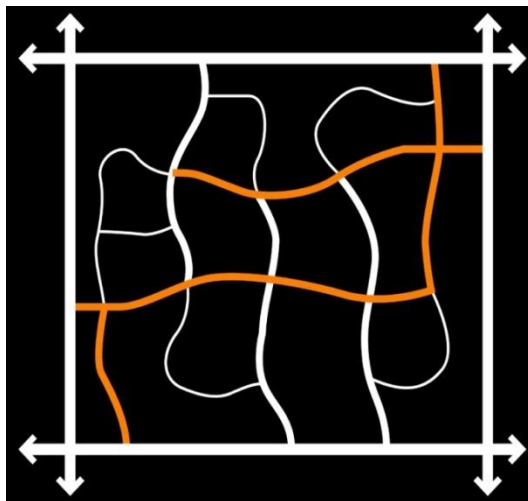
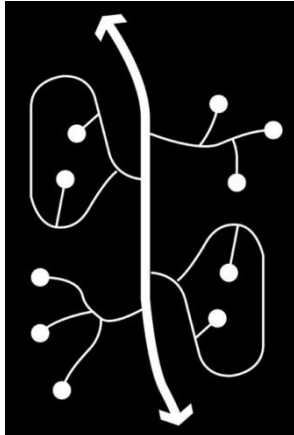
## Curvilinear: Loops & Lollipop



$$\text{Connectivity Index} = 1.2$$

# ***BUILDING THE EVIDENCE***

**Atlanta adults:** accelerometer showed people who live in walkable neighborhoods are more likely to meet recommended daily levels of physical activity.



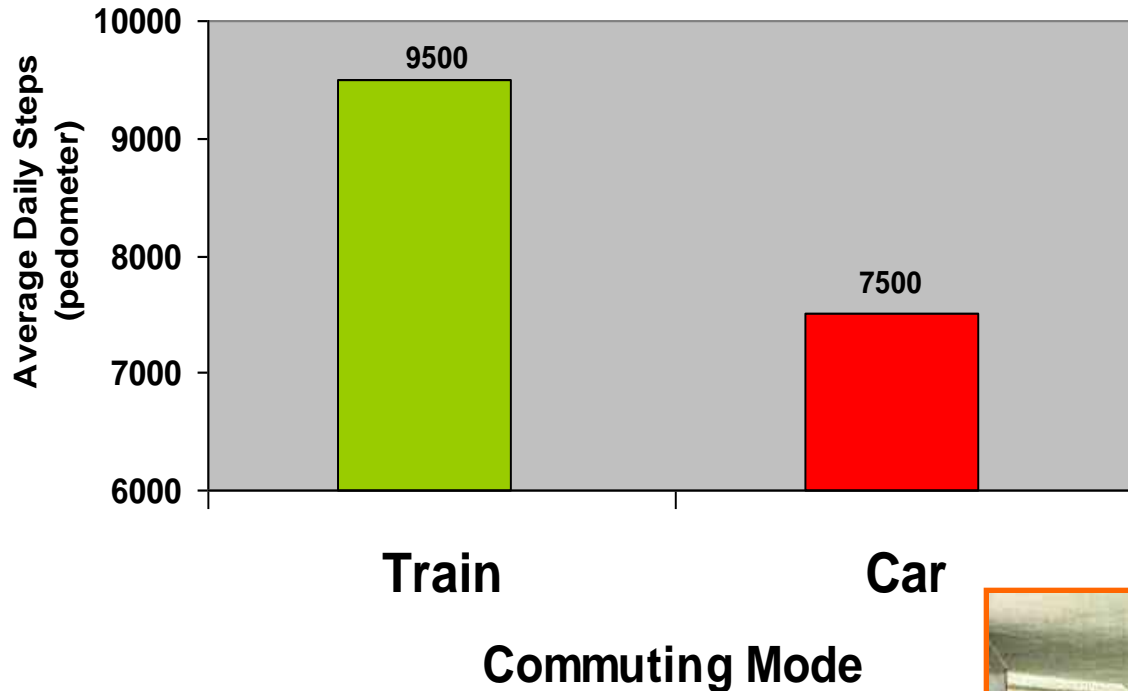
Frank, Schmid, et al., Am J Prev Med, 2005

