Neighborhood characteristics, activity engagement, and health among community-dwelling older adults

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# **Dimensions of health**

- Health is defined by the World Health Organization (WHO) as a state of complete physical, social, and mental well-being.
- It is not merely the absence of disease or infirmity.
- Hence, in discussing health, the focus should be on optimizing the individual functioning including the body and mind.



Porty-ninth edition 2020



Source: World Health Organization (2020). Constitution of the World Health Organization. In: World Health Organization: Basic documents (49th ed). Geneva: World Health Organization.

## **Theoretical framework**

### Ecological perspective

- Health both affects, and is affected by, multiple levels of influence, such as their physical, social, and community engagement
- Individual health both shapes, and is shaped by, the environment both social and physical aspects



Source: Smedley BD, Syme SL (eds.), Institute of Medicine. Promoting Health: Strategies from Social and Behavioral Research. Washington, D.C.:, National Academies Press, 2000.

Source: National Institute of Health (2005). Theory At A Glance: A Guide for Health Promotion and Practice. Bethesda, MD: United States Department of Health and Human Service.

### Determinants of health



Source: Tarlov, A. R. (1999). Public policy frameworks for improving population health. *Annals of the New York Academy of Sciences, 896,* 281-293.

Source: Schroeder, S. A. (2007). We can do better-improving the health of the American people. *The New England Journal of Medicine, 357,* 1221-1228.













### Activity and environment as health modifiers

- Healthy behaviors, such as activity engagement
  - Physical (e.g., exercise)
  - Social (e.g., meeting)
  - Leisure (e.g., entertainment)
  - Productive (e.g., volunteering)
- Community characteristics and environmental support
  - Aging-friendly physical environment (e.g., outdoor spaces, transportation, housing, etc.)
  - Supportive social environment (e.g., social organizations, senior centers, health centers, etc.)

### Variations in activity and environment

#### Activity

- People can and do engage in multiple activities
- These activities tend to cluster in a certain way based on their preference, choices, and opportunities or constraints

#### Environment

- Physical and social environment
- Urban and non-urban areas
- Variations in the utilities and impacts of environment







# **Basic questions**

- Do activities clustered in a meaningful way, and how do these varied clusters related to health?
- What's the mechanisms connecting activity engagement and health?
- Do physical and social environment predict health?
- Whether the importance of physical and social environement on health varied by urban and non-urban areas?

### This presentation

Using publicly available data of community-dwelling older adults from the US and China:

- Activity engagement affects physical, mental, and cognitive health in later life, and what is the mechanism connects the two (US data)
- How physical and social environment influences mental health, and whether and how these environment features vary by rural and urban contexts (Chinese data)

### Activity engagement and health in the US context

<u>Chen, Y. C.</u>, Putnam, M., Lee, Y. S., & Morrow-Howell, N. (2019). Activity patterns and health outcomes in later life: The role of nature of engagement



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OXFORD

#### **Research Article**

### Activity Patterns and Health Outcomes in Later Life: The Role of Nature of Engagement

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#### Abstract

**Background and Objectives:** The health benefit of activity participation at older ages is documented in the current literature. Many studies, however, only explored the health benefits of engaging in a few activities and did not examine mechanisms connecting activity participation to health. We investigated the pathway between activity and health by testing the mediation role of the nature of engagement (physical, cognitive, and social) on physical, mental, and cognitive health of older adults.

**Research Design and Methods:** We analyzed data of 6,044 older adults from the 2010 and 2012 Health and Retirement Study linked with 2011 Consumption and Activity Mail Survey. We used latent class analysis to identify the patterns of participating in 33 activities as well as patterns of nature of engagement, and examined how these patterns were associated with cognition, depressive symptoms, and self-rated health in later life.

**Results:** Meaningful patterns of activity (high, medium, low, passive leisure, and working) and the nature of activity engagement (full, partial, and minimal) were identified. High and working groups, compared to the passive leisure group, showed better health and cognition outcomes. The nature of engagement mediated the relationship between activity patterns and health, especially for older adults who were either full or partially engaged.

**Discussion and Implications:** The nature of engagement may play a more important role than the activity itself in relation to health. Identifying the heterogeneity in activity engagement in later life is critical for tailoring interventions and designing programs that can improve the health of older adults.

Keywords: Activity engagement, Cognition, Depression, Self-rated health

# Background

- Theoretically, activity engagement is central to many models of healthy aging
- Empirical approach to define activity engagement
  - **Single measure**: focus on a single activity at a time
  - Combined measure: various combinations
  - **Clustered measure**: tendency or intensity in a wider range of activities, and group people into different patterns



Source: Rowe, J. W. & Kahn, R. L. (1997). Successful aging. *The Gerontologist,* 37, 433-440.



### Evidence

- Engaging in various activities has health benefits
  - Physical functioning
  - Psychological well-being
  - Cognition
  - Lower mortality
- Empirical evidence supports the direct link between activity engagement and health

### What is the pathway or mechanism?

Sources:

- o Chao, S. F. (2016). Changes in leisure activities and dimensions of depressive symptoms in later life: A 12-year follow-up. The Gerontologist, 56, 397-407.
- o Han, S. H., Tavares, J. L., Evans, M., Saczynski, J., & Burr, J. A. (2017). Social activities, incident cardiovascular disease, and mortality. Journal of Aging and Health, 29, 268-288.
- Peeters, G. M., Verweij, L. M., van Schoor, N. M., Pijnappels, M., Pluijm, S. M., Visser, M., & Lips, P. (2010). Which types of activities are associated with risk of recurrent falling in older persons? *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 65*, 743–750.
- 0 Ueshima, K., Ishikawa-Takata, K., Yorifuji, T., Suzuki, E., Kashima, S., Takao, S.,...Doi, H. (2010). Physical activity and mortality risk in the Japanese elderly: A cohort study. American Journal of Preventive Medicine, 38, 410-418.

# Pathway

### Social Model of Health Promotion

- Physical, Cognitive, and Social pathway
- Fundamental mediation in nature
- Dynamic and interactive effect between different nature of engagement

Source: Fried, L. P., Carlson, M. C., Freedman, M., Frick, K. D., Glass, T. A., Hill, J., ... & Zeger, S. (2004). A social model for health promotion for an aging population: initial evidence on the Experience Corps model. *Journal of Urban Health*, *81*, 64-78.



# Gaps & RQs

- Gaps:
  - Clustered nature for activity and nature of engagement
  - Direct impacts of activity engagement, not pathway

### • Research questions (RQs):

- 1. What is the clustered nature for both activity and nature of engagement?
- 2. How does the nature of engagement link between activity and physical, mental, and cognitive health?

# Data

### • Source:

- US Health and Retirement Study (HRS), 2010 and 2012
- Consumption and Activity Mail Survey (CAMS), 2011

### • Sample:

- Data from 3 time points were merged
- Consider (a) attrition & response pattern and (b) age 51+
- Total sample N = 6,044 aged 51 and above

### • Missing data:

• Multiple imputation (m=20) and combined using Rubin's rule

# **Measures and Design**

#### *CAMS 2011*

#### HRS 2012



Income, Assets. All from HRS 2010

Activity*	Jennifer	Kevin					
Reading	4	1					
Exercise	1	4					
Working	1	4					
Meeting	4	1					
(Total)	10	<u>10</u>					
Nature*	Jennifer	Kevin					
Physical	1	4					
Social	4	1					
(Total)	5	5					

### **Empirical** approach

- 1. Combine (sum)
- 2. Clustered approach



Mixture model

\*Measured in intensity from 1 (least likely) to 4 (most likely)

- Activity: *Factor mixture model* 
  - Confirmatory factor analysis (CFA) for 33 measures. 9 factors identified.
  - Latent class analysis (LCA) to identify distinct and meaningful groups
- Nature of engagement: LCA
  - Using 4 indicators to fit a LCA model





Note. F = latent factors; C = latent class

- Mediation:
  - Activity  $\rightarrow$  Nature of engagement (X  $\rightarrow$  Mediator): Multinomial logistic regression
  - Nature of engagement  $\rightarrow$  Health outcomes (Mediator  $\rightarrow$  Y): OLS regression
  - Tofighi and MacKinnon's method was used to reproduce the confidence interval (CI) of the mediation effect
  - Complex survey design (personal weight, stratum, cluster)



### Results (RQ1)

• Patterns of *activity engagement* (9 factors based on 33 items)



### Results (RQ1)

• Patterns of *nature of engagement* (physical, cognitive, & social pathway)



### Results (RQ2)

Activity patterns → Pattern of Nature of Engagement (X → Mediator)

#### Pattern of Nature of Engagement $\rightarrow$ Health outcomes (Mediator $\rightarrow$ Y)

Variable	Partial vs. Minimal engagement		Full vs. Minimal engagement		Self-Rated health		Depressive symptoms		Cognition	
	b	SE	b	SE	b	SE	b	SE	b	SE
Activity pattern (ref=Passive	leisure)									
Moderate activity	0.53*	0.20	1.04***	0.27	0.10	0.05	-0.02	0.04	0.46**	0.16
Low activity	0.16	0.24	0.63*	0.30	0.11	0.06	-0.02	0.04	0.34	0.21
High activity	2.06***	0.43	3.16***	0.46	0.18**	0.05	-0.04	0.04	0.48*	0.19
Working	1.11**	0.34	2.14***	0.35	0.23**	0.05	-0.06	0.04	0.57**	0.19
Nature of engagement (ref=Minimal engagement)										
Partial engagement	_				0.15*	0.06	-0.06	0.04	0.56*	0.25
Full engagement					0.22**	0.06	-0.09*	0.04	0.59*	0.27

# Results (RQ2)

Mediator	Self-rated health	Depressive symptoms	Cognition
	95% CI	95% CI	95% CI
Moderate vs. passive leisure			
Partial	(0.01, 0.18)	-0.09,0.01	(0.02, 0.71)
Full	(0.08, 0.42)	(-0.20, -0.01)	(0.06, 1.35)
Low vs. passive leisure			
Partial	-0.05.0.11	-0.05, 0.02	-0.19,0.43
Full	(0.01, 0.31)	-0.15,0.001	-0.01, 0.97
High vs. passive leisure			
Partial	(0.06, 0.62)	-0.31,0.04	(0.13, 2.40)
Full	(0.30, 1.15)	(-0.56, -0.04)	(0.19, 3.74)
Working vs. passive leisure			
Partial	(0.03,0.36)	-0.18, 0.02	(0.06, 1.40)
Full	(0.20,0.79)	(-0.39,-0.02)	(0.13,2.57)

Note: Coefficients in parenesis () indicate significant mediation effect.

# Discussion

- Summary:
  - Engaging in activity with higher intensity and better quality leads to better health outcomes
  - Nature of engagement link activity engagement and health. The nature/quality of activity engagement matters more on health than the activity itself

### • Implications:

- Promote "ideal activities" that involves meaningful engagement, as they have potential for engaging people physically, cognitively, and socially
- Identify older adults at risk (i.e., low & passive leisure groups)
- Create inclusive environment to foster meaningful engagement, particularly for the older adults with low activity engagement (i.e., with disabilities or other constraints)

### Environmental features and health in the Chinese context

Wang, Y., <u>Chen, Y. C.</u>, Shen, H. W., & Morrow-Howell, N. (2018). Neighborhood and depressive symptoms: a comparison between rural and urban Chinese older adults



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OXFORD

#### Research Article

### Neighborhood and Depressive Symptoms: A Comparison of Rural and Urban Chinese Older Adults

Yi Wang, MSW,<sup>1,\*</sup> Yu-Chih Chen, MSW,<sup>1</sup> Huei-Wern Shen, PhD, MSW,<sup>2</sup> and Nancy Morrow-Howell, PhD, MSW<sup>3</sup>

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#### Abstract

**Background and Objectives:** Individual stressors of depressive symptoms in old age are well identified, yet little is known about the neighborhood stressors of depressive symptoms. Guided by the ecological extension of the Pearlin's Stress Process Model, this study explores the rural and urban differences in neighborhood stressors of depressive symptoms among older adults in China.

**Research Design and Methods:** Data came from two waves of the China Health and Retirement Longitudinal Study, a nationally representative survey. The study included 6,548 older adults ages 60 and above in 2011, with follow-up in 2013. Predictors (individual and neighborhood characteristics) were drawn from the 2011 baseline, and outcome, depressive symptoms, was extracted from the 2013 wave.

**Results:** Multilevel modeling results showed that after controlling for depressive symptoms at the baseline, symptoms decreased in neighborhoods where physical environment and social environment were better. Among rural respondents, neighborhood stressors stemmed mainly from the physical environment, whereas among urban residents, the stressors came from the social environment.

**Discussion and Implications:** This study demonstrated and discussed the role that neighborhoods may play in reducing depressive symptoms in later life. Community organizers and policy makers are encouraged to ameliorate community environments to improve mental health among older adults in China.

Keywords: China, Depressive symptoms, Neighborhood, Older adults, Rural and urban



# Evidence on the neighborhood

- Neighborhood stressors were closely related to poor mental health
  - Poor/low neighborhood socioeconomic status (SES)
  - Deterioration of the physical environment
  - Unavailability or inaccessibility of health care facilities
  - Lack of amenities promoting social and physical activity engagement
- Neighborhood characteristics as enabling factors of positive mental health
  - Physical: high quality outdoor space (e.g., walkability, green space, easy-access transportation, etc.)
  - Social: access to health care, social support, and opportunities for engagement

Sources:

o Berke, E. M., Gottlieb, L. M., Moudon, A. V., & Larson, E. B. (2007). Protective association between neighborhood walkability and depression in older men. Journal of the American Geriatrics Society, 55, 526–533

o Kim, D. (2008). Blues from the neighborhood? Neighborhood characteristics and depression. Epidemiologic Reviews, 30, 101-11

o Lehning, A. J., Smith, R. J., & Dunkle, R. E. (2014). Age-friendly environments and self-rated health: An exploration of Detroit elders. Research on Aging, 36, 72-94.

o Meyer, O. L., Castro-Schilo, L., & Aguilar-Gaxiola, S. (2014). Determinants of mental health and self-rated health: A model of socioeconomic status, neighborhood safety, and physical activity. American Journal of Public Health, 104, 1734–1741.

## Theories and models

- Ecological perspective
- Active ageing framework
- Aging-friendly cities and communities
- Neighborhood stress process model\*



# Gaps and RQs

- Gaps:
  - Knowledge on individual-level factors are abundant, but not for neighborhood factors.
  - The majority of knowledge about neighborhood-level determinants of health outcomes in later life among older adults was established through studies conducted in Western or developed countries.

### • Research questions (RQs):

- How do neighborhood characteristics (physical and social environment) influence depression?
- Do the effects of physical and social environment operates differently across urban and rural areas?

## Data

### • Source:

- China Health and Retirement Longitudinal Study (CHARLS), 2011 and 2013
- Individual file reported by the respondents ( $n\sim17,500$ ) linked with community-level data ( $n\sim450$ ) reported by village/neighborhood officers

### • Sample:

- Data from 2 time points were merged, linked with community data using community identifier
- Consider (a) attrition & response pattern and (b) age 60+
- Total sample N = 6,548 aged 60 and above living in 447 communities (298 rural villages and 149 urban communities)

### Neighborhood characteristics

#### Physical environment stressors

- Outdoor space and buildings
- Transportation
- Housing facilities

#### Social environment stressors

- Amenities
- Social organizations
- Health-care centers

# Individual characteristics

- Control variables: Age, gender, martial status, education, perceived economic status, self-rated health
- Baseline depression

# Measures and Design



CHARLS 2011

CHARLS 2013

- **Multilevel modelling** to estimates the effects of neighborhood characteristics on depression, controlling for individual attributes
- Lagged model with two time points to create time-order design

### Results

		Region				
Variables	Entire sample ( <i>N</i> = 447)	Rural ( <i>n</i> = 298, 66.67%)	Urban ( <i>n</i> = 149, 33.33%)	þ		
Physical environment stressors						
Outdoor space and buildings						
Type of roads				* * *		
Paved road	66.00	58.29	91.47			
Nonpaved road	34.00	41.71	8.53			
Days of roads that were not passable (0-366 days)	34.82 (90.78)	42.18 (97.97)	11.12 (56.02)	***		
Tidiness of the roads (1–7)	3.85 (1.46)	3.62 (1.41)	4.61 (1.38)	* * *		
Public restroom (1 = yes)	36.13	25.62	71.95	* * *		
Handicapped access (1-7)	1.96 (1.45)	1.67 (1.27)	2.90 (1.58)	* * *		
Transportation						
Number of bus lines (0–32 lines)	2.14 (4.10)	1.29 (3.17)	5.00 (5.38)	**		
Distance to bus stop (0-100 km)	3.38 (10.50)	4.01 (10.52)	1.30 (10.23)	***		
Housing						
Sewer system $(1 = yes)$	29.67	14.11	81.08	***		
Waste management (1 = yes)	51.48	38.64	94.00	가 가 가		
Indoor toilet (1 = yes)	38.60	28.55	71.55	* * *		
Days with electricity (0-366 days)	356.03 (28.10)	353.90 (29.86)	362.90 (19.90)	* * *		
Social environment stressors						
Amenities (post office, library, police station, bank, theatre,	2.87 (1.97)	2.29 (1.61)	4.81 (1.83)	가 가 가		
convenience store, farmers' market, supermarket) (0-8)						
Outside exercise facilities (1 = yes)	30.31	20.82	60.89	* * *		
Social organization (organization for the elderly and handicapped,	0.90 (1.12)	0.62 (0.97)	1.81 (1.11)	가 가 가		
activity center, elderly association) (0-3)						
Health center (1 = yes)	11.34	6.08	29.18	* * *		
Health post (1 = yes)	12.80	6.14	35.38	* * *		
Community SES (1–7)	3.72 (1.33)	3.55 (1.34)	4.28 (1.15)	**		

Source: Wang, Y., Gonzales, E., & Morrow-Howell, N. (2017). Applying WHO's age-friendly communities framework to a national survey in China. Journal of Gerontological Social Work, 60(3), 215-231.

Fixed effect	Model 1		Model 2		Model 3		Model 4a (Rural)		Model 4b (Urban)	
	Ь	SE	b	SE	В	SE	Ь	SE	b	SE
Control variables										
Intercept	18.31***	0.22	20.75***	1.35	20.34***	1.35	19.97***	1.43	4.97	16.39
Age	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	-0.01	0.02
Female	-0.19	0.16	-0.10	0.17	-0.09	0.17	0.12	0.20	-0.88**	0.32
Married	0.22	0.21	0.21	0.22	0.29	0.22	0.41	0.26	-0.21	0.40
Education (ref: below middle school)	-0.78***	0.18	-0.60**	0.19	-0.57**	0.19	-0.53*	0.24	-0.57	0.32
Self-rated SoL 2011	-0.71***	0.11	-0.72***	0.12	-0.73***	0.12	-0.88***	0.14	-0.21	0.22
Self-rated health 2011	-0.75***	0.10	-0.72***	0.11	-0.71***	0.11	-0.73***	0.13	-0.62**	0.20
CESD 2011	0.41***	0.01	0.41***	0.02	0.41***	0.02	0.39***	0.02	0.47***	0.03
Physical environment stressors										
Outdoor space and buildings										
Type of roads (ref: nonpaved road)			0.31	0.24	0.30	0.24	0.41	0.27	-0.10	0.70
Days of roads that were not passable			0.003*	0.001	0.003*	0.001	0.003**	0.001	-0.002	0.003
Tidiness of the roads			-0.004	0.08	0.02	0.09	0.03	0.11	0.04	0.13
Public restroom			-0.11	0.23	-0.13	0.24	-0.06	0.31	-0.14	0.38
Handicapped access			0.02	0.02	0.02	0.02	0.003	0.04	0.04	0.03
Transportation										
Number of bus lines			-0.02	0.08	0.001	0.08	0.04	0.10	-0.06	0.12
Distance to bus stop			0.02*	0.01	0.03*	0.01	0.03*	0.01	0.02	0.07
Housing										
Sewer system			-0.64*	0.28	-0.64*	0.30	-0.76*	0.39	0.49	0.51
Waste management			0.01	0.25	0.07	0.26	0.18	0.29	-0.31	0.77
Toilet type (ref: outdoor toilet)			-0.11	0.24	-0.01	0.25	0.09	0.30	-0.30	0.46
Days with electricity			-0.01*	0.004	-0.007	0.004	-0.007	0.004	0.04	0.04
Social environment stressors										
Amenities					0.07	0.07	0.12	0.08	0.01	0.10
Outdoor exercise facilities					-0.55*	0.27	-0.93**	0.38	0.08	0.36
Social organization					0.16	0.12	0.10	0.16	0.28	0.17
Health center					-0.79*	0.31	-0.50	0.55	-0.82*	0.36
Health post					-0.20	0.31	-0.22	0.57	-0.21	0.34
Community SES					-0.02	0.09	0.02	0.11	-0.21	0.16

# Discussion

### • Summary

- Study results are line in with evidence produced in developed countries that walkability, transportation difficulty, housing conditions, and neighborhood resources and support matter in protecting mental health
- The effects of environment features may operate differently based on the levels of urbanicity, and may be more important for older adults living in the rural/remote areas.

### • Implications:

- Develop programs and provide services that emphasize improving neighborhoods' physical environment by allocating for budget and financial resources that strengthen basic living conditions and neighborhood infrastructure
- Developing support programs to reach lonely or isolated older adults as well as community-based social services at convenient venues is essential (e.g., increasing proximity removing barriers in accessibility to health care)



### Lessons learned

- Develop policy and programs to maximize engagement of the older adults in meaningful and productive roles through activity engagement
- Funding and investment in building agingfriendly communities that promote physical and social environment
- Produce knowledge to guide the development of the most feasible and effective interventions

# Ease of modifying antecedents for health

Antecedents vary in degree of modifiability





# The benefits could be limited by:

- Ageist attitude
- Ineffective policies
- Lack of programs
- Outdated organizational structures
- Not coordinated (i.e., not see the forest for the trees)



Source: Morrow-Howell, N. & Chen, Y. C. (2016). Productive engagement in later life: A response to population aging. Conference presentation at Taiwan Association of Gerontology, Taipei, Taiwan.

# Thank you