Urban health: the role inequalities and place

Ana V. Diez Roux MD PhD
University of Michigan
September 2008

Outline

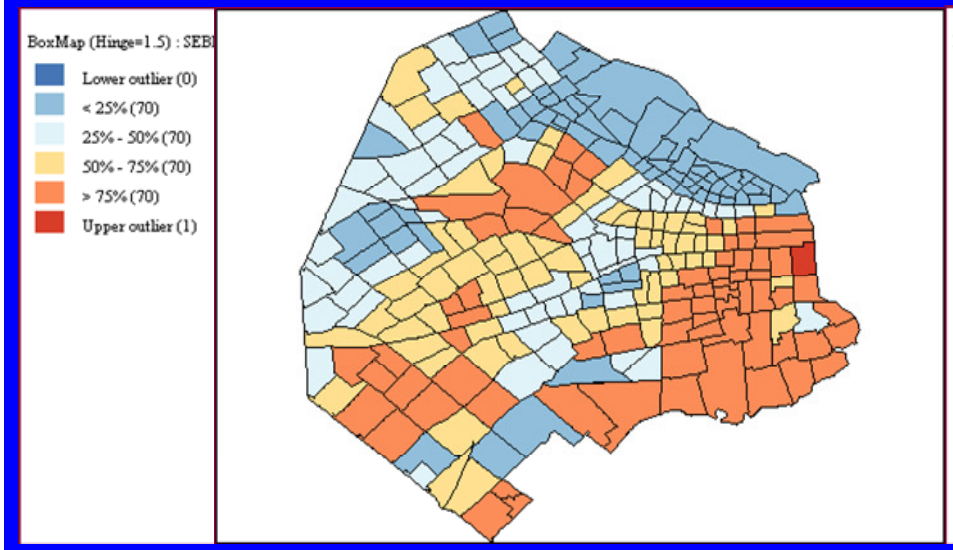
- Important differences between urban and rural areas…but city living is not the same for all
- What explains variations in health within cities?
  - The role of place-based inequalities
- Implications of place-based inequalities for research and action

City-living is not the same for all…

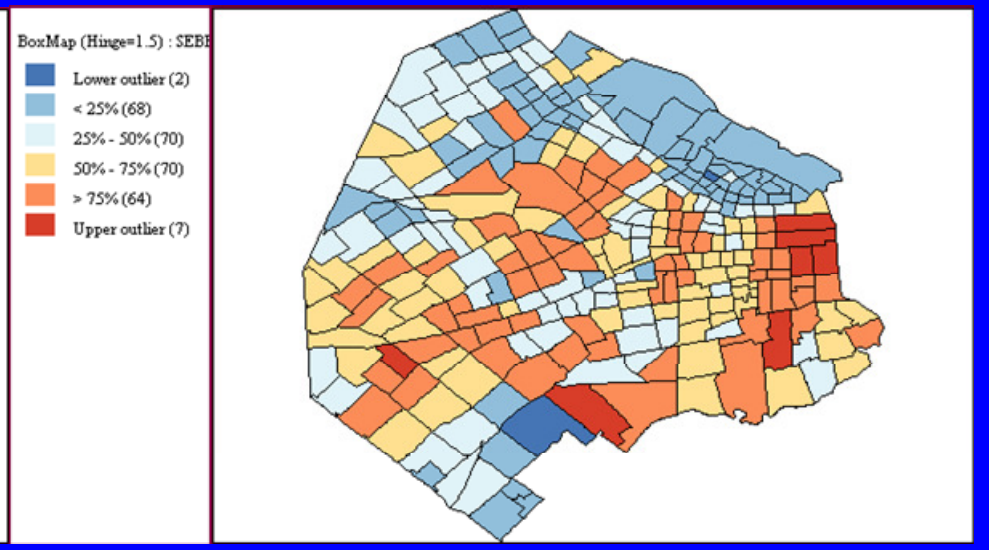
- Large heterogeneity in health within cities…
- Space is one important dimension across which this heterogeneity is patterned

Death rates by censal fraction, Buenos Aires

Male

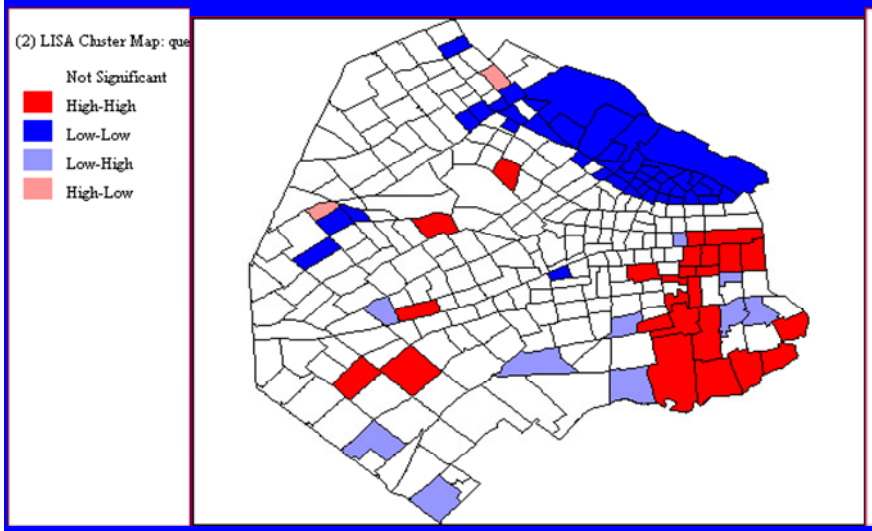


Female

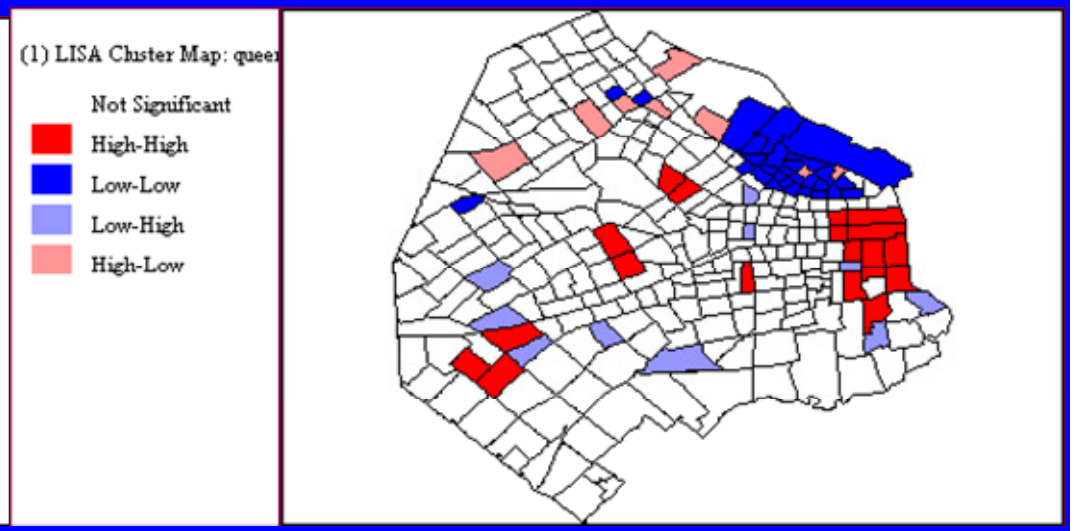


Spatial clusters of death rates, Buenos Aires

Male



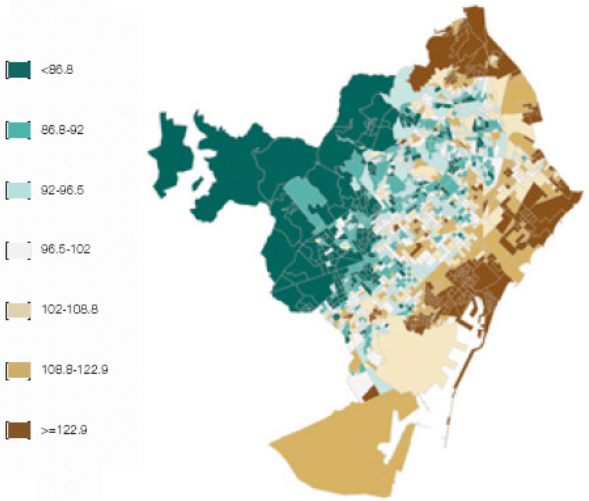
Female



BARCELONA

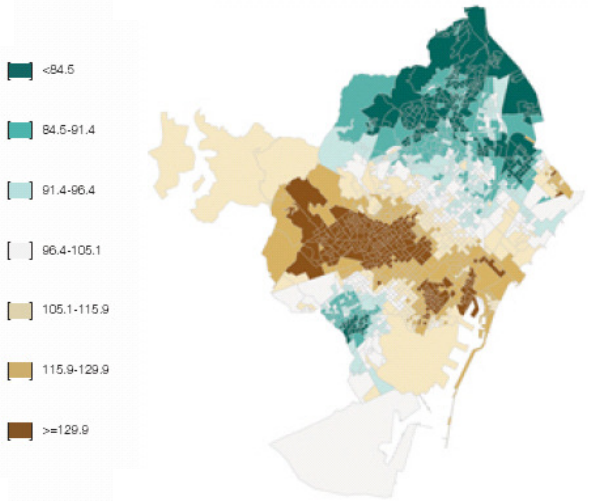
CÁNCER DE TRÁQUEA, BRONQUIOS Y PULMÓN (CIE-9: 162 Y CIE-10: C33-C34)
TRACHEA, BRONCHI AND LUNG CANCER (ICD-9: 162 AND ICD-10: C33-C34)

hombres
men



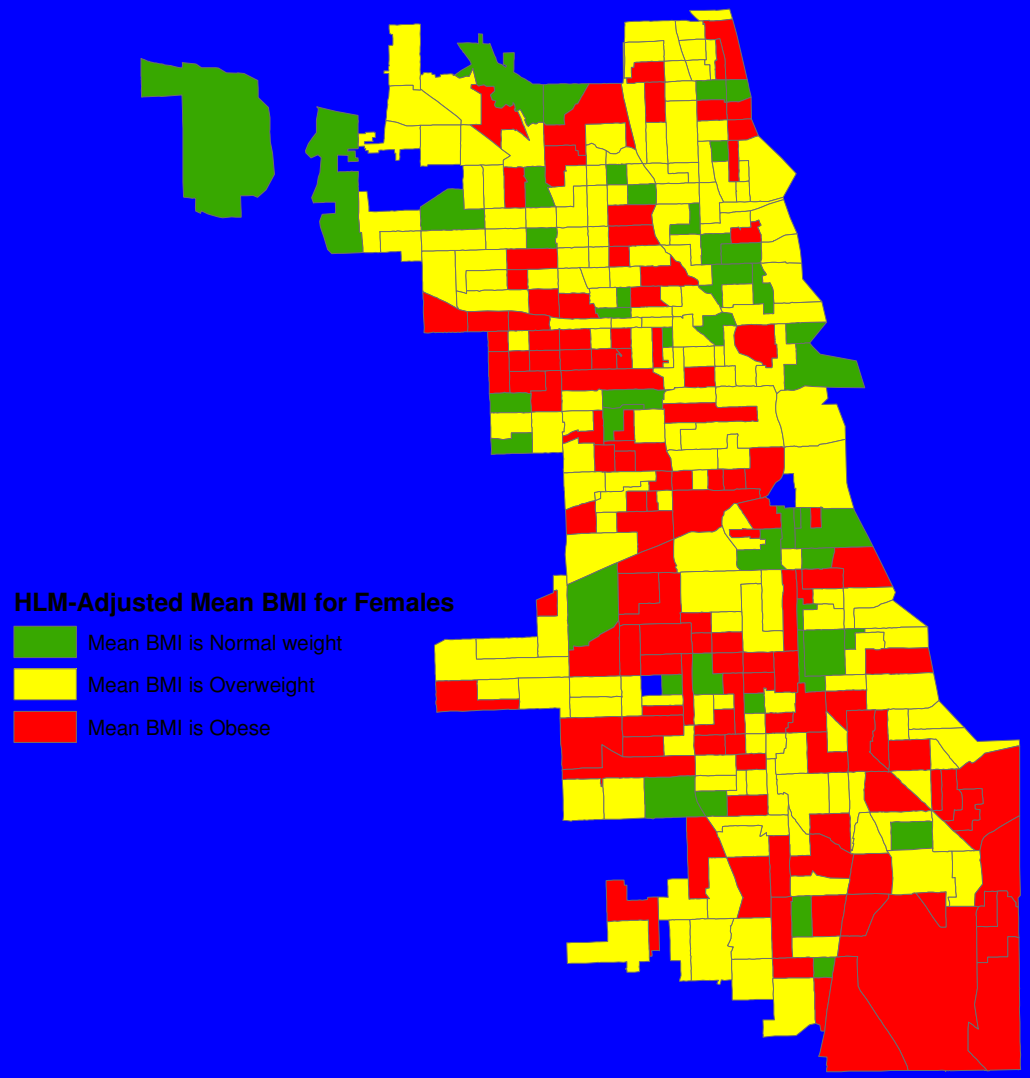
Razón de Mortalidad Estandarizada suavizada (RMEs)
smoothed Standarized Mortality Ratio (SMRs)