# Complete Streets



# Walking & Public Transit

Daily steps are higher among adults who commute by train instead of car



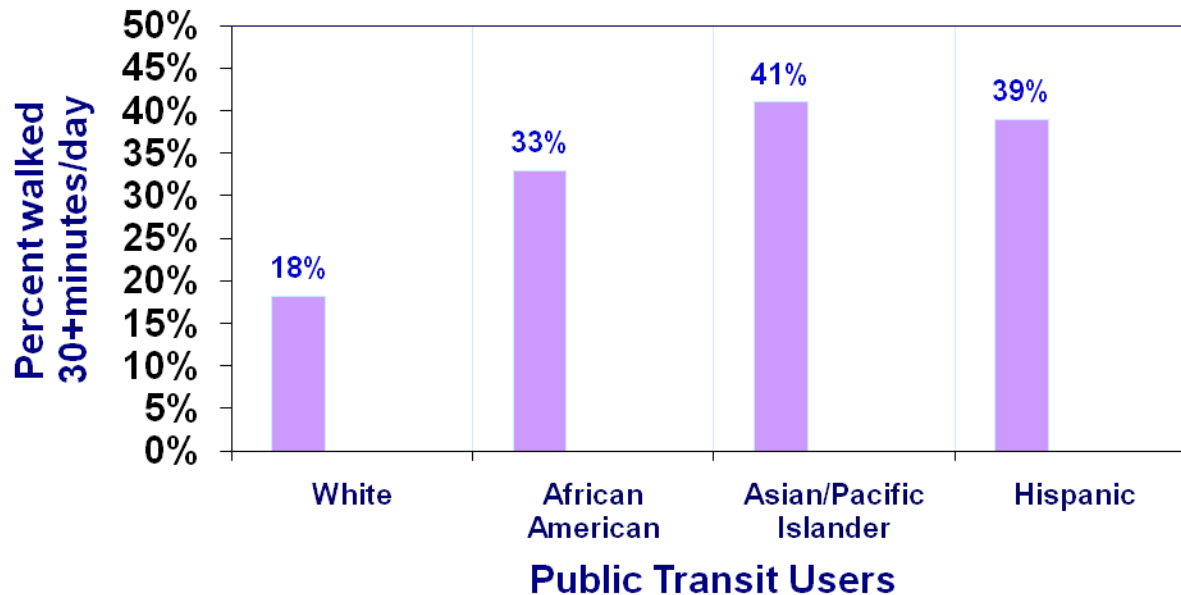
**Pedometer data** collected from over **100 New Jersey train and car commuters** revealed that **those who commuted by train walked 30% more steps a day** and were 4 times more likely to meet recommended 10,000 steps daily than car commuters.

Wener & Evans, *Environment and Behavior*, 2007



# Walking & Public Transit: Pro-Inclusiveness

2001 National Household Travel Survey (N=3,312): 29% of public transit users achieve the Surgeon General's recommendation of 30 minutes or more of physical activity a day while walking to and from transit. Racial/ethnic minorities reported even greater percentages of achieving the recommended level of activity.



Besser & Dannenberg, Am J Prev Med, 2005



**Portland  
Oregon's  
Pearl  
District**



# Ped-Friendly TOD: Fruitvale BART



# Smart Growth Street Design



# Smart Growth Street Design





Day Care



Bike Station



High School



Car Sharing



Open Air Market

# Urban Planner's Role in Transdisciplinary Research

## Influences of Built Environments on Walking and Cycling: Lessons from Bogotá

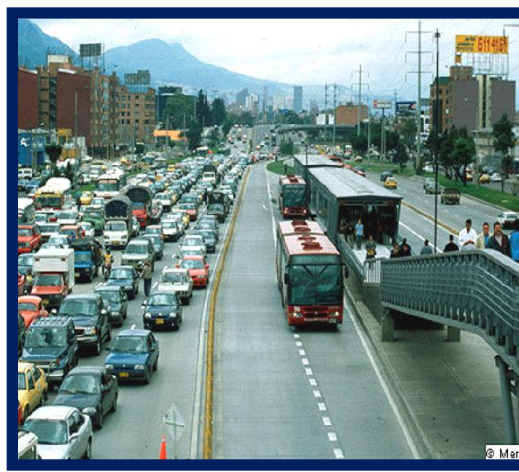
Robert Cervero, Ph.D., University of California, Berkeley

