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## Short Report

# Associations between physical health and depressive symptoms in Chinese older adults: Do neighborhood resources matter?

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## ABSTRACT

This is one of the first studies to examine the buffering effect of neighborhood resources, specifically leisure amenities and voluntary associations, on the relationship between poor physical health and depressive symptoms among older persons in China. Using data from the 2011 baseline survey of the China Health and Retirement Longitudinal Study, the analytical sample included 4715 older adults aged 60 and over nested in 446 neighborhoods. Two-level linear regression analyses were conducted in the urban ( $n = 1225$ ) and rural ( $n = 3490$ ) samples, respectively. We found that leisure amenities significantly reduced the effect of ADL limitations on depressive symptoms in urban older adults, and alleviated the effect of chronic conditions on depressive symptoms in rural older Chinese.

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## Introduction

Poor physical health, often indicated by chronic conditions and activities of daily living (ADL) limitations, is a major risk factor of depression in older adults (Chapman, Perry, & Strine, 2005; Fiske, Wetherell, & Gatz, 2009; Ormel, Rijdsdijk, Sullivan, van Sonderen, & Kempen, 2002). From the perspective of the stress process (Pearlin & Bierman, 2013), physical health problems are stressors diminishing sense of mastery and self-esteem, which lead to negative emotions, including depressive symptoms. This process, however, is not linear. The stress buffering hypothesis posits that social support can alleviate the emotional consequence of stressors such as poor physical health, as it may provide solutions to the problem, lessen the perceived importance of the difficulty, and affirm the identity and worth of the individual (Cohen & Wills, 1985). Numerous studies have provided evidence for the buffering effects of social support at the individual level (e.g., DeGarmo, Patras, & Eap, 2008; Wight, Aneshensel, & LeBlanc, 2003). More recently, there has been a growing interest in the role of neighborhood in the stress process (Aneshensel, 2010; Elliott, 2000). Most previous studies have focused on negative features of neighborhoods such

as disorder, poverty and deprivation (e.g., Casciano & Massey, 2012; Ross, 2000). In this exploratory study, we focus on neighborhood resources, specifically leisure amenities and voluntary associations, and examine their effects in moderating the relationship between poor physical health and depressive symptoms among older persons in rural and urban China, respectively.

Leisure amenities in the neighborhoods provide easy-to-access places where residents can meet and spend time together; and because of the relaxing nature of the setting or activities the ensued interaction is usually pleasurable. Such interactions may facilitate the development of social bonds and networks, and has the potential to generate social capital such as “interpersonal trust and norms of reciprocity and mutual aid” in the neighborhood (Kawachi, 1999, p.120). Likewise, voluntary associations could promote resident participation in community life and strengthen social networks, which could reinforce social connections, reciprocity and interdependence among residents (McKenzie, 2008; Wickrama & Bryant, 2003).

Older adults suffering from poor physical health are likely to have fewer opportunities to develop and maintain new social ties, and be at higher risk of social isolation compared to their healthy counterparts (Penninx et al., 1999). Collective actions to care for older adults with poor health and engage them in community life may be more likely to occur in neighborhoods with high levels of social capital, which helps to increase sense of security, protect self-esteem, improve social connections and resolve daily life

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problems of these older adults. In addition, leisure amenities and voluntary associations in neighborhoods provide physical space and opportunities for older people with poor health—whose mobility is likely to be more restricted than those in good health—to spend time and develop ties with others, thus reducing their likelihood of isolation and loneliness. Based on the literature about buffering effects of social support at the individual levels (Cohen & Wills, 1985), it seems reasonable to expect that older adults with poor physical health will benefit more than those in good health from living in neighborhoods with more leisure amenities and voluntary associations.

In China, neighborhood is interchangeable with community, which is officially defined as “a common social sphere constituted by people living within a certain geographical parameter per official administration” (Shen, 2014, pp. 210). Since the mid-1980s, the Chinese government has launched a nationwide campaign, “Community Building” as a way to address social problems, such as weakened security, loss of identity, and decreased collective responsibility, that arose from the rapid social transformations from a planned- to a market-based economy. The aims of community building include establishing a sense of geographic-based community into people’s daily life, encouraging community participation in providing social services, and promoting life quality of residents (Xu, 2005). In the past decade, there have been centrally driven attempts to create a sense of community in neighborhoods, including building facilities for leisure and recreational activities, sponsoring social groups, and boosting social participation (Xu, Gao, & Yan, 2005). Older persons are one of the populations targeted by the community building effort because of the rapid growth of the older population and dramatic changes of family structure in China (Bray, 2006; Xu et al. 2005). However, the evidence about the health benefits of community building is scant at best. A study using regional data has suggested that more neighborhood amenities and organizations are associated with fewer depressive symptoms in middle-aged and older residents in China (Shen, 2014). Our study aims to extend the scope to the national level, and examines whether community building is particularly important for older persons with poor health.

## Methods

### Data

This study used data from the 2011 baseline survey of the China Health and Retirement Longitudinal Study (CHARLS), collected from a national representative sample of adults aged 45 and older (main respondents), and their spouses if available, in China. More information about the research design of the CHARLS is available at the project website <http://charls.ccer.edu.cn/en>. Our analytical sample included respondents aged 60 or older ( $n=6845$ ). If both the main respondent and his/her spouse were age eligible, we excluded the spouse ( $n=2130$ ) to avoid interdependence of sampling units within the same household. The final sample was composed of 1225 older adults from 148 urban communities and 3490 older adults from 298 rural communities. The communities are located across 28 of China’s 31 provincial-level administrative units. We defined rural/urban neighborhood based on the type of residents’ committee the neighborhood has. In China, every neighborhood has a residents’ committee which is the local self-governing body. They are called community committee in urban neighborhoods and village committee in rural villages. We merged the individual-level dataset with the data from the community survey in which officials of village and community committees provided information on socio-demographic, economic and cultural characteristics of their communities.

### Measures

The dependent variable, depressive symptoms, was measured by the widely used 10-item Center for Epidemiological Studies Depression Scale (CESD-10) (Andresen, Malmgren, Carter, & Patrick, 1994). The scale has been validated in older Chinese in Hong Kong (Cheng & Chan, 2005). It asked respondents to rate depressive symptoms in the past week on a 4-point scale (from “rarely or none of the time” to “most or all of the time”). The sum score of CESD-10 ranged from 0 to 30 (reversed coded 2 items; Cronbach’s  $\alpha=0.81$ ).

Our independent variables at the neighborhood level were leisure amenities and voluntary associations. Leisure amenities was based on community leaders’ responses to the questions of whether their village/community had each of the following seven types of facilities: basketball court, outdoor exercising facilities, outdoor table tennis, room for table tennis, room for card games and chess games, activity center for the elderly, and other entertainment facilities in the neighborhoods. All the yes answer was summed to represent the variety of leisure amenities. Similarly, community leaders were asked whether their village/community had each of the following four types of voluntary associations—calligraphy and painting, dancing team or other exercise organizations, organizations for helping the elderly and the handicapped, and the elderly association. A sum of the yes answer represents the variety of voluntary associations.

The key independent variables indicating physical health of older adults were ADL limitations and chronic conditions. Because of skewed distributions, both variables were dichotomously coded. ADL limitations was coded 1 = *need help with one or more ADL* (i.e., dressing, bathing/showering, eating, getting in or out of bed, using the toilet, and bladder and bowel control) and 0 = *do not need help with any ADL*. Chronic conditions was coded 1 = *having at least one diagnosed chronic disease* (e.g., hypertension, dyslipidemia, diabetes, cancer, heart disease, stroke, etc.) and 0 = *no diagnosed chronic disease*.

We controlled for covariates associated with depressive symptoms in later life including the respondent’s demographic characteristics, socioeconomic status (SES), family support, and cognitive status as well as neighborhood economic conditions (Cong & Silverstein, 2008; Hybels et al., 2006; Pinquart & Sörensen, 2000; Richard et al., 2013). We included three demographic characteristics: age measured in years, sex (1 = *male*, 0 = *female*) and marital status (1 = *married*, 0 = *widowed, divorced or never married*). SES was indicated by education, household assets and pension benefits. Education was coded in four categories: *illiterate, less than elementary, up to elementary, middle school or higher*. Household assets were assessed by a count of 17 items (e.g., refrigerator, washing machine, TV, computer, cell phone etc.) that the household owned. Pension benefit refers to income from public and private pension programs, and was classified into four categories—*no pensions*, and *low, medium, and high* benefits. The latter three categories were tertiles of those receiving pension benefits. Two variables, proximity of children and monetary support from children, were constructed to indicate family support. Proximity of children was coded in three categories: *children in the same household, children in the same neighborhood, no children in the same neighborhood*. Monetary support was constructed as a dummy variable with 1 = *receiving monetary support from children* and 0 = *no monetary support from children*. Respondents’ cognitive status was measured by 31 items selected from the Telephone Interview of Cognitive Status (Brandt, Spencer, & Folstein, 1988) and Mini Mental State Examination (Folstein, Folstein, & McHugh, 1975). We constructed a continuous variable with higher scores indicating better cognitive status (Cronbach’s  $\alpha=0.71$ ). The community leaders’ reports of per-capita net income of their

neighborhoods in 2010 were used to indicate neighborhood economic conditions.

Data analysis

Given the vastly different contexts between rural and urban areas of China (Xu, Perkins, & Chow, 2010), we carried out the analysis separately for rural and urban residents. Two-level linear regression analysis with individuals nested in neighborhoods was conducted. For the urban sample, we first entered independent variables at the individual level (Model 1), and then added characteristics of neighborhoods to the model (Model 2). To examine stress-buffering effects of neighborhood resources, we created four product terms (Leisure amenities X ADL limitations, Voluntary associations X ADL limitations, Leisure amenities X Chronic conditions and Voluntary associations X Chronic conditions) and added each separately to Model 2. Statistically significant product terms were retained in the final model (Model 3). The same analytic procedure was applied to the rural sample (Models 4 to 6). To address missing data, we carried out multiple imputation using chained equations (White, Royston, & Wood, 2011). The results are based on five multiple-imputed replicates. All analyses of this study were done in STATA 13.0.

**Table 1**  
Sample characteristics of older adults in China<sup>a</sup> (N=4715).

	Urban (n = 1,225) Mean (SE <sup>b</sup> )/%	Rural (n = 3490) Mean (SE <sup>b</sup> )/%
<b>Individual-level variables</b>		
Depression (range=0–30) <sup>*** c</sup>	7.51 (0.24)	9.86 (0.13)
ADL limitations (%) <sup>***</sup>	15.24	25.97
Chronic conditions (%)*	77.45	72.51
Age (in years, range=60–101)	68.72 (0.28)	68.66 (0.16)
Sex (%) <sup>***</sup>		
Male	46.28	50.59
Female	53.72	49.41
Marital status (%)*		
Married	70.54	64.24
Widowed, divorced or separated	29.46	35.76
Education (%) <sup>***</sup>		
Illiterate	19.76	43.96
Less than elementary	13.31	21.84
Up to elementary	24.07	23.40
Middle school and higher	42.86	10.80
Items of household asset (range=0–17) <sup>***</sup>	4.60 (0.10)	3.18 (0.05)
Pension benefits (%) <sup>***</sup>		
No pension	36.82	71.62
Low	2.07	15.08
Medium	23.12	10.02
High	37.31	3.28
Proximity of children (%) <sup>***</sup>		
Children in household	44.96	49.02
Children in same neighborhood	28.60	32.25
No children in the same neighborhood	26.43	18.73
Monetary support from children (% yes) <sup>***</sup>	34.66	50.54
Cognitive status (range=0–28) <sup>***</sup>	15.48 (0.31)	11.42 (0.12)
<b>Neighborhood-level variables (n=446)</b>		
Leisure amenities (range=0–7) <sup>***</sup>	4.42 (0.35)	2.04 (1.16)
Voluntary associations (range=0–4) <sup>***</sup>	2.49 (0.12)	0.79 (0.08)
Neighborhood per-capita net income (in 1000 ¥) <sup>***</sup>	10.82 (2.02)	4.73 (0.40)

Note:

\*\*p < .01.

<sup>a</sup> Weighted statistics at the individual level are reported.

<sup>b</sup> SE: Standard error.

<sup>c</sup> Statistically significant differences between urban and rural older adults and between urban and rural neighborhoods.

\* p < .05.

\*\*\* p < .001.

Results

Table 1 presents the weighted descriptive statistics of urban and rural samples, respectively. The average score of depressive symptoms was 7.51 in the urban and 9.86 in the rural sample. The disparity of depressive symptoms between rural and urban samples is consistent with most previous studies (Chen, Hu, Qin, Xu, & Copeland, 2004; Chen et al., 2005; Dong & Simon, 2010; Ma et al., 2008; Li et al., 2011). About 15% of urban and 26% of rural respondents had ADL limitations; and 77% of urban and 73% of rural respondents had chronic conditions. On average, the urban neighborhoods had 4.42 types of leisure amenities and 2.49 types of voluntary associations. Among the rural neighborhoods, there

**Table 2**  
Neighborhood resources and depressive symptoms of older adults in urban China (n=1225).

Individual-level variables	Model 1 B (SE)	Model 2 B (SE)	Model 3 B (SE)
Age	−0.06 (0.03)*	−0.06 (0.03)*	−0.05 (0.03)*
Male (reference: female)	−1.41 (0.35) <sup>***</sup>	−1.37 (0.36) <sup>***</sup>	−1.41 (0.35) <sup>***</sup>
Married (reference: not married)	−0.50 (0.40)	−0.46 (0.40)	−0.47 (0.40)
Education (reference: illiterate)			
Less than elementary	0.85 (0.60)	0.90 (0.59)	1.03 (0.58)
Up to elementary	0.54 (0.55)	0.63 (0.54)	0.73 (0.54)
Middle school and higher	0.04 (0.56)	0.02 (0.56)	0.16 (0.56)
Household asset	−0.33 (0.09) <sup>***</sup>	−0.29 (0.09) <sup>***</sup>	−0.29 (0.09)
Pension benefits (reference: no pension)			
Low	−0.21 (1.11)	−0.25 (1.07)	−0.23 (1.06)
Medium	−0.02 (0.44)	0.03 (0.43)	0.03 (0.43)
High	−0.61 (0.42)	−0.60 (0.41)	−0.60 (0.41)
Proximity of children (reference: children in household)			
Children in same neighborhood	−0.49 (0.39)	−0.38 (0.39)	−0.37 (0.38)
Not children in the same neighborhood	−0.15 (0.41)	−0.09 (0.41)	−0.06 (0.41)
Monetary support from children (reference: no)	−0.35 (0.34)	−0.41 (0.34)	−0.42 (0.42)
Cognitive status	−0.21 (0.04) <sup>***</sup>	−0.20 (0.04) <sup>***</sup>	−0.20 (0.20) <sup>***</sup>
ADL limitations	3.06 (0.46) <sup>***</sup>	3.14 (0.45) <sup>***</sup>	5.42 (0.77) <sup>***</sup>
Chronic conditions	2.03 (0.38) <sup>***</sup>	2.05 (0.37) <sup>***</sup>	2.07 (0.37) <sup>***</sup>
<b>Neighborhood-level variables</b>			
Leisure amenities		0.02 (0.10)	0.13 (0.10)
Voluntary associations		−0.06 (0.17)	−0.04 (0.17)
Neighborhood per-capita net income		−0.02 (0.02)	−0.02 (0.02)
<b>Product term</b>			
ADL limitations X Leisure amenities			−0.65 (0.19) <sup>***</sup>
<b>Random-effects parameters</b>			
Variance at the neighborhood level	1.12	1.08	1.13
Variance at the individual level	5.15	5.14	5.10
<b>Likelihood Ratio Tests</b>			
		0.08 <sup>a</sup>	15.06 <sup>** b</sup>

Note:

B: Coefficient.

SE: Standard error.

<sup>a</sup> Likelihood ratio tests comparing goodness of fit between Models 1 and 2.

<sup>b</sup> Likelihood ratio tests comparing goodness of fit between Models 1 and 3.

\* p < 0.05.

\*\* p < 0.01.

\*\*\* p < 0.001.

were, on average, 2.04 types of leisure amenities and 0.79 types of voluntary associations.

Table 2 shows the results of two-level regression models for urban elders. Model 1 shows that ADL limitations and chronic conditions were significantly and positively correlated with depressive symptoms among older adults in urban neighborhoods. The associations between leisure amenities and voluntary associations with depressive symptoms were not statistically significant (Model 2). But there were significant differences in the effects of leisure amenities on depressive symptoms for urban older adults with and without ADL limitations ( $B = -0.65$ ,  $SE = 0.19$ ,  $p = 0.000$  in Model 3). For those without ADL limitations, leisure amenities were not significantly associated with depressive symptoms whereas for those with ADL limitations, an increase of one type of leisure amenities was significantly related to 0.52 lower points in the CESD-10. No other product terms between neighborhood resources and physical health indicators were statistically significant.

Among rural older adults, both ADL limitations and chronic conditions were positively associated with depressive symptoms (Table 3, Model 4). Neighborhood leisure amenities and voluntary associations were not significantly associated with depressive symptoms (Table 3, Model 5). Regarding the testing of interaction

effects of neighborhood resources and physical health, only one product term—Leisure amenities X Chronic conditions—was statistically significant ( $B = -0.24$ ,  $SE = 0.12$ ,  $p = 0.046$  in Model 6), and the results suggest that the association between leisure amenities and depressive symptoms was stronger in those with chronic conditions than those without chronic conditions. Specifically, among rural elders with chronic conditions, increase of one type of leisure amenities was significantly associated with 0.21 points decrease in CESD-10, whereas leisure amenities was not significantly associated with depressive symptoms in those without chronic conditions.

## Discussion

This study shows that older Chinese adults with poor physical health benefit more from living in neighborhoods with more leisure amenities than those with good health. Specifically, we found that leisure amenities buffer the adverse effects of ADL limitations on depressive symptoms among older adults living in urban neighborhoods. Possibly, it is challenging for older adults with ADL limitations to participate in social activities outside their neighborhoods. Leisure amenities in the neighborhood may provide

**Table 3**  
Neighborhood resources and depressive symptoms of older adults in rural China ( $n = 3490$ ).

<i>Individual-level variables</i>	Model 4 B(SE)	Model 5 B (SE)	Model 6 B (SE)
Age	-0.07 (0.02) <sup>***</sup>	-0.07 (0.02) <sup>***</sup>	-0.07 (0.02) <sup>***</sup>
Male (reference: female)	-1.17 (0.23) <sup>***</sup>	-1.20 (0.23) <sup>***</sup>	-1.20 (0.23) <sup>***</sup>
Married (reference: not married)	-0.70 (0.25) <sup>