

# Neighborhood Environments and Cognition among Older People

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# Presentation Outline

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- Overview of neighborhood environments and health
- Key research findings
- Findings on racial and ethnic segregation
- Study of urban/rural difference in China
- Future research directions

# Why is interest in neighborhood health effects growing?

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- ❑ Revitalized interest in patterns of disease and health across geographic areas and populations
- ❑ Insufficient individual-based explanations
- ❑ Direct policy-relevance of research on neighborhood health effects
- ❑ Increasing availability of methods suited to the study of neighborhood health effects (multilevel, GIS, etc.)

# Older people are more vulnerable to neighborhood effects

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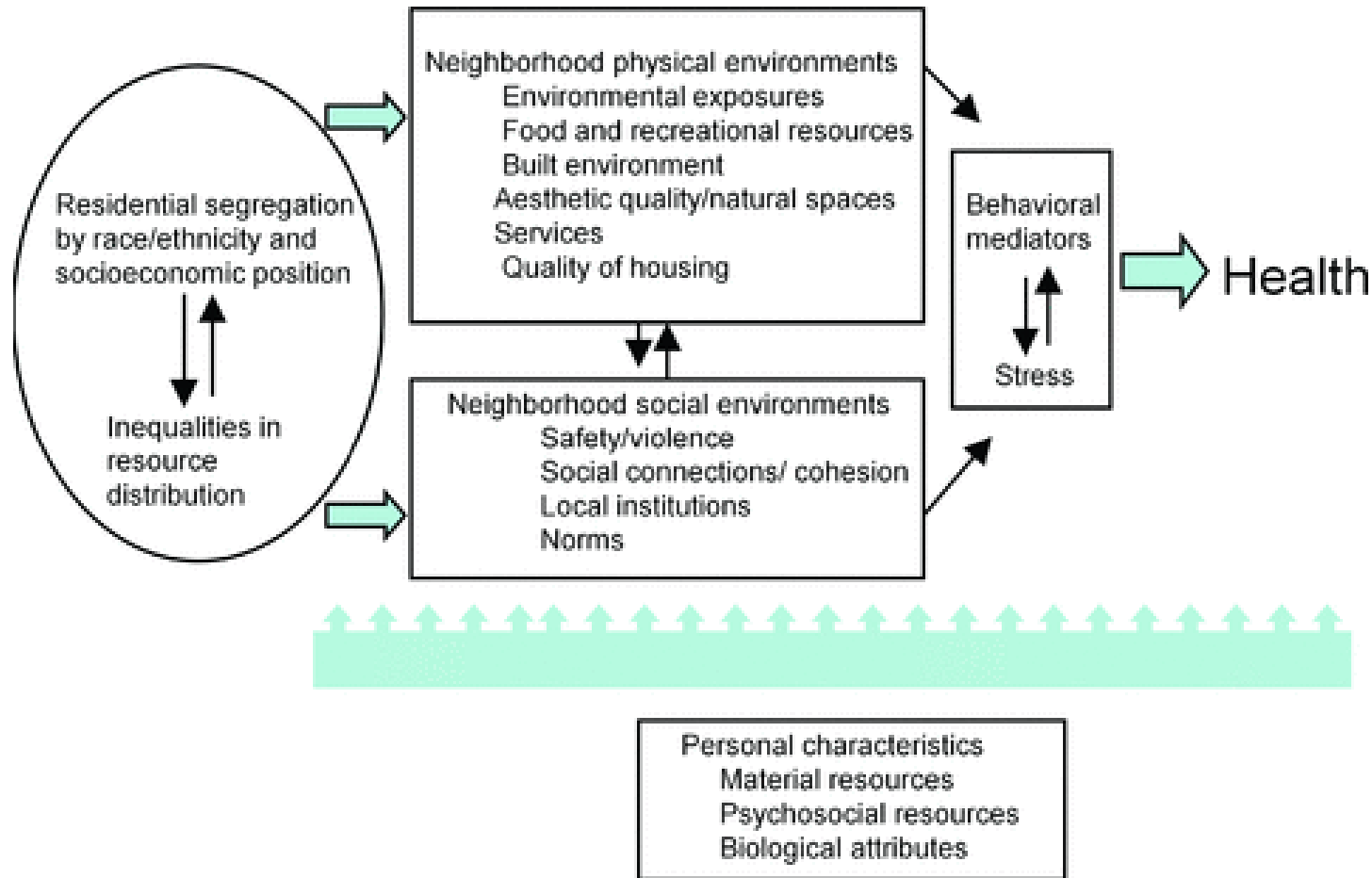
- ❑ Longer duration of exposure
- ❑ Increased biological and psychological vulnerability
- ❑ Changing patterns of spatial use with age
- ❑ Shrinking social networks