Olga L. Sarmiento, M.D., Los Andes University, Bogotá

Enrique Jacoby, M.D., PanAmerican Health Organization, Washington

Luis Fernando Gomez, M.D., Fundacion Social, Bogotá

*International Journal of Sustainable Transport*, Vol. 3, 2009, pp. 203-226



# Research Design

1. **Physical Activity & Travel Data:** weekly diaries compiled from International Physical Activity Survey (IPAQ) of 1335 HHs; validated by accelerometers

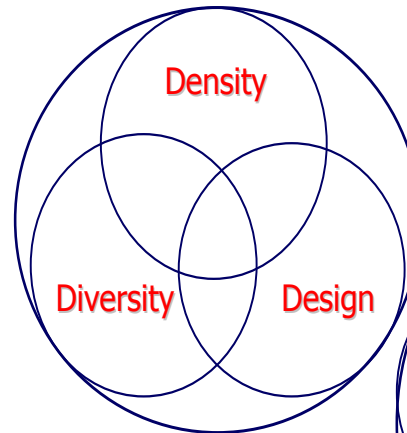
2. **Built Environment Data:** 5 D's compiled using cadastral data & GIS

3. **Modeling:**

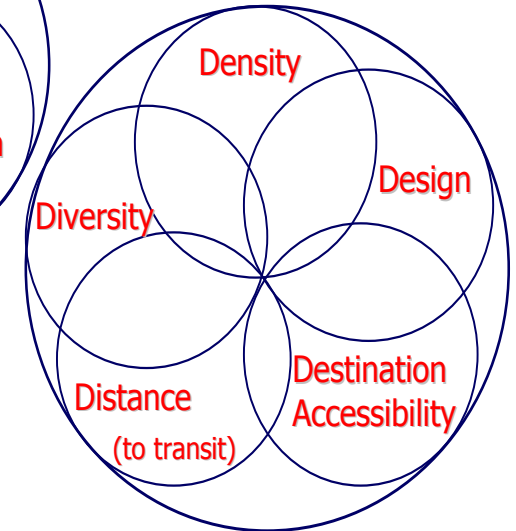
*Ecological Approach –*

- \* **Socio-economic factors**
- \* **Attitudinal factors**
- \* **Policy variables**
- \* **Environmental factors**
  - **Built Environment**
  - **Natural Environment**

*3 D's of the Built Environment*



*5 D's of the Built Environment*

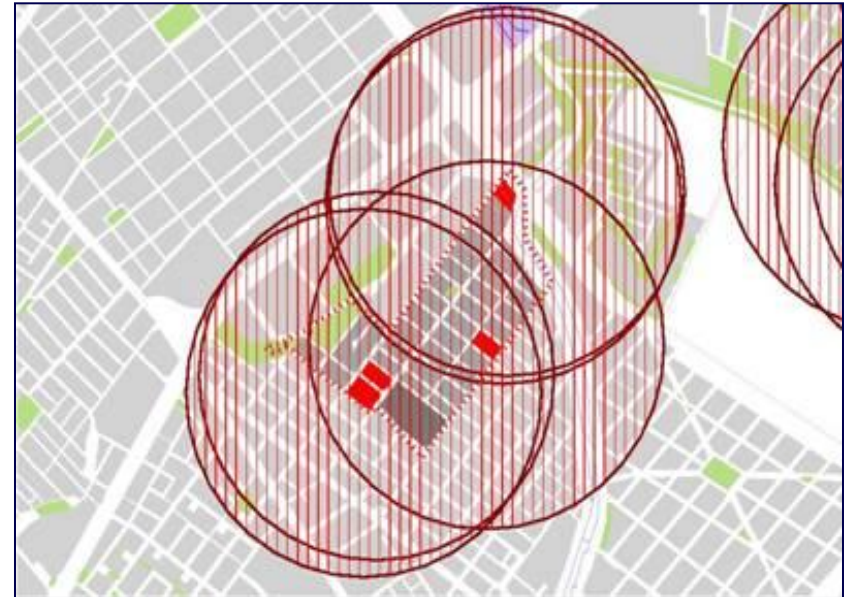


R. Cervero & K. Kockelman,  
Travel Demand & the 3Ds:  
Density, Diversity, Design,  
*Transportation Research D*, 1997.

**Used Multi-Level Modeling: People nested within Neighborhoods**

# Scales of Analysis for Built Environment Variables

**BLOCK**  
**500 meter buffer**  
**around the block**  
**centroid**  
(immediate  
neighborhood  
environment)



**DISTRICT**  
**1000 meter buffer**  
**from the**  
**neighborhood**  
**boundaries**  
(expanded  
neighborhood  
environment)