mujeres
women

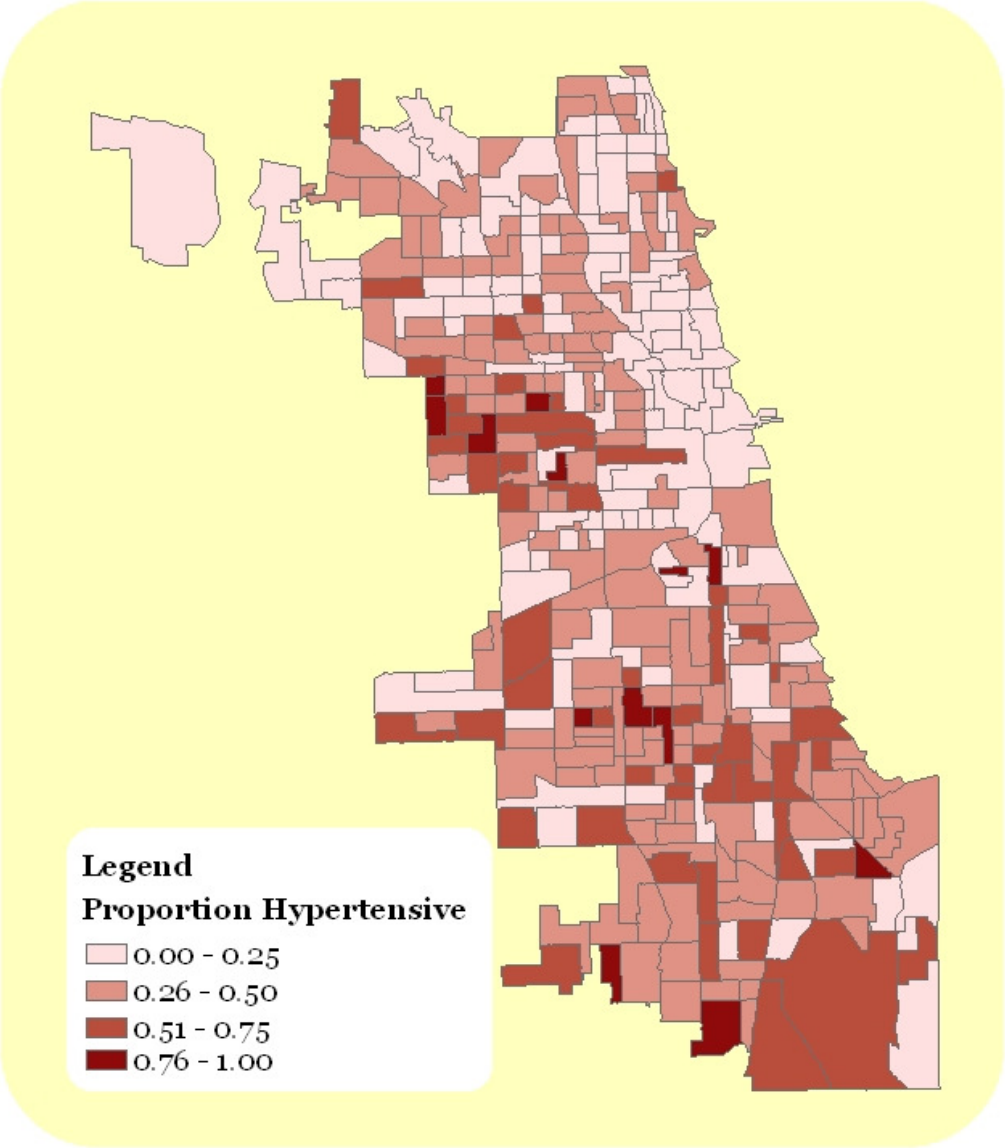


Razón de Mortalidad Estandarizada suavizada (RMEs)
smoothed Standarized Mortality Ratio (SMRs)

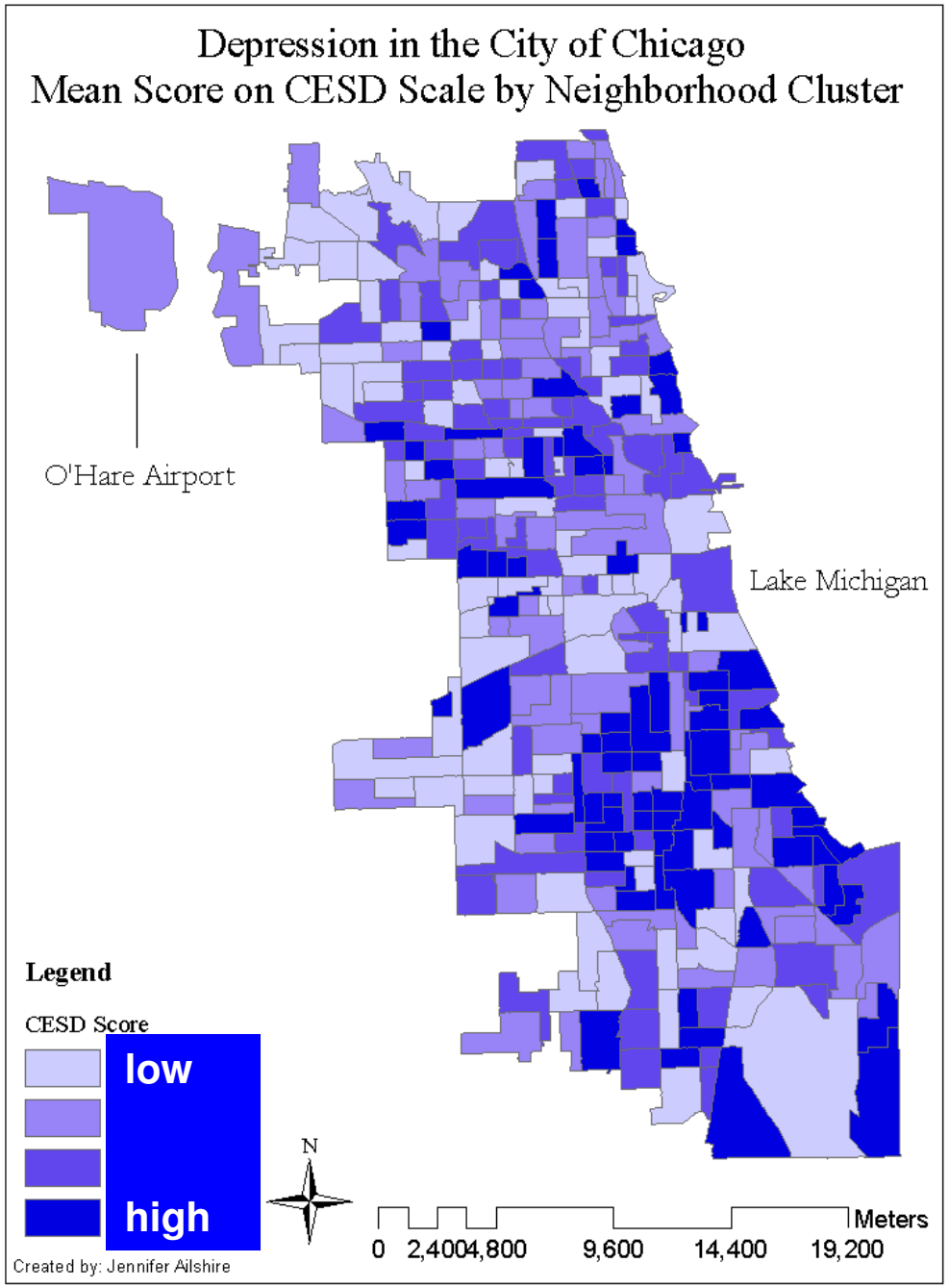
The Spatial Clustering of BMI in Chicago



Neigborhood Cluster Hypertension Prevalence



Map created by Jennifer Ailshire and Michael Bader


Depression in the City of Chicago
Mean Score on CESD Scale by Neighborhood Cluster
O'Hare Airport
Lake Michigan
Legend
CESD Score
low
high
N
Meters
0 2,4004,800 9,600 14,400 19,200
Created by: Jennifer Ailshire

What explains this spatial patterning?

- Residential segregation by socioeconomic/ethnic characteristics predictive of health

- Place-based features as contributors and perpetuators of social differences

- Residential segregation by socioeconomic/ethnnic characteristics predictive of health

- Place-based features as contributors and perpetuators of social differences

- Residential segregation by socioeconomic/ethnnic characteristics predictive of health

- Place-based features as contributors and perpetuators of social differences

How do places affect health?

09.19.2008 18:25

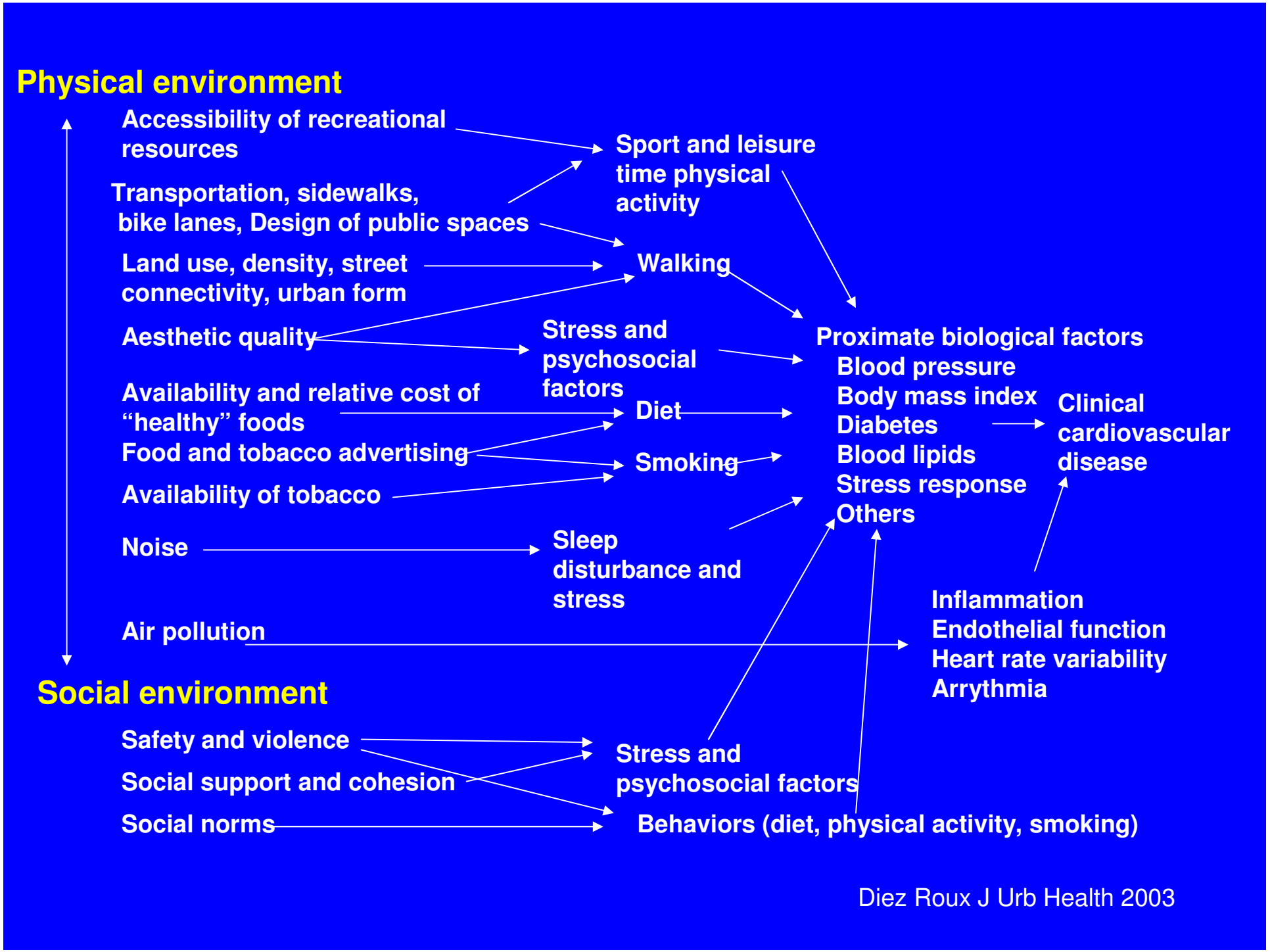
How do place-based features affect health?