# Theories of neighborhood health effects

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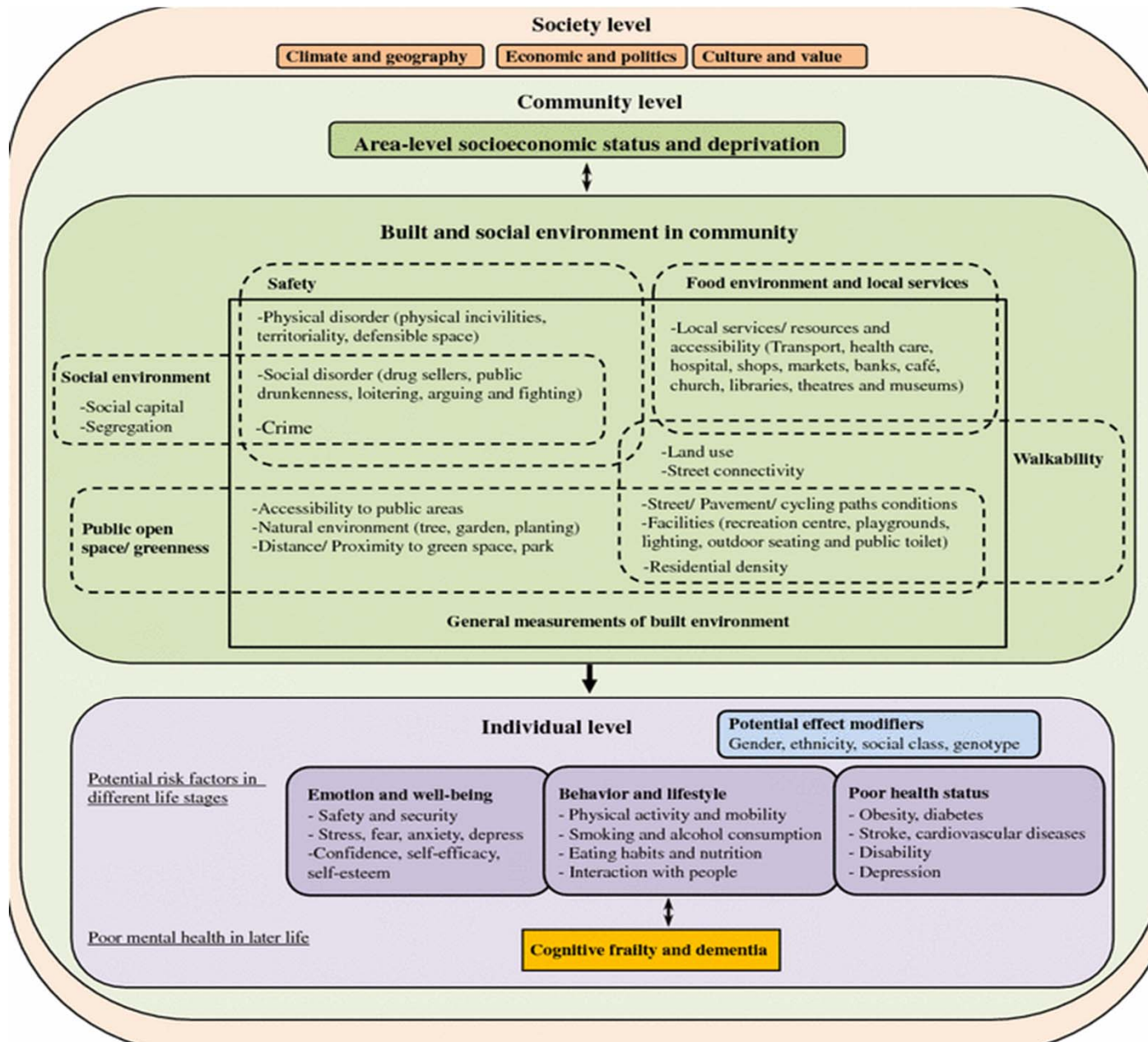
- Lawton's ecological theory of aging
  - Dynamic interactions between individuals and their living environments
  - Person-environment fit
- Collective resources theory
- Collective efficacy theory
- Compound advantages/disadvantages
- Stress process theory
- Life-course perspective

# Pathways from neighborhoods to health



Diez Roux & Mair. (2010). *Annals of the New York Academy of Sciences*, 1186(1), 125-145.