<b>Dimension</b>	<b>Candidate Variables</b>
<b>(1) DENSITY</b>	Persons per hectare; dwelling units per hectare; % of land area occupied by buildings; average building floor height; plot ratio (building m <sup>2</sup> /land m <sup>2</sup> )
<b>(2) DIVERSITY</b>	Entropy index of land-use mix (0-1 scale); proportion of buildings vertically mixed; proportion of total floorspace in buildings with 2+ uses
<b>(3) DESIGN</b> <i>Amenities</i>	Public park area as % of total land area; average park size (hectares); % of road links with median strips; traffic light density (traffic lights/street length); tree density (trees/street length);
<b>(3) DESIGN</b> <i>Site &amp; Street Design</i>	Average lot size (m <sup>2</sup> ); quadrilateral lots as % of total; percent of blocks with contained housing and access control; street density (street area/land area); proportion of intersections with: 1 point (cul de sac), 3 points, 4 points, 5+ points; bike lane density (lineal m of bikelane/lineal m of streets); route directness (0-1 scale measuring shortest street distance/straightline distance between neighborhood centroid and 8 compass points); connectivity index (intersection nodes/street links); number of bridges; ciclovía two-way length (lineal m)
<b>(3) DESIGN</b> <i>Safety</i>	Number of pedestrian bridges; pedestrian accidents per year; average automobile speeds on main streets; deaths (all types) in traffic accidents per year; number of reported crimes per year
<b>(4) DESTINATION ACCESSIBILITY</b>	Number of: public schools; hospitals; public libraries; shopping centers (> 500m <sup>2</sup> ); churches; banks
<b>(5) DISTANCE TO TRANSIT</b>	Number of TransMilenio (BRT) stations; shortest network distance to closest TransMilenio station; number of feeder TransMilenio stations.





# Measure: DESIGN

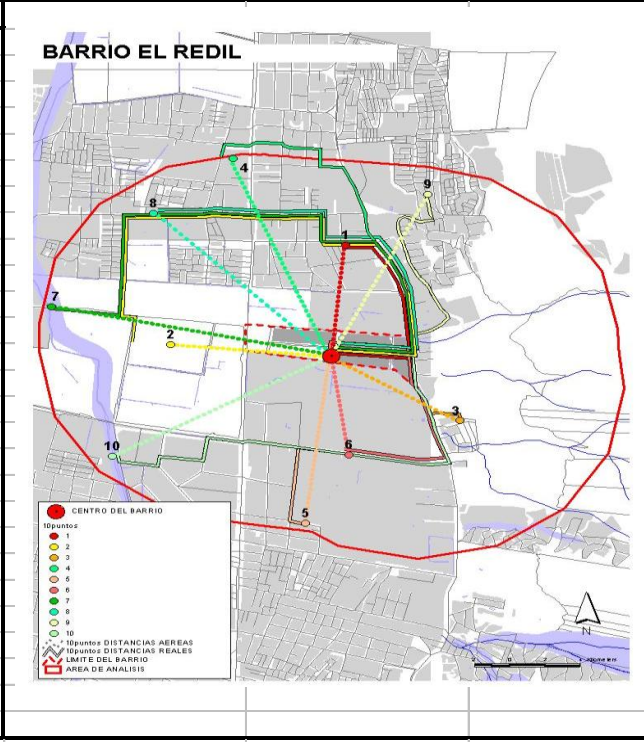
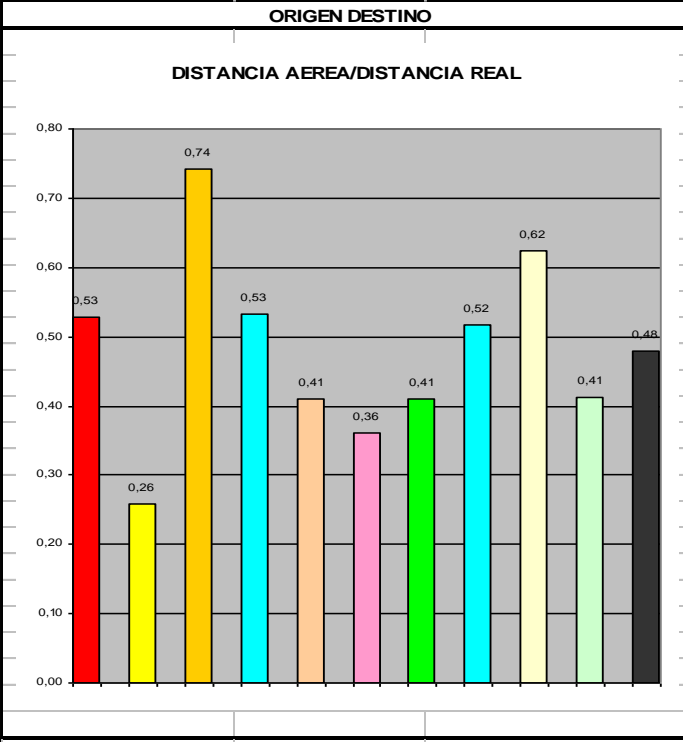
## Walking/Biking Quality