- Physical attributes of places/resources
- Social attributes of places

How do place-based features affect health?

- Physical attributes of places/resources
  - Environmental exposures
  - Built environment (housing, urban design)
  - Resources
  - Services
- Social attributes of places
  - Safety/violence
  - Social cohesion/trust/capital
  - Social norms

The example of cardiovascular disease



Diez Roux J Urb Health 2003

Four examples

- Diet
- Physical activity
- Hypertension
- Diabetes

MESA Neighborhood Study

- Ancillary study to the Multiethnic Study of Atherosclerosis
  - Longitudinal study of 6800+ participants aged 45-64 years in six sites
    - NY, Baltimore, Forsyth, St. Paul, Los Angeles, Chicago
  - Detailed measures of cardiovascular disease, biologic markers, and behaviors
  - Neighborhood-level data

Are place-based factors related to diet?

Adjusted ratios of stores per population by area socioeconomic characteristics

Type of Store	Lowest Income		Middle Income	
Grocers	3.9	(3.3-4.7)	2.1	(1.8-2.6)
Supermarkets	0.5	(0.3-0.8)	1.0	(0.7-1.3)
Convenience Stores	1.9	(1.4-2.5)	1.6	(1.2-2.1)
Meat & Fish Markets	1.9	(1.3-2.7)	1.0	(0.7-1.5)
Fruit & Veg. Markets	0.8	(0.5-1.4)	0.5	(0.3-0.8)
Natural Food Stores	0.4	(0.2-0.7)	0.5	(0.3-0.8)
Liquor Stores	1.5	(1.1-1.9)	0.9	(0.7-1.2)

Moore and Diez Roux 2004

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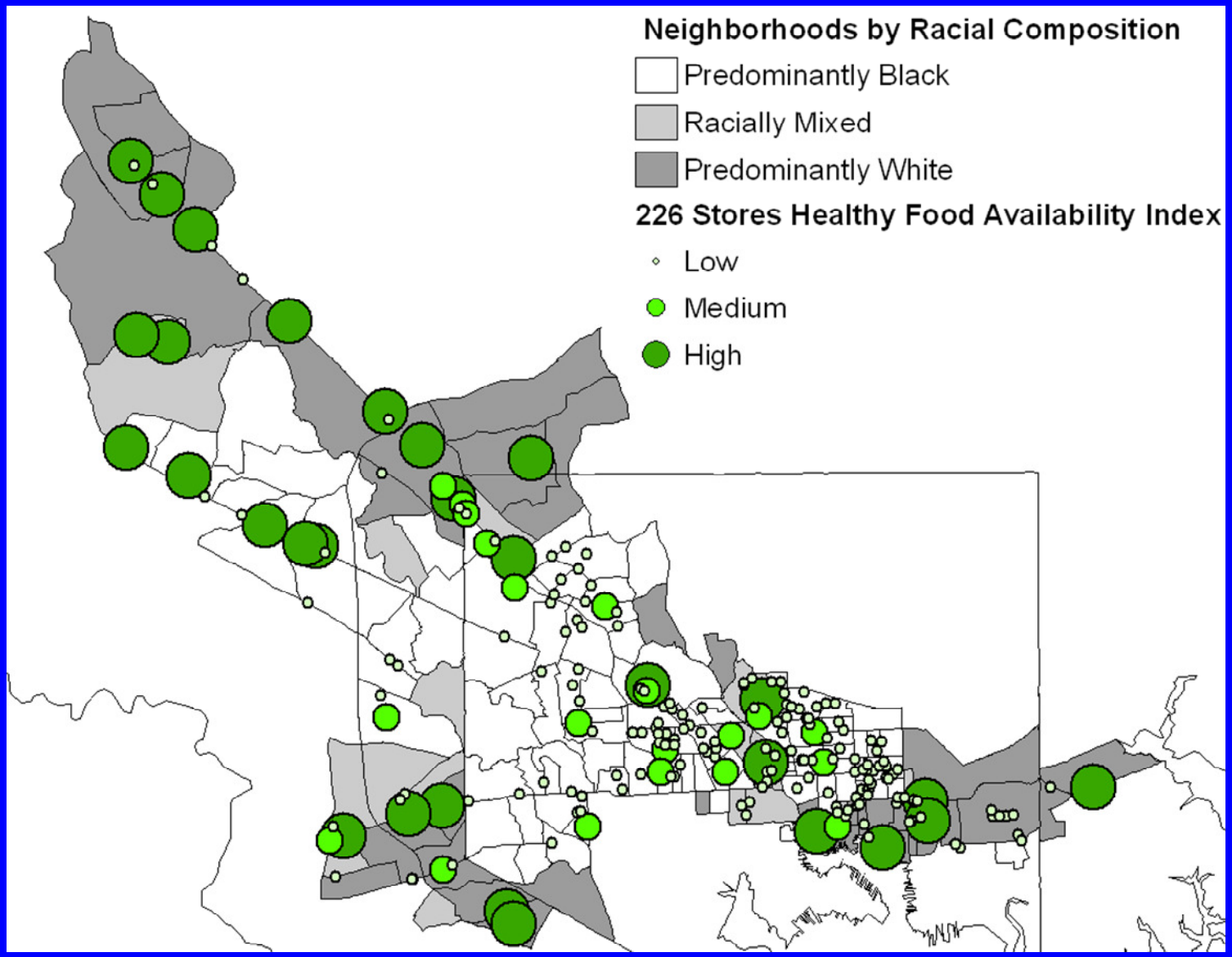
Moore and Diez Roux 2004

Smoke Before Food: A Tale of Baltimore City

American Journal of Public Health | July 2007, Vol 97, No. 7

Manuel Franco, MD, Arijit Nandi, MPH, Thomas Glass, PhD, and Ana Diez-Roux, MD, PhD

Food stores and healthy food availability indices in Baltimore



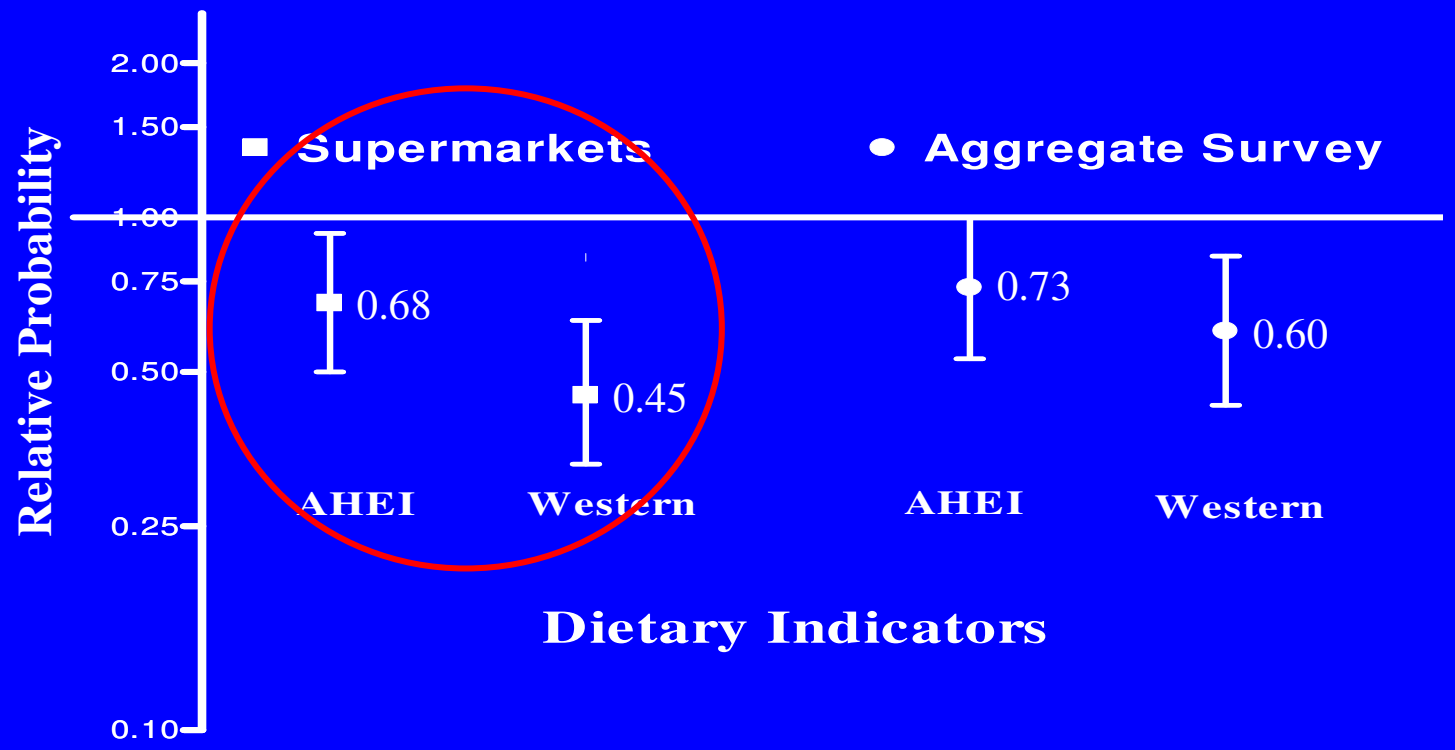
Franco, Diez Roux et al AJPM in press

Healthy Foods Availability Index (HFAI) of two supermarkets

Location	**Baltimore City**		**Baltimore County**	
Racial Composition	97% Black		93% White	
Median HH Income	$ 20,833		$ 57,391	
	Avail.	Points	Avail.	Points
Skim milk	Yes	2	Yes	3
Fruits	17	2	59	4
Vegetables	38	3	74	4
Lean meat	No	2	Yes	3
Frozen foods	No	0	Yes	3
Low Na foods	No	0	Yes	2
100% whole wheat bread	Yes	2	Yes	4
Low sugar cereals	Yes	2	Yes	2
HFAI (0 to 27)		18		25

Franco et al 2008

Adjusted relative probability (95% CL) of having a good diet for 1st vs. 4th quartile of food environment

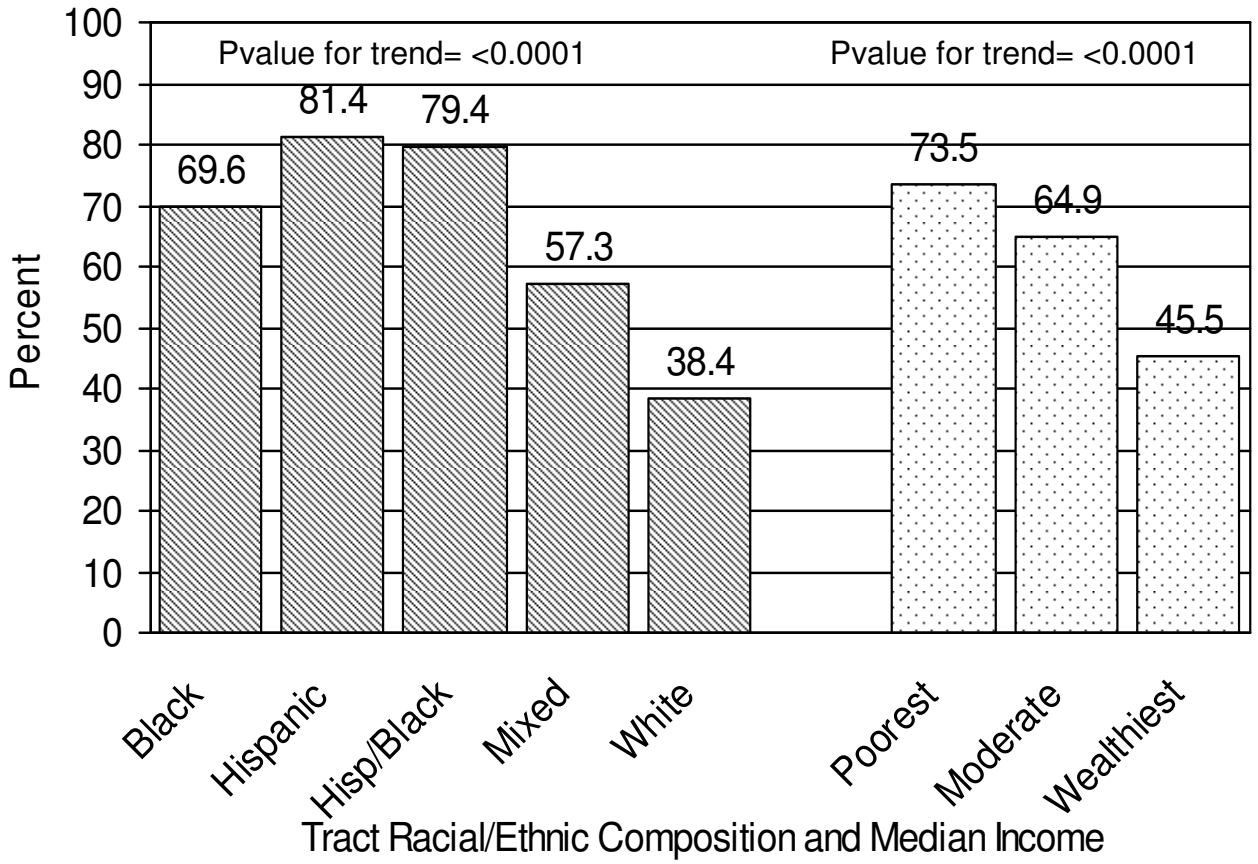


- Participants with worst availability of supermarkets were 32-55% less likely to have a good quality diet
- Those who lived in areas with the worst ranked local food environments were 27-40% less likely to have a good diet

Moore, Diez Roux et al. AJE in press

The physical environment and physical activity

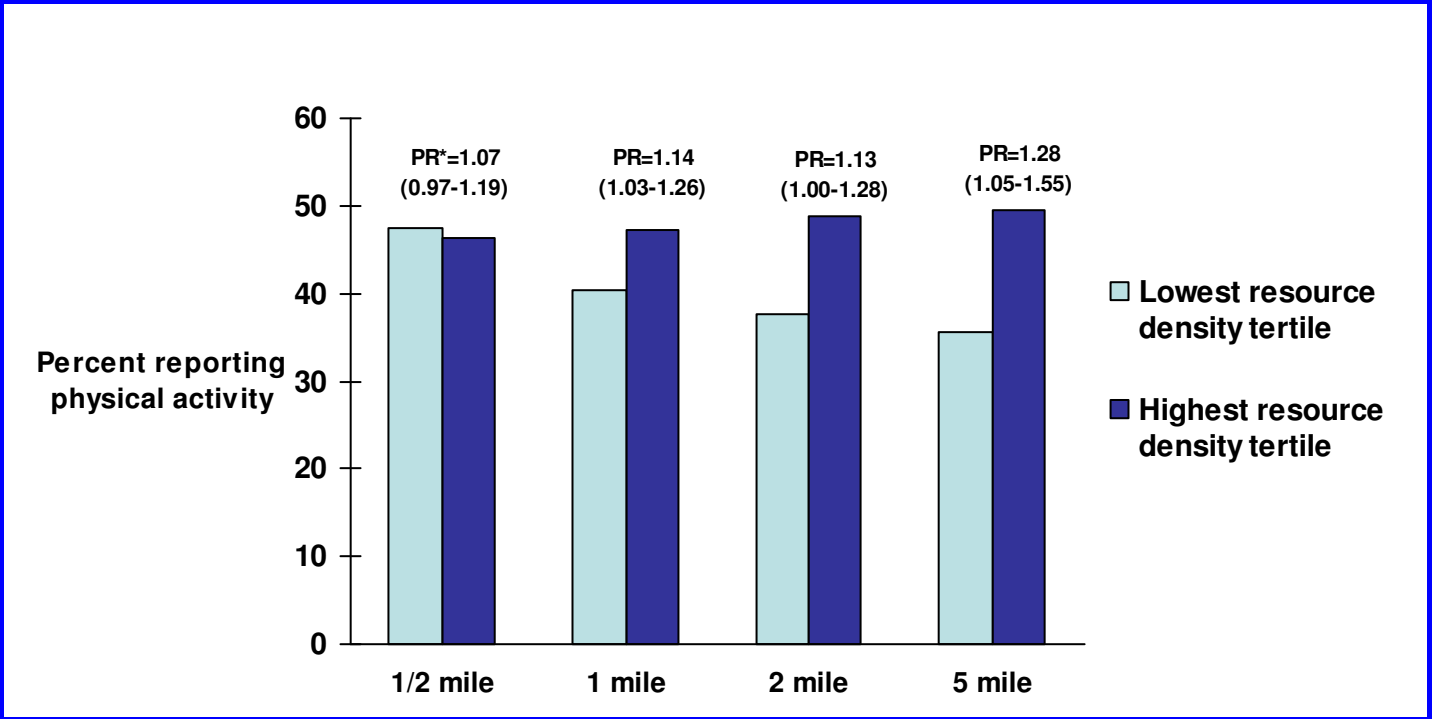
Percent of tracts without a recreational facility by racial/ethnic composition and median income adjusted for tract area*



* Proportions were adjusted to the mean area of the tracts using logistic regression

Moore et al 2008

Percent of participants reporting physical activity and prevalence ratios (PR) of activity by resource densities for windows of varying size*



*Adjusted for age, sex, race/ethnicity, income, site, neighborhood violence.
Resource densities are adjusted for population.

Diez Roux et al 2006

Other features of the built environment linked to physical activity

- Street connectivity
- Urban design
- Proximity of destinations

Comparison of three types of neighborhoods

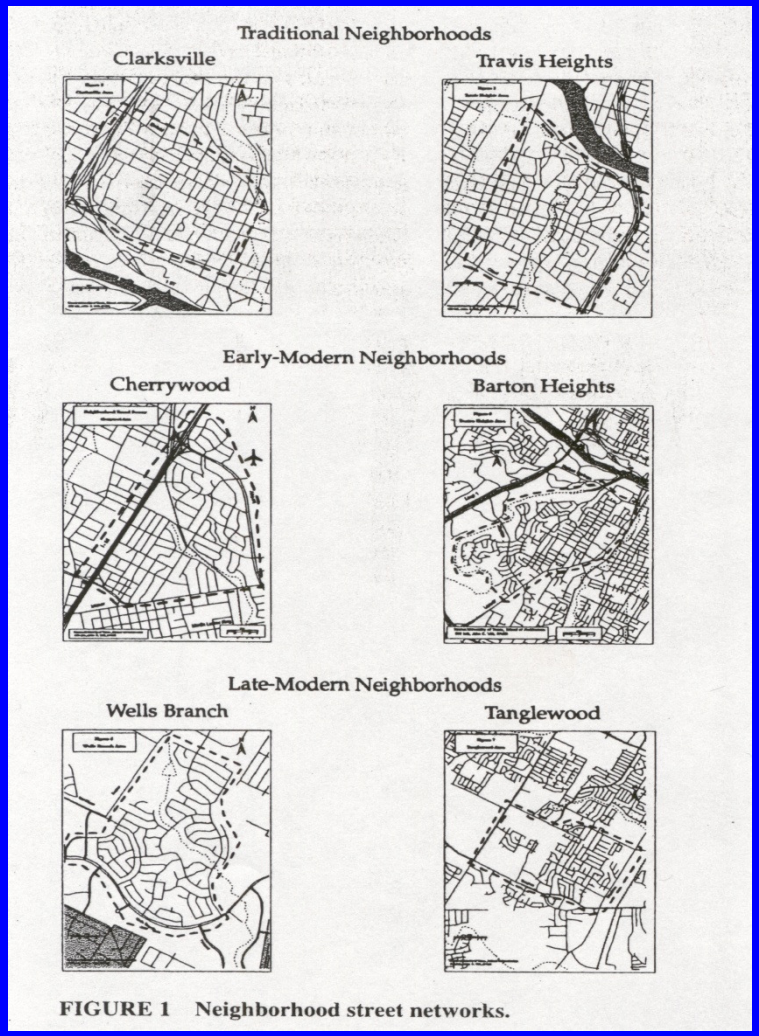
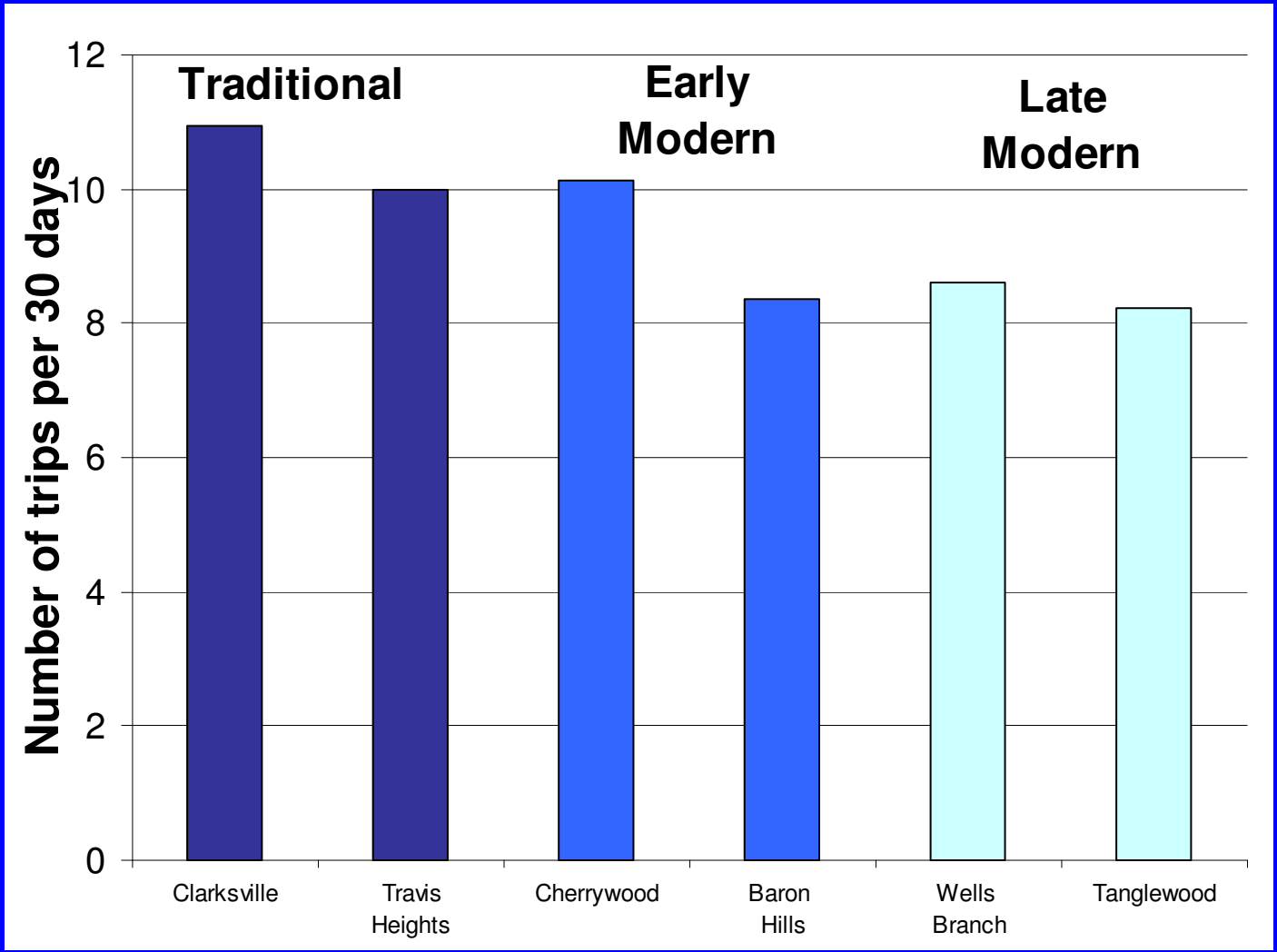


FIGURE 1 Neighborhood street networks.