# Pathways from neighborhoods to cognition



Wu et al. (2015).  
*Social Psychiatry and Psychiatric Epidemiology*, 50(3), 351-362

# Types of neighborhood environment measures

Type	Measure	Content	Data source
Compositional	Community-level Socioeconomic status	Townsend deprivation index (households without car, overcrowded, not owner-occupied, unemployment) % of household poverty % of unemployment % of homeownership % of adults over 25 without high school degree % of adults with professional or managerial occupation	National statistics and census
	Perceived social environment	Crime and safety Community network and cohesion Social disorders (drugs problems, public drunkenness)	Questionnaire, interview, national survey
	Perceived built environment	Satisfaction to living environments and local services	Questionnaire and interview
Contextual	Social environment	Collective efficacy (voter turnout, crime rate) Social organization Ethnicity fragmentation (Index of Dissimilarity)	National survey and statistics, Yellow page
	Built environment	Safety (features of disorders and urban designs) Public open space/greenness Walkability (street connectivity, land use mixed) Food environment and local resource (recreation centers, food stores, library, church, café)	National statistics, GIS, Yellow page, direct observation and investigation,

Wu et al. (2015). *Social Psychiatry and Psychiatric Epidemiology*, 50(3), 351-362



# Built environment and cognition

Author (year)	Study design	Built environment categories				
		Density <sup>a</sup> n=3	Design <sup>a</sup> n=2	Destination <sup>a</sup> n=3	Diversity <sup>a</sup> n=1	Distance to transit <sup>a</sup> n=1
Clarke (2012)	Cross-sectional	NS		NS		
Clarke (2015)	Longitudinal		+	+		+
Magaziner (1989)	Cross-sectional			+		
Martinez (2007)	Longitudinal	NS				
Watts (2015)	Longitudinal		+			
Wu (2015)	Cross-sectional	+			+	
Total significant studies		1 out of 3	2 out of 2	2 out of 3	1 out of 1	1 out of 1

+ at least one significant association.  
a population density and density of social destinations.  
b intersection density and presence of sidewalks.  
c distance to nearest store.  
d land use mix and business types in the neighborhood.  
e For example, distance to nearest bus stop.

Besser et al. (2017). *American Journal of Preventive Medicine*, 53(2), 241-251.

# Social environment and cognition

Author (year)	Study design	SES <sup>a</sup>	Demographics <sup>b</sup>	Psychosocial disorder <sup>c</sup>	Social climate/social ties <sup>d</sup>
		n=15	n=8	n=5	n=2
Aneshensel et al. (2011)	Cross-sectional	+	NS		
Basta et al. (2008)	Cross-sectional	+			
Boardman (2012)	Longitudinal	NS		+	
Brown (2009)	Cross-sectional				+
Clarke (2012)	Cross-sectional	+	+	NS	
Espino (2001)	Cross-sectional		+		
Glass (2009)	Cross-sectional			NS	
Kovalchik (2015)	Longitudinal		NS		
Lang (2008)	Cross-sectional	+			
Lee (2011)	Cross-sectional			+	
Magaziner (1989)	Cross-sectional				NS
Martinez (2007)	Longitudinal	NS	+		
Meyer (2015)	Longitudinal	NS	NS		
Murayama (2013)	Longitudinal		NS		
Rej (2015)	Longitudinal	NS			
Sheffield (2009)	Longitudinal	+	+		
Shih (2011)	Cross-sectional	NS			
Sisco (2012)	Cross-sectional	+			
Wee (2012)	Cross-sectional	+			
Wight (2006)	Cross-sectional	+			
Wu (2015)	Cross-sectional	NS		NS	
Zeki Al Hazzouri (2011)	Longitudinal	NS			
<b>Total significant studies</b>		<b>8 of 15</b>	<b>4 of 8</b>	<b>2 of 5</b>	<b>1 of 2</b>

+ at least one significant association.  
a SES and income or wealth, employment, and education.  
b age, race/ethnicity, and perceived homogeneity with neighbors.  
c presence of graffiti and crime, etc.  
d neighboring, social support/acts, and social ties in neighborhood.