- **Network Connectivity Indicator** =  $(\# \text{ links}) / (\# \text{ nodes})$
- **Sidewalk completeness** = Length of sidewalks / Length of public street (centerline distances)
- **Bikelane completeness** = Length of bikelanes / Length of public streets (centerline distances)
- **Route directness** = Avg. straight-line distance to neighborhood center / Avg. shortest road distance to neighborhood center
- **Proportion of blocks (or block faces) with:**
  - sidewalks; street trees; overhead street lights; quadrilateral shape; bicycle lanes; mid-block crossings

# "Route Directness"

(avg. straight-line distance to neighborhood center) / (avg. shortest road distance to neighborhood center)



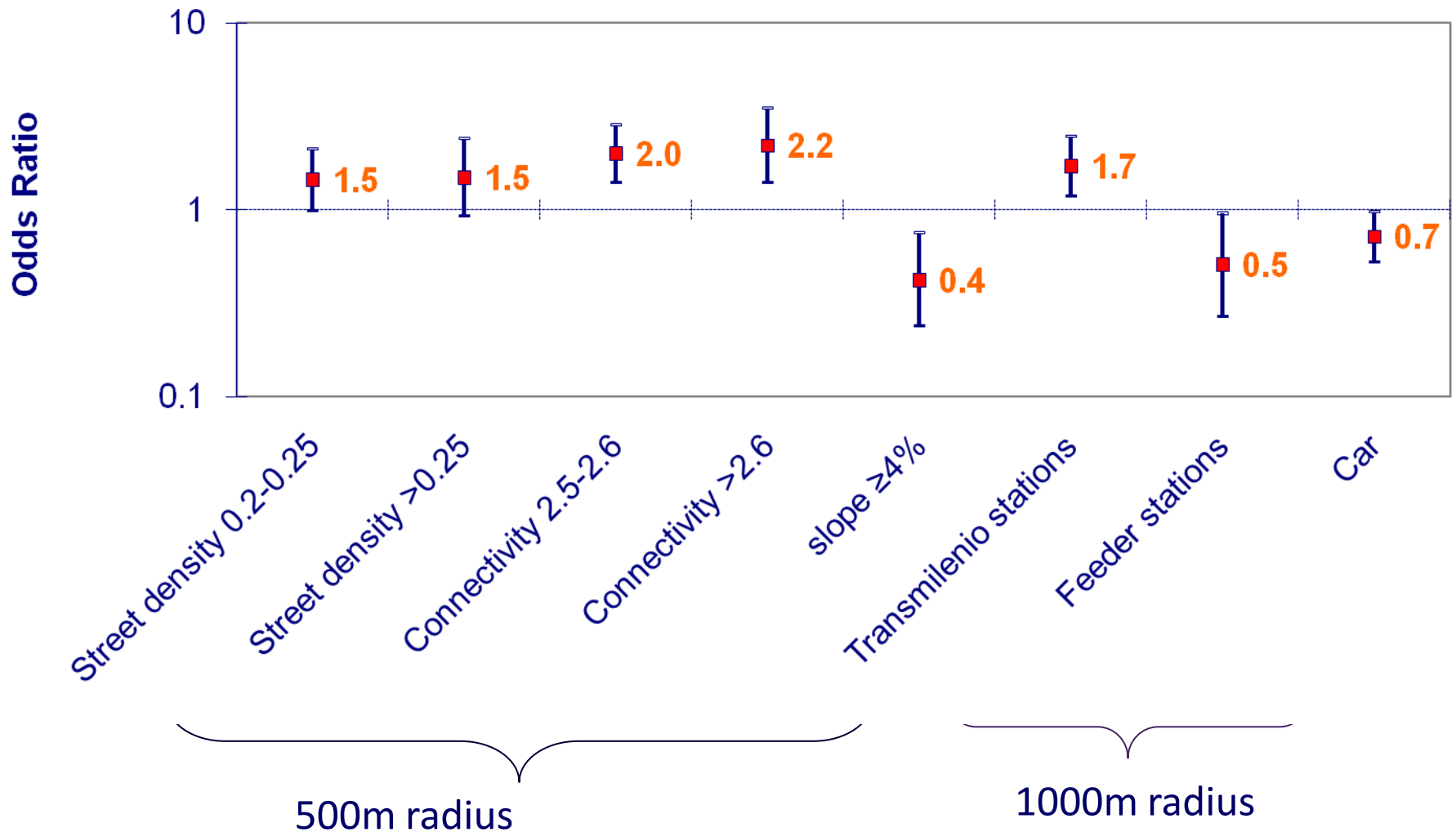
INDICADOR	ESCALA	VARIABLES	UNIDADES	VALORES	VALOR DEL INDICADOR
PROMEDIO DE LA DISTANCIA AEREA AL CENTRO DEL BARRIO(PARA 10 PUNTOS)/PROMEDIO DE LA DISTANCIA DE LAS CALLES POR LA RUTA MAS DIRECTA AL CENTRO DEL BARRIO	AREA DE ANALISIS	P1 DISTANCIA AEREA	METROS LINEALES	668,991	<b>0,53</b>
		P1 DISTANCIA REAL	METROS LINEALES	1265,644	
		P2 DISTANCIA AEREA	METROS LINEALES	796,363	<b>0,26</b>
		P2 DISTANCIA REAL	METROS LINEALES	3081,329	
		P3 DISTANCIA AEREA	METROS LINEALES	727,582	<b>0,74</b>
		P3 DISTANCIA REAL	METROS LINEALES	980,705	
		P4 DISTANCIA AEREA	METROS LINEALES	1257,5	<b>0,53</b>
		P4 DISTANCIA REAL	METROS LINEALES	2362,936	
		P5 DISTANCIA AEREA	METROS LINEALES	970,905	<b>0,41</b>
		P5 DISTANCIA REAL	METROS LINEALES	2361,627	
		P6 DISTANCIA AEREA	METROS LINEALES	580,142	<b>0,36</b>
		P6 DISTANCIA REAL	METROS LINEALES	1603,521	
P7 DISTANCIA AEREA	METROS LINEALES	1401,952	<b>0,41</b>		
P7 DISTANCIA REAL	METROS LINEALES	3411,191			
P8 DISTANCIA AEREA	METROS LINEALES	1211,729	<b>0,52</b>		
P8 DISTANCIA REAL	METROS LINEALES	2348,756			
P9 DISTANCIA AEREA	METROS LINEALES	1066,25	<b>0,62</b>		
P9DISTANCIA REAL	METROS LINEALES	1710,535			
P10 DISTANCIA AEREA	METROS LINEALES	1204,694	<b>0,41</b>		
P10 DISTANCIA REAL	METROS LINEALES	2927,269			
		PROMEDIO CONSOLIDADO			<b>0,48</b>

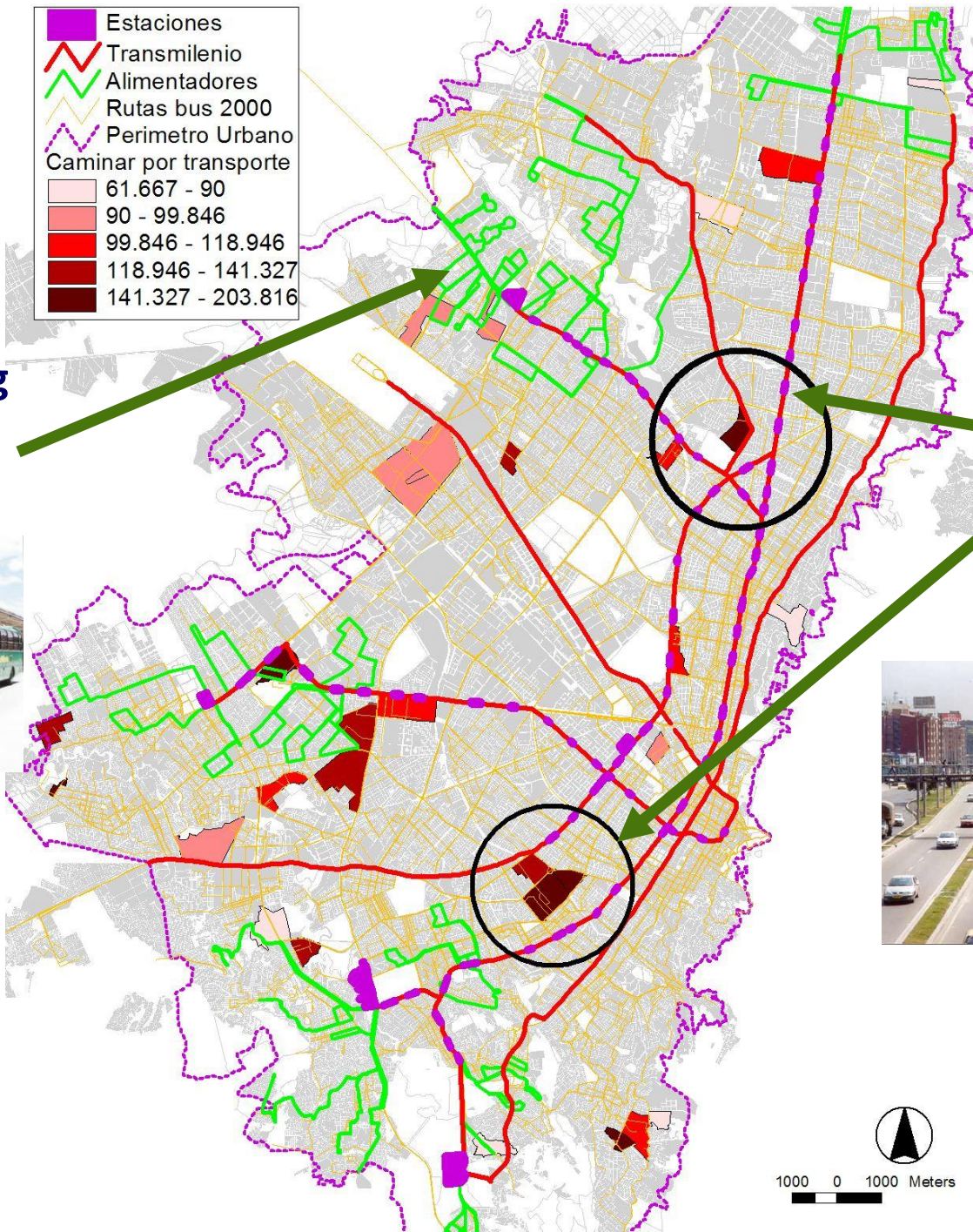
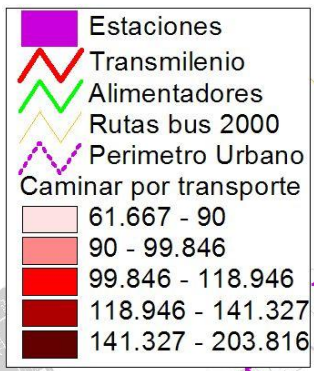
ACCESIBILIDAD	MANZANA	ISOCRONAS POR USOS?			
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# Distance to Transit and Destination accessibility



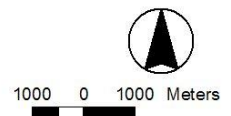
**Odds Ratios & 95% Conf. Intervals for MLM on  
*Walking  $\geq 30$  Minutes per Weekday  
for Utilitarian Purposes***





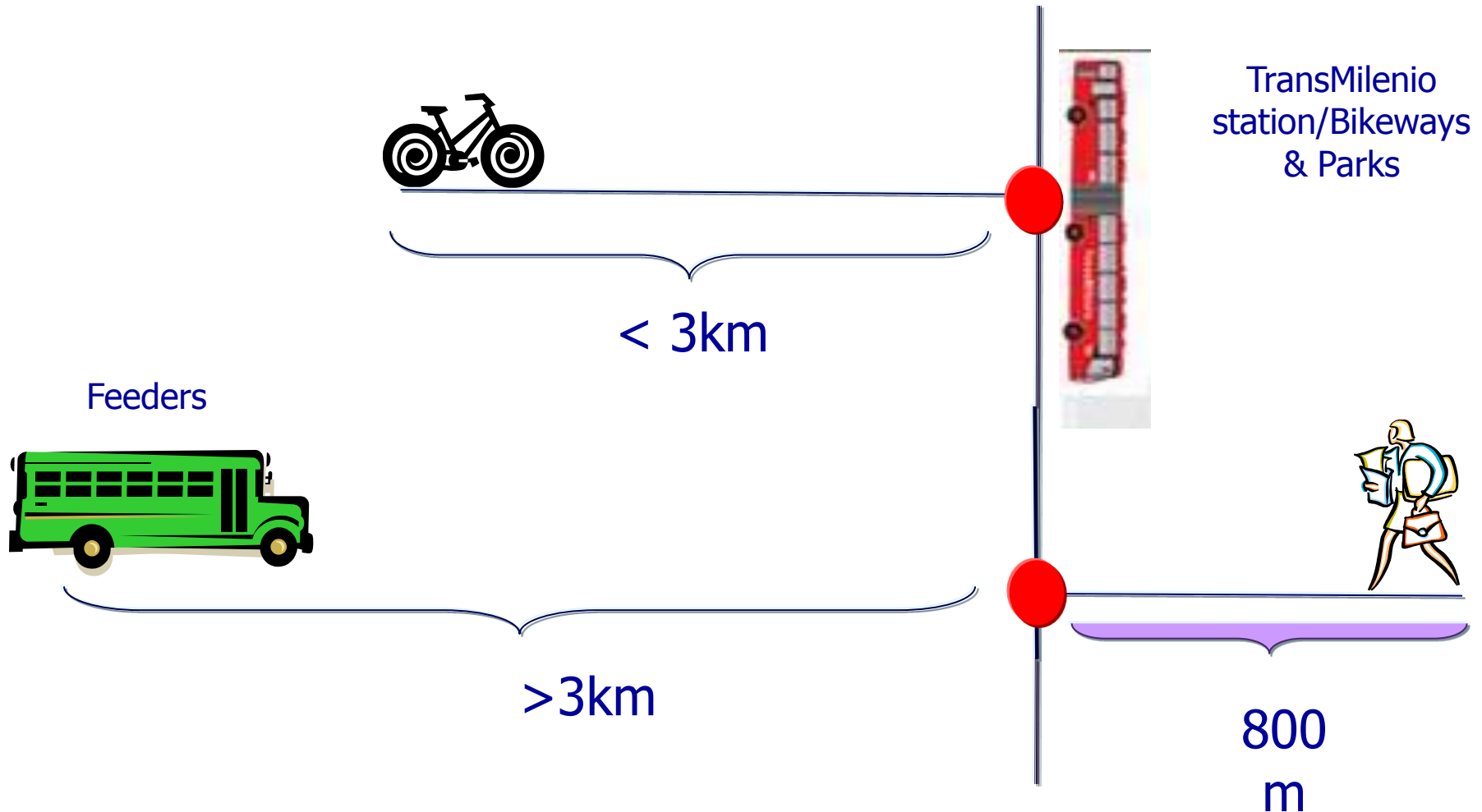
**Low walking incidence & Bus Feeders**

**High walking incidence & Transmilenio Stations**



# TransMilenio Offers Physical Activity Opportunities

## Multi-Modal Planning & Design



**Policy Choices:**  
**Invest in Feeder Buses or "Green Connectors"?**