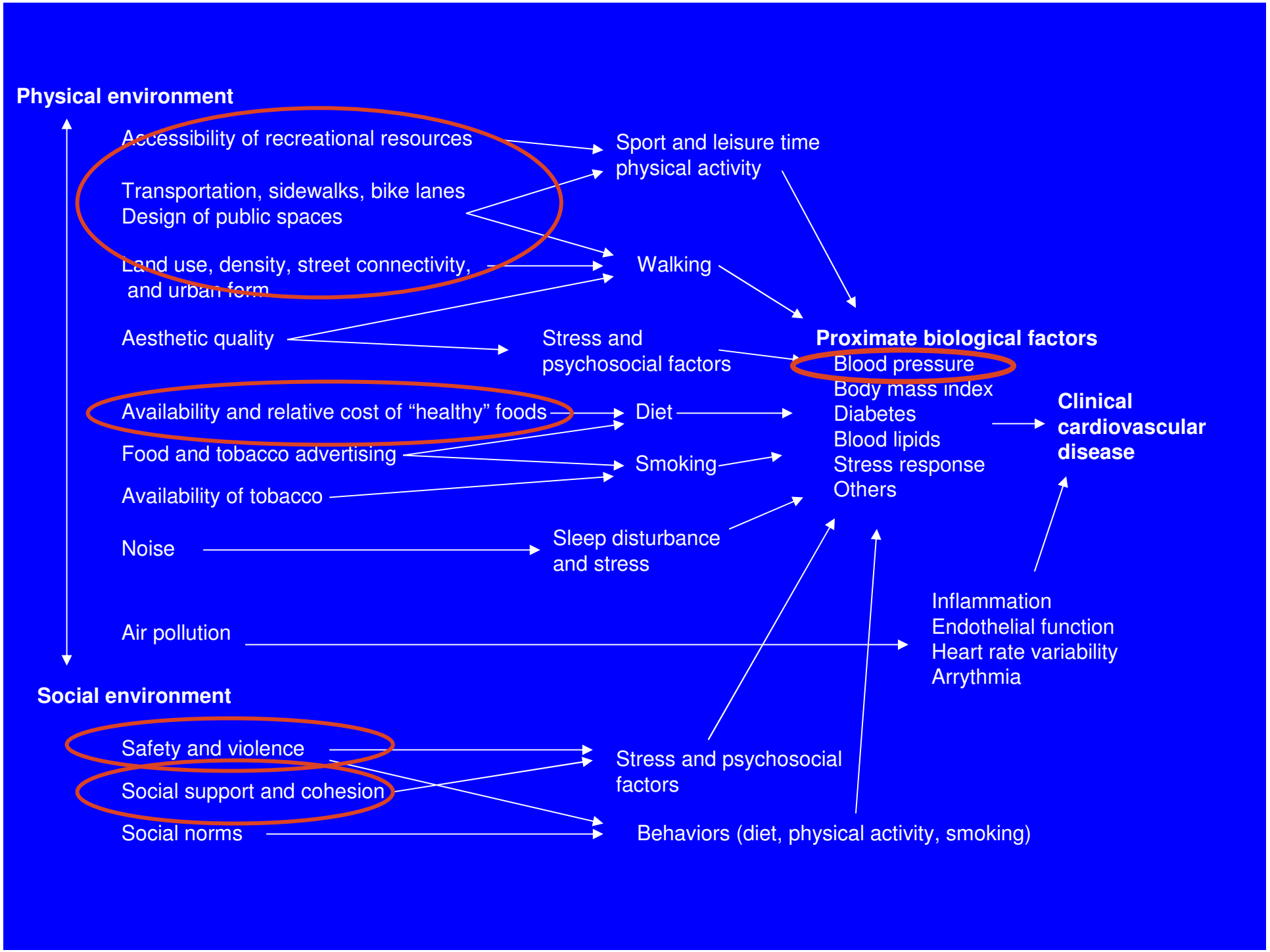
Source: Handy (1996)

Strolling Trips by Type of Neighborhood



Source: Handy (1996)

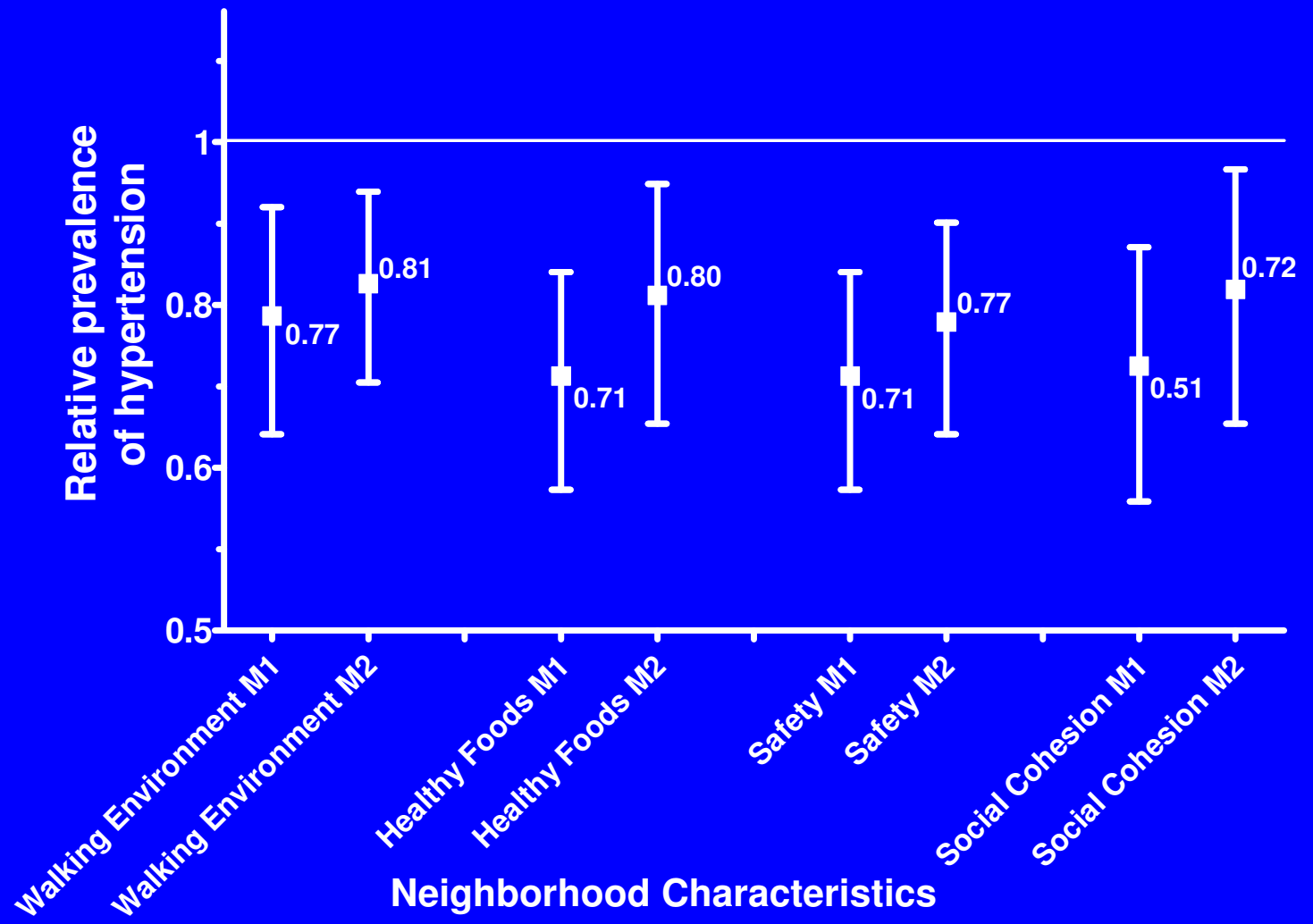
What about biomedical risk factors


Physical environment
Accessibility of recreational resources
Transportation, sidewalks, bike lanes
Design of public spaces
Land use, density, street connectivity, and urban form
Aesthetic quality
Availability and relative cost of "healthy" foods
Food and tobacco advertising
Availability of tobacco
Noise
Air pollution
Sport and leisure time physical activity
Walking
Stress and psychosocial factors
Diet
Smoking
Sleep disturbance and stress
Proximate biological factors
Blood pressure
Body mass index
Diabetes
Blood lipids
Stress response
Others
Clinical cardiovascular disease
Inflammation
Endothelial function
Heart rate variability
Arrythmia
Social environment
Safety and violence
Social support and cohesion
Social norms
Stress and psychosocial factors
Behaviors (diet, physical activity, smoking)

Community survey scales

Walking/PA environment	1. My neighborhood offers many opportunities to be physically active. 2. Local sports clubs and other facilities in my neighborhood offer many opportunities to get exercise. 3. It is pleasant to walk in my neighborhood. 4. The trees in my neighborhood provide enough shade. 5. In my neighborhood it is easy to walk places. 6. I often see other people walking in my neighborhood. 7. I often see other people exercise (f or example jog, bicycle, play sports) in my neighborhood.
Availability of healthy foods	1. A large selection of fresh fruits and vegetables is available in my neighborhood. 2. The fresh fruits and vegetables in my neighborhood are of high quality. 3. A large selection of low fat products is available in my neighborhood.
Safety	1. I feel safe walking in my neighborhood day or night. 2. Violence is not a problem in my neighborhood. 3. My neighborhood is safe from crime
Social cohesion	1. People around here are willing to help their neighbors. 2. People in my neighborhood generally get along with each other. 3. People in my neighborhood can be trusted. 4. People in my neighborhood share the same values

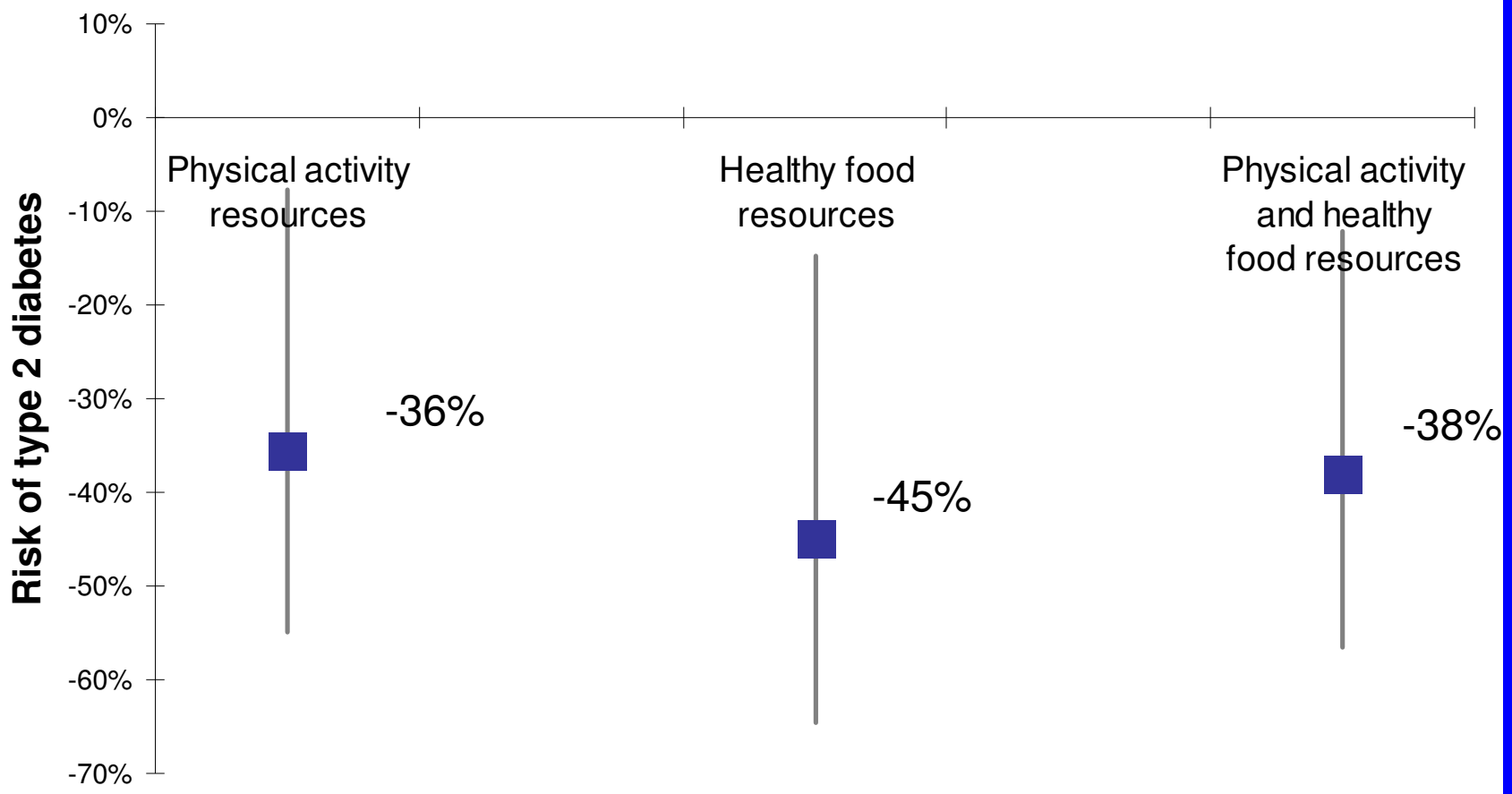
Relative prevalence of Hypertension associated with better neighborhood characteristics



Model 1 (M1): adjusted for site, age, gender; **Model 2 (M2)**: adjusted for site, age, gender, education, income,

Based on EB estimates

Reduction in risk of developing type II diabetes associated with better neighborhood characteristics



Data from 5 years of follow-up (2000-2006) of the Multi-Ethnic Study of Atherosclerosis and 1 year of The Community Survey (2004), n =2285 (excluded diabetes at baseline).

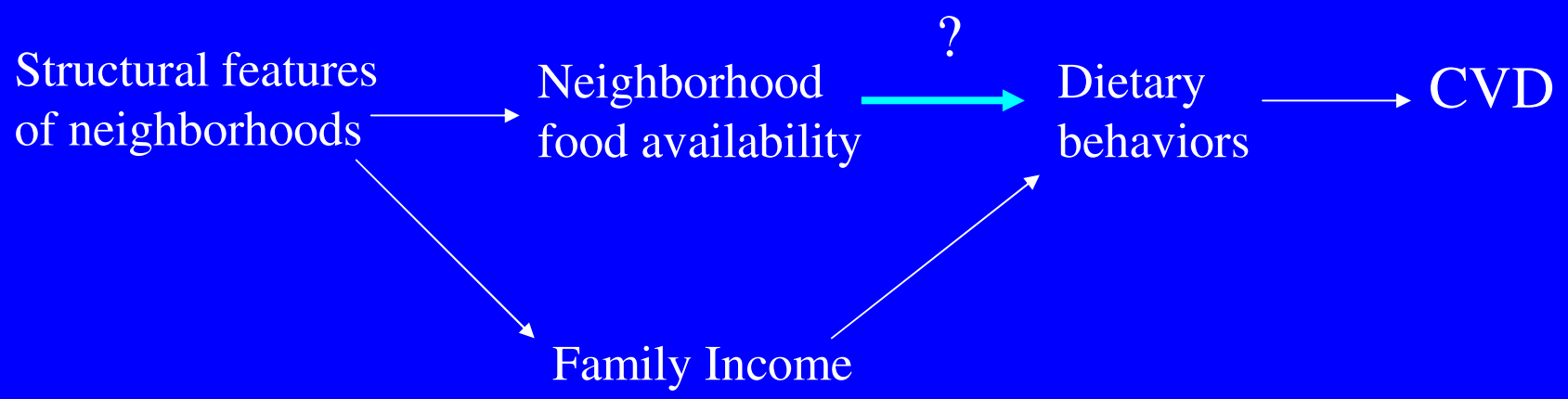
Multilevel dynamic processes

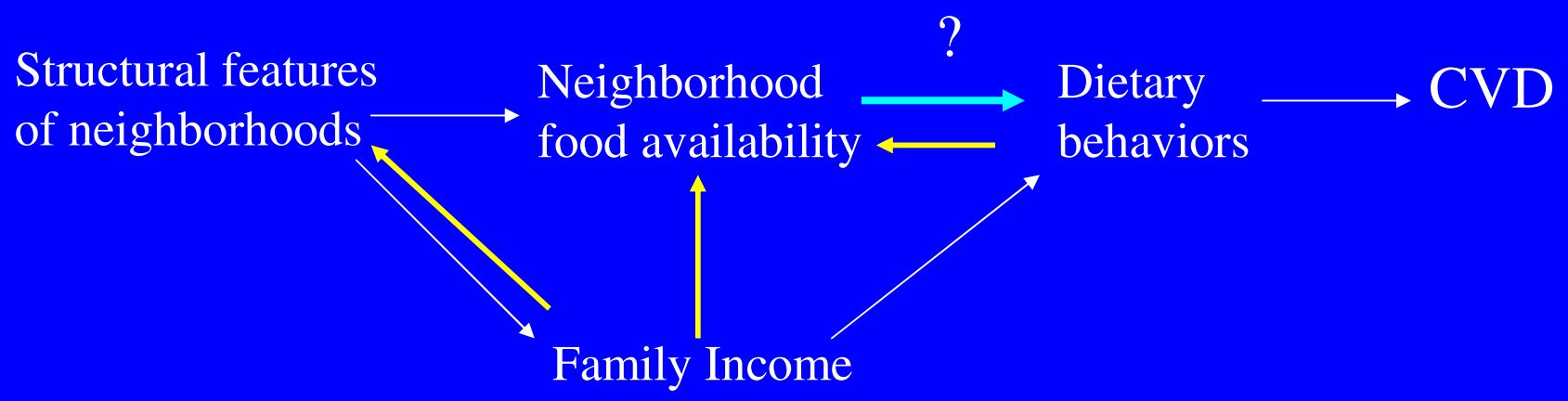
- People and places
- Interacting places
- Places within a larger context
- Multiple nested and non-nested geographic hierarchies

Multilevel causal processes

- Contexts underspecified
- Individual-level confounders and mediators
- Dynamic and recursive processes

Structural features of neighborhoods
Neighborhood food availability
?
Dietary behaviors
CVD


Structural features
of neighborhoods
Neighborhood
food availability
?
Dietary
behaviors
CVD
Family Income


Structural features
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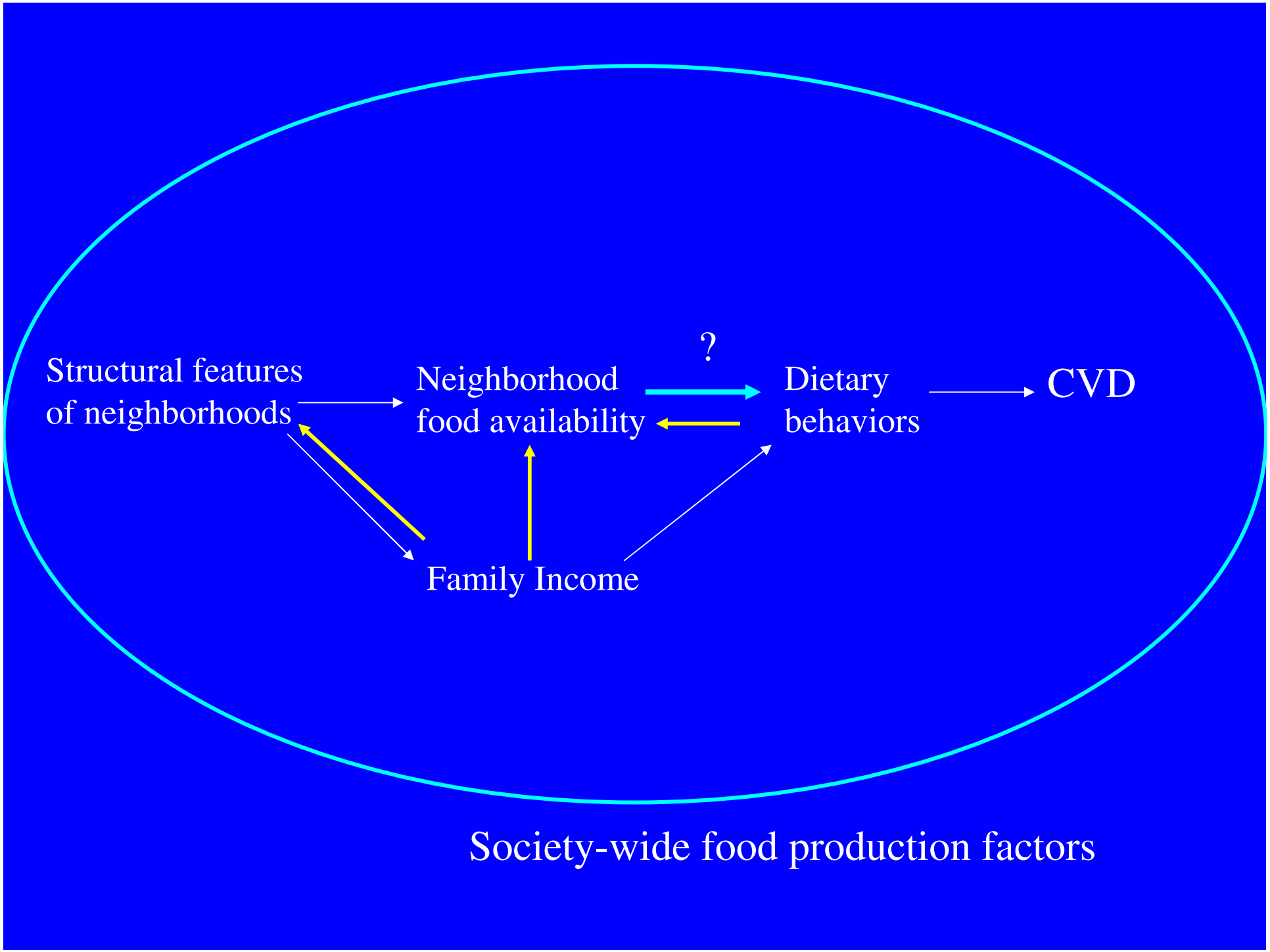

Structural features
of neighborhoods
Neighborhood
food availability
?
Dietary
behaviors
CVD
Family Income
Society-wide food production factors

Multiple Sources of Evidence

- Qualitative studies
- Rigorous Observational studies
- Natural experiments/quasi experiments
- Simulation/systems approaches

Neighborhood (spatial) patterning of health emerges from the functioning of a system:

- individuals interact with their environment
- individuals interact with each other
- individuals and environments adapt and change over time
- Possible utility of simulation and systems approaches

Auchincloss and Diez Roux AJE 2008

Why focus on places/neighborhoods?

- Mutually reinforcing nature of place –based and individual inequalities
- Neighborhood differences not “naturally” determined
- Result from specific policies
- Amenable to intervention
- Changes in neighborhood environments likely to have multiple health and non-health benefits

Policy Implications

- Spatial inequality in physical/social environments contributes to health and health inequalities
- Policies to reduce these spatial inequities within cities are likely to have multiple health and non-health benefits

Places can change……

Courtesy of Howard Frumkin

COLFAX AVENUE, DENVER, COLORADO: Done in association with Space Analytics, LLC for Colfax on the Hill, Inc., funded in part by the Denver Foundation

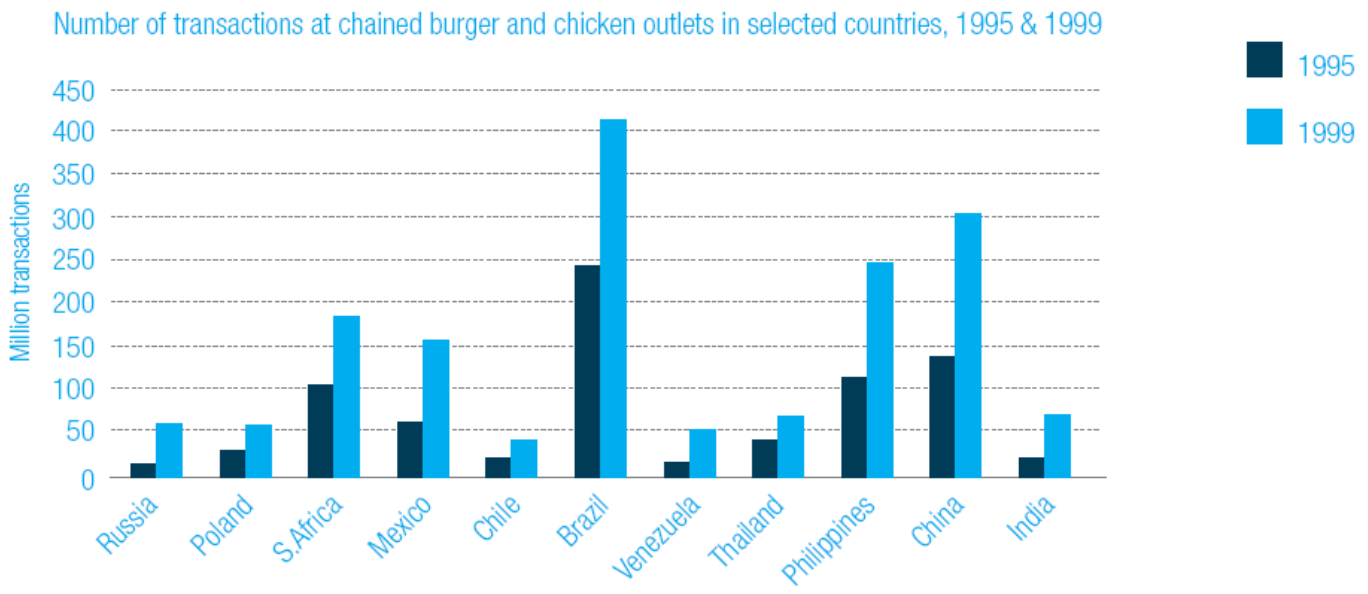
"New" paradigm in public health

Interdisciplinary

Transportation, urban planning, food access, community development policies as health policies

photo Transportation Alternatives

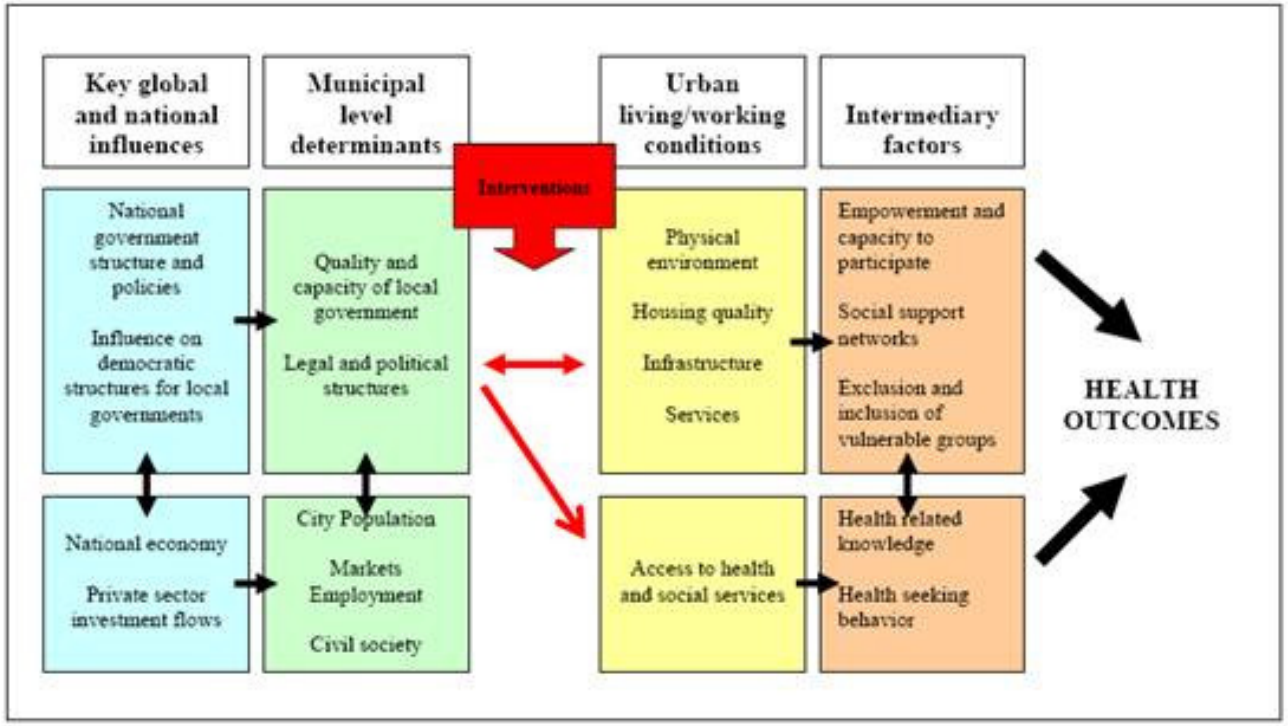
Figure 12.1 Fast food consumption (1995 and 1999) in selected countries.



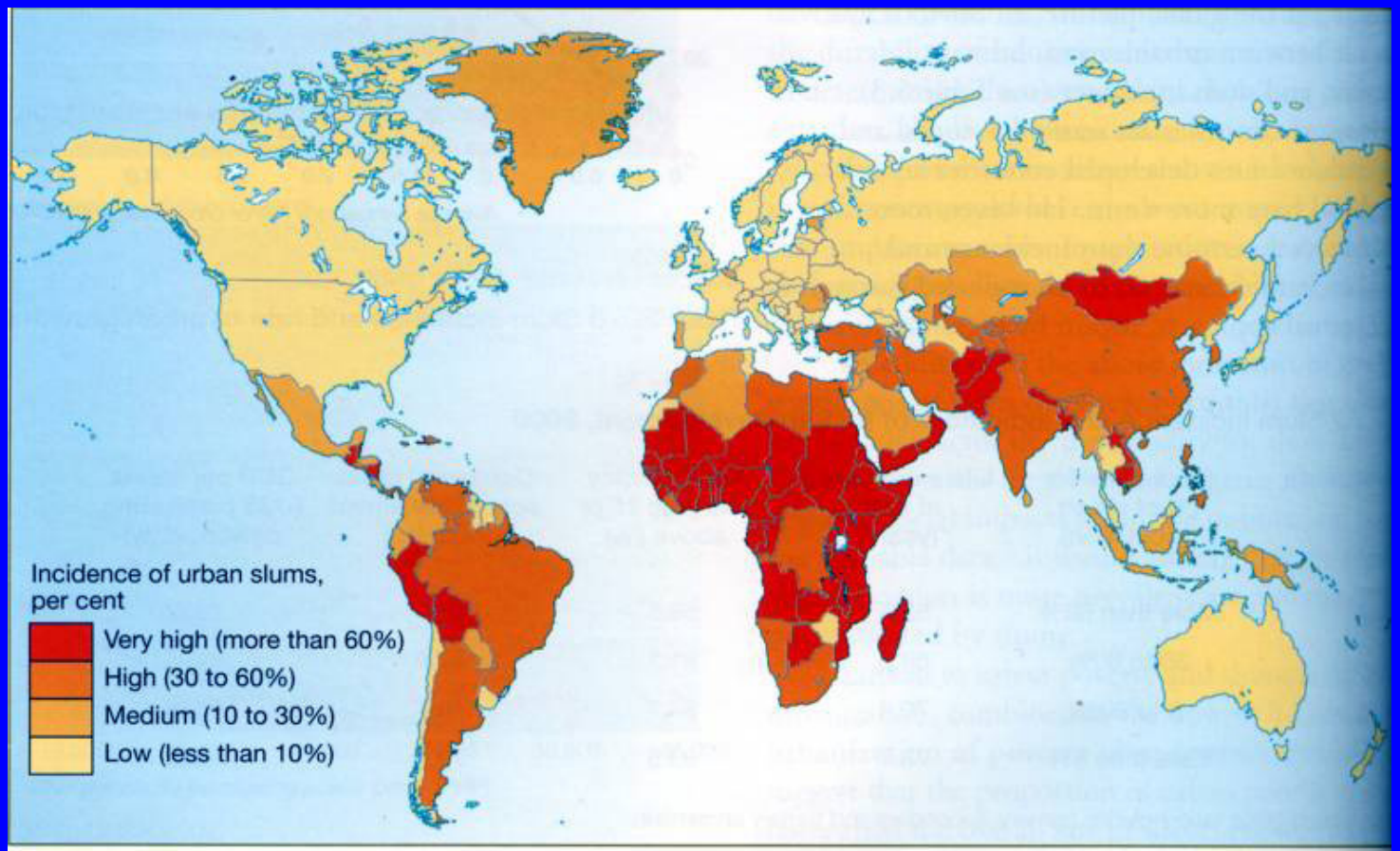
Reprinted, with permission of the publisher, from Hawkes (2002).
Source: Euromonitor data in Hawkes (2002).

Comission on the Social Determinants of Health, 2008

Figure 4. A conceptual framework for urban health



Percentage of population living in urban slums



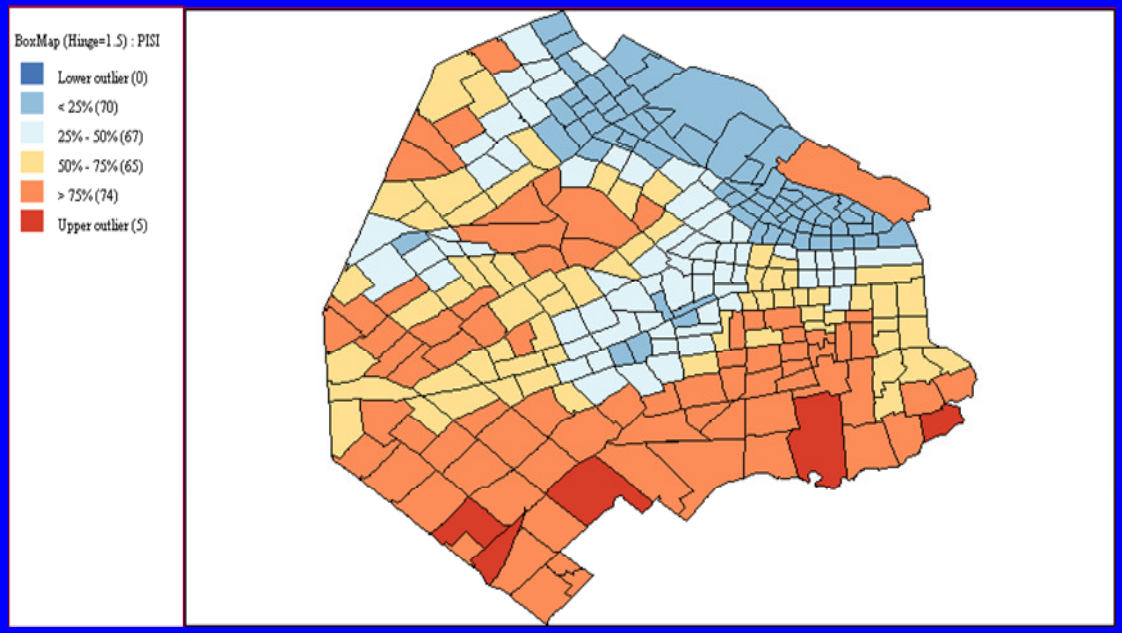
Source: UN-Habitat, 2003b.

MAP 5.1 **Urban slum incidence, 2001**

- Not just about slums but about the continuum …….WHO tables?

Indicadores socioeconómicos

	Mediana (percentilos 10 y 90)	I de Moran
Porcentaje de población con secundaria incompleta	38.8 (20.2-55.6)	0.83



Riesgos relativos de muerte asociados a nivel educativo de la fracción censal de residencia, Ciudad de Buenos Aires 2001

	Riesgo relativo	Intervalo de confianza del 95%	
		LCL	UCL
Hombres			
Muertes totales	1.23	1.09	1.39
Cardiovasculares	1.35	1.15	1.60
Respiratorias	1.21	0.97	1.52
Cáncer	0.94	0.84	1.04
Mujeres			
Muertes totales	1.23	1.07	1.42
Cardiovasculares	1.22	1.01	1.46
Respiratorias	1.07	0.85	1.34
Cáncer	1.03	0.87	1.22

*Riesgo relativo correspondiente a la diferencia entre el percentilo 90 y el percentilo 10 de la distribución de nivel educativo en la ciudad.

Intersections per square mile of area

Street Maps at the Same Scale

A.B. Jacobs (1993) used by Reid Ewing in Pedestrian- and Transit-Friendly Design

Comparison of three types of neighborhoods

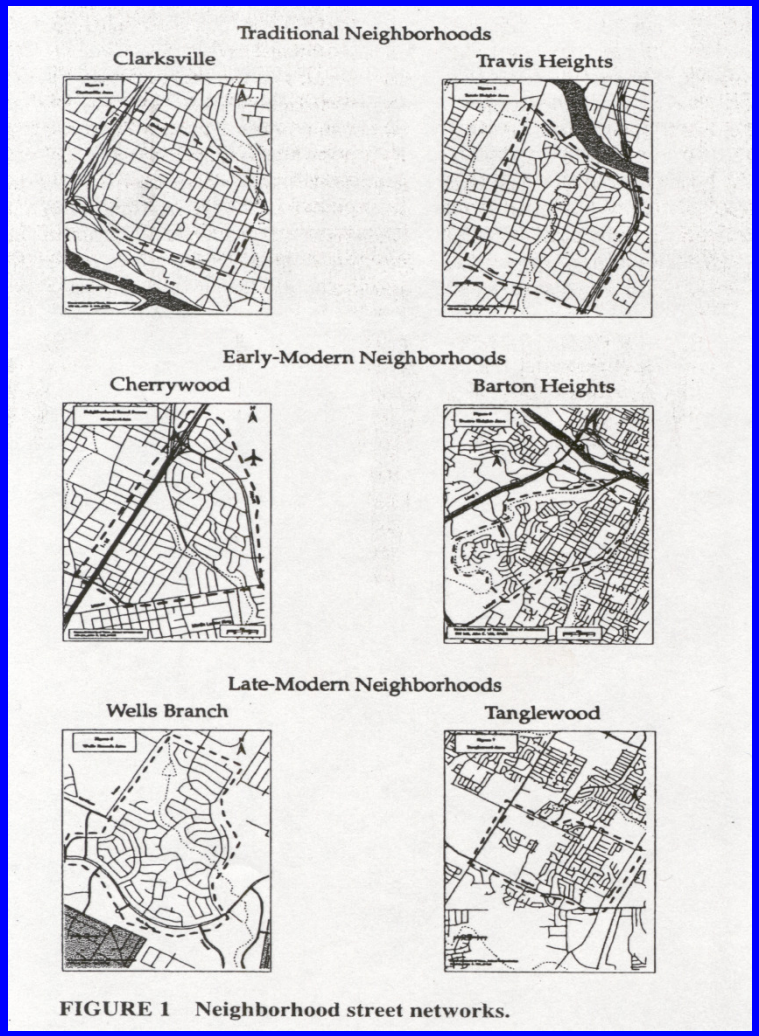


FIGURE 1 Neighborhood street networks.

Source: Handy (1996)

Figure 1. The Spatial Clustering of Raw and Adjusted Neighborhood Mean BMI

Figure 1a. Raw Mean BMI

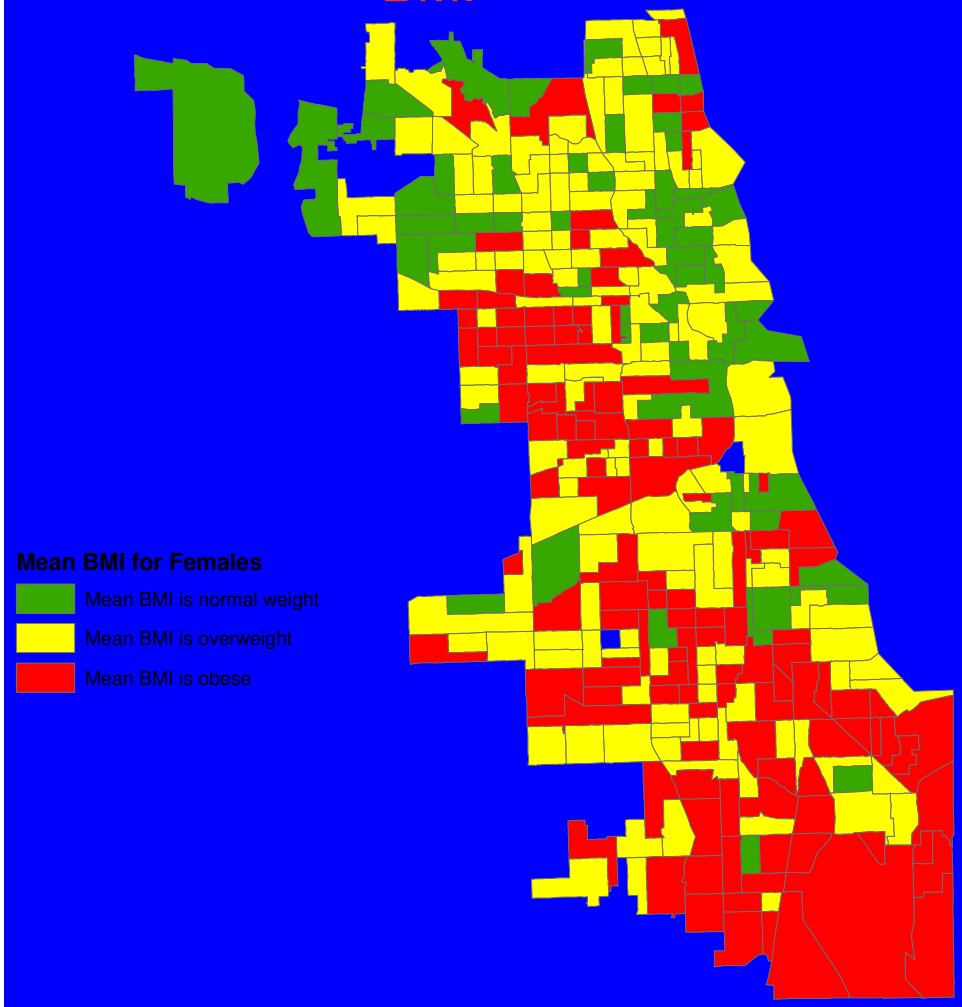
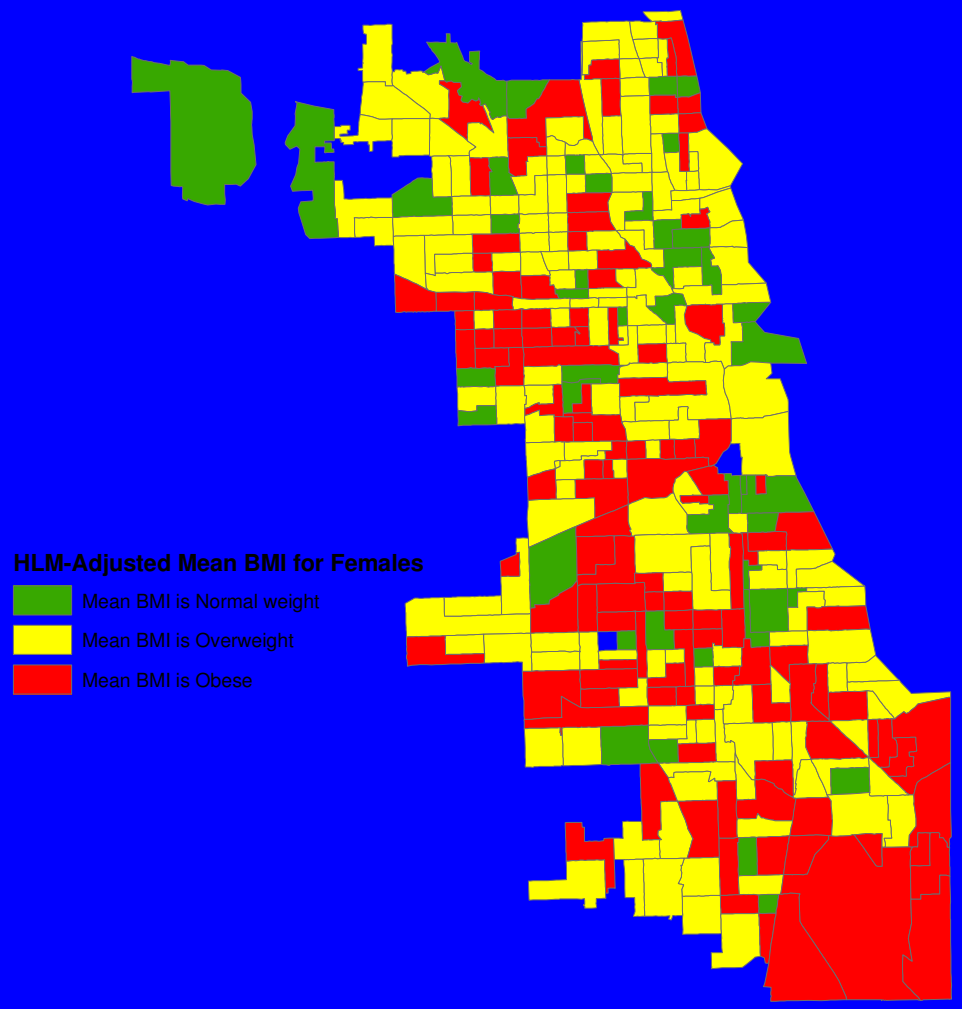
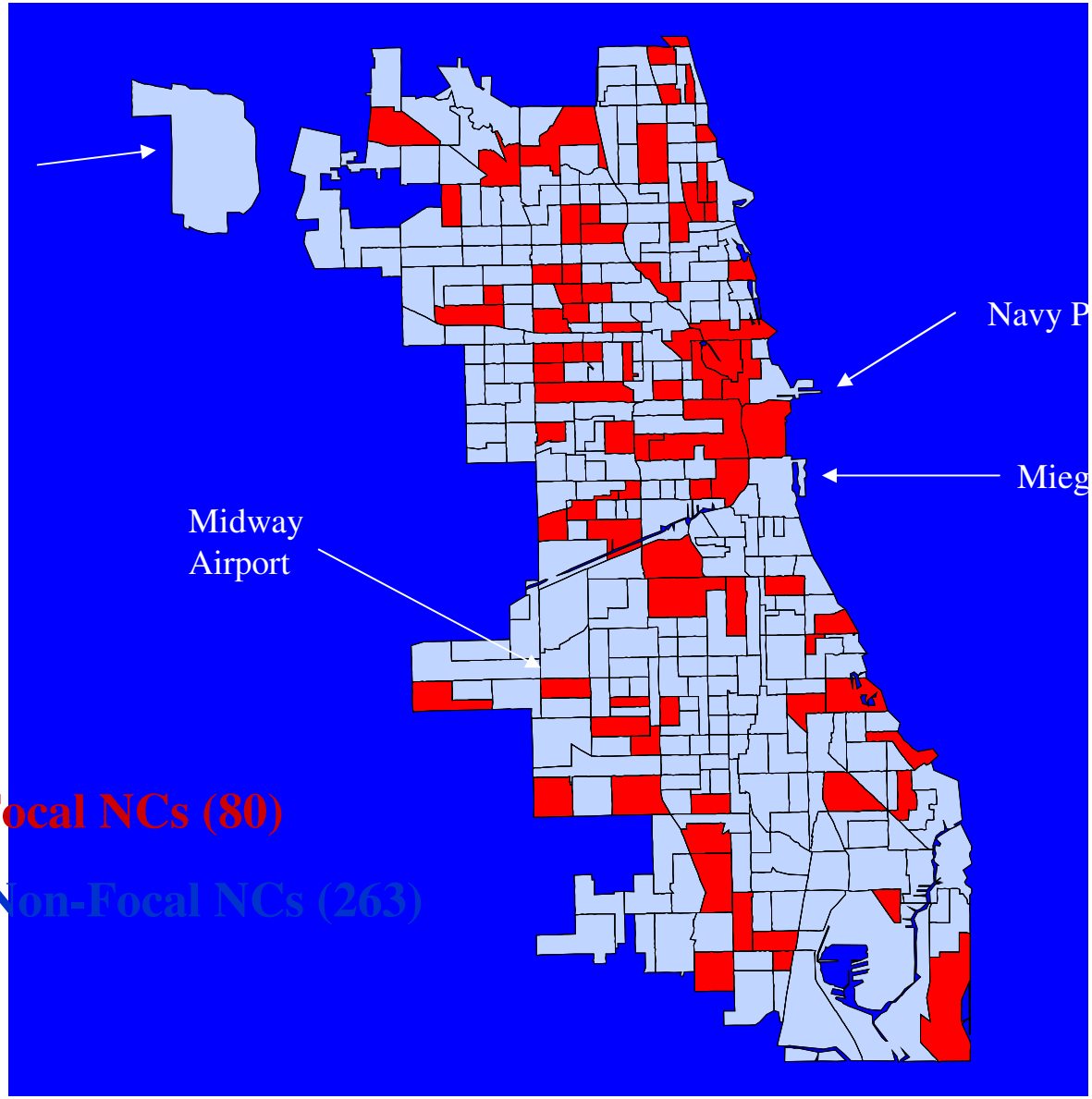


Figure 1b. Adjusted Mean BMI



Chicago Neighborhood Clusters



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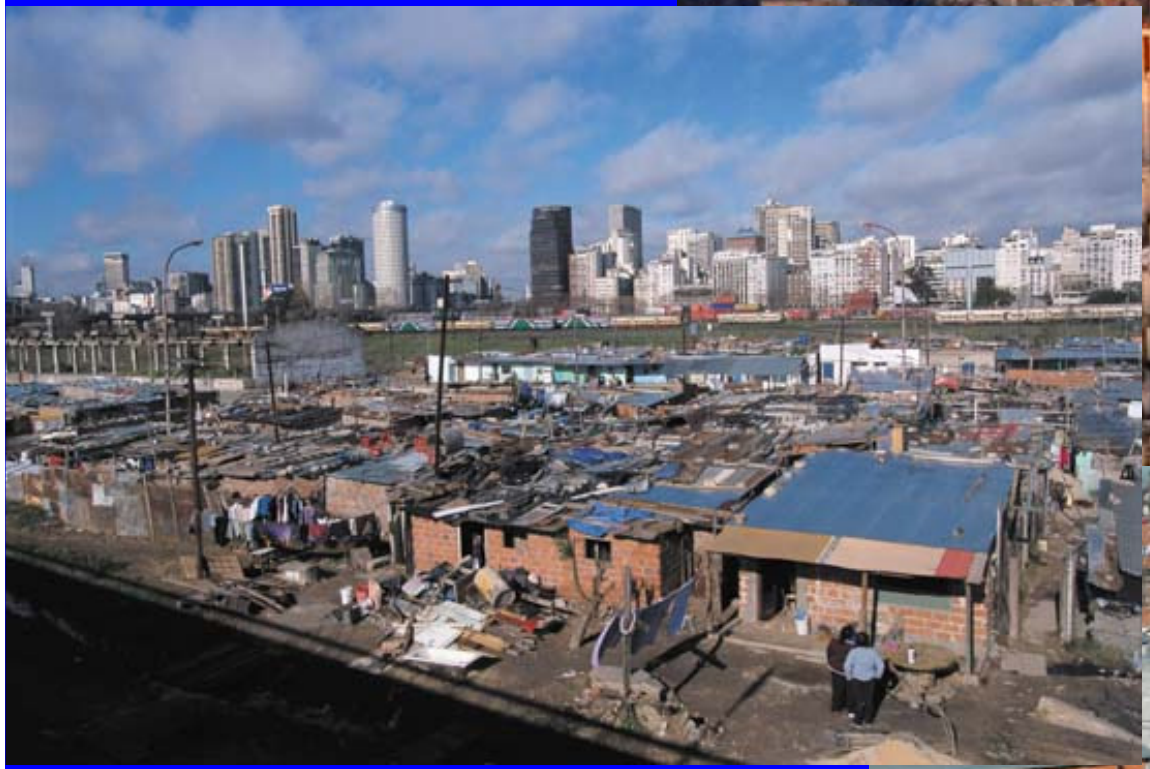
Red = Focal NCs (80)

Blue = Non-Focal NCs (263)



JUNTA ELECTORAL
VILLA LUGANO