Besser et al. (2017). *American Journal of Preventive Medicine*, 53(2), 241-251.

# Mixed results on the effect of racial and ethnic segregation

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- ❑ Ethnic enclaves may protect the health of older adults in disadvantaged communities by supporting healthy behaviors and through stronger social networks.
- ❑ This benefit seems to be limited to Mexican Americans.
- ❑ Individual-level SES may moderate the effect.
- ❑ Longitudinal studies showed mixed results.

# Neighborhood context and cognitive decline in older Mexican Americans: results from the Hispanic Established Populations for Epidemiologic Studies of the Elderly, Sheffield & Peek, Am J Epidemiol (2009)

Data: 3050 Mexican Americans aged 65+ from Hispanic Established Populations for Epidemiologic Studies of the Elderly (Southwest U.S.); five-year follow-up (1998-2003)

MMSE (brief cognitive test)

- (1) economic status;
- (2) social disadvantage;
- (3) percent Mexican Americans (all based on U.S. Census tract)

Finding: **Increased percent of Mexican Americans was associated with lower odds of cognitive decline among Mexican Americans.**

## Neighborhood predictors of cognitive training outcomes and trajectories in ACTIVE, Meyer et al., Research on Aging (2015)

Data: 2438 white and African American respondents aged 65+ from Advanced Cognitive Training for Independent and Vital Elderly Study (Baltimore, Maryland; Birmingham, Alabama; Boston, Massachusetts; Detroit, Michigan; Indianapolis, Indiana; central Pennsylvania, U.S.); clinical trial over 10 years

Derived four domain scores based on 11 tests (memory, reasoning, processing speed, everyday cognition)

- (1) socioeconomic position (SEP);
- (2) percent minority (both based on U.S. Census tract)

Findings: **Percent minority was not associated with baseline memory, reasoning, or speed scores or changes over time.**

**Ethnic differences in Mini-Mental State Examination (MMSE) scores: where you live makes a difference, Espino et al., J Am Geriatr Soc (2001)**

Data: 827 Mexican Americans and European Americans aged 65+ from San Antonio Longitudinal Study of Aging

MMSE (brief cognitive test)

(1) neighborhood type (barrio, transitional, suburb) (researcher defined neighborhood)

**Findings: Mexican Americans living in low-income, almost exclusively Mexican American neighborhoods have an elevated risk cognitive impairment than living elsewhere.**

# Racial disparities in cognitive performance over time among older adults: A multilevel analysis of neighborhood effects, Martinez, University of California Los Angeles (2007)

Data: 2580 white and African American respondents aged 70+ from Asset and Health Dynamics Among the Oldest Old Study

TICS (brief cognitive measure)

- (1) percent African American;
- (2) percent with less than high school education;
- (3) percent unemployed;
- (4) percent on public assistance;
- (5) percent under poverty level;
- (6) percent  $\geq 65$  years old;
- (7) socioeconomic disadvantage (all based on U.S. Census tract)

**Findings: An increased neighborhood percent of African Americans associated with worse cognition.**

**Neighbourhood racial/ethnic composition and segregation and trajectories of cognitive decline among U.S. older adults, Kovalchik et al., J Epidemiol Community Health (2015)**

Data: 6150 white, black, Hispanic respondents aged 50+ from Health and Retirement Study; 10-year follow-up

Modified TICS (brief cognitive test)

(1) percent African American;

(2) percent Hispanic (both based on U.S. Census tract)

Findings: **Higher neighborhood Hispanic composition was associated with better cognition at baseline, but was not associated with change in cognition over time. Neighborhood African American composition not associated with cognition at baseline or change in cognition over time.** No effect modification of the association between neighborhood racial composition and cognition by individual-level race/ethnicity.



## The urban neighborhood and cognitive functioning in late middle age, Aneshensel et al., J Health Soc Behav (2011)

Data: 4525 respondents aged 55-65 in 1996 Health and Retirement Study

Telephone Interview for Cognitive Status (TICS) (brief cognitive test)

- (1) neighborhood disadvantage;
- (2) percent African American;
- (3) percent Hispanic (all based on U.S. Census tract)

Findings: Neighborhood disadvantage associated with worse cognition among those with little personal wealth, no effect on those with higher personal wealth. **Percent of African Americans in neighborhood was associated with slightly worse cognition among those with little education and was associated with better cognition among those with higher education.**

## Cognitive function in the community setting: the neighbourhood as a source of 'cognitive reserve'? Clarke et al., J Epidemiol Community Health (2012)

Data: 949 respondents aged 50+ from Chicago Community Adult Health Study

Modified TICS (brief cognitive test)

- (1) percent  $\geq 65$  years old;
- (2) presence of institutions (both based on U.S. Census tract)

Findings: Residents in neighborhoods with more older adults had better cognition among those living in the neighborhood 6-10 years and worse cognition among those living in a neighborhood 10 or more years; **living in a neighborhood with a high density of institutional resources was associated with better cognition among whites, and increased institutional resources had negative impact on cognition among blacks and Hispanics.**

## Neighborhood Environments and Cognitive Decline Among Middle-Aged and Older People in China, Luo et al., J of Gerontology: Social Sciences (2019)

- ❑ Rapid population aging: The proportion of individuals ages 60+ will increase from 10.2% in 2000 to 25.1% in 2030.
- ❑ In 2010, an estimated 5.69 million Chinese had Alzheimer's disease and 9.19 million had dementia.
- ❑ Governmental investment in community recreational facilities/organizations and advocating for participating in exercises.
- ❑ The city-centric policies and programs promote age-friendly communities in urban areas, but systematically ignore the challenges and experiences of older people in rural environments.

# Research Questions and Hypotheses

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- Is there an association between neighborhood environments and cognitive decline in mid and old age?
  - ***H1: Chinese older people who live in neighborhoods with better physical and social environments have slower cognitive decline over time.***
- Does the relationship between neighborhood environments and cognitive decline vary by urban/rural residence?
  - ***H2: Neighborhood environments have more impact on cognitive decline among rural Chinese older people than urban Chinese older people.***

# Data

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- ❑ Three waves of the China Health and Retirement Longitudinal Study 2011-2015.
- ❑ A nationally representative longitudinal survey of adults ages 45 years and over in China; response rate 80.5% at baseline survey.
- ❑ Community characteristics were obtained from a local village/community official and interviewer's observation at baseline survey.
- ❑ Analytical sample: 12,131 respondents living in 298 rural villages and 4,059 respondents living in 150 urban communities.

# Measures

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- Cognition (brief version of TICS)
- Neighborhood environments
  - Seven indicators of neighborhood physical environment to capture community basic infrastructures, outdoor space and buildings, transportation, and healthcare service
  - Six indicators of neighborhood social environment to capture community support, community social activity participation, and community SES
- Individual level controls
  - Gender, Age in year, Urban/rural residence, Educational level, Marital status, Living arrangement, Household expenditure, Functional limitations

# Statistical Analysis

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- Growth curve models were estimated to examine the trajectories of cognitive function over the 4-year study period
  - 3-level hierarchical linear model has 3 occasions of measurement of cognitive function (level 1) nested within individuals (level 2), who were nested within neighborhoods (level 3).
- Four models for all respondents, then for urban/rural separately
  - Model 1: Physical environment + individual controls
  - Model 2: Social environment + individual controls
  - Model 3: Physical and social environments + individual controls

# Findings

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- ❑ Chinese older people who lived in neighborhoods with more handicap access, more bus lines, employment service, and higher socioeconomic status had slower cognitive decline.
- ❑ Neighborhood basic infrastructures, number of days that roads were unpassable, outdoor exercise facilities, and average social activity participation were associated with baseline cognitive function in both rural and urban areas
- ❑ Neighborhood environments had more impact on cognitive decline among rural older adults than urban older adults.



# Future Directions

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- Examine the potential mechanisms
- Examine individual-level moderators and environmental moderators
- More longitudinal and experimental studies
- Incorporate measures of neighborhoods across the lifespan

## Future Directions (continued)

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- Focus on neighborhood features most relevant to older adults
- Include both objective and subjective neighborhood environment measures
- Incorporate alternative ways to define and measure neighborhood environments

Thank you!



*Any Questions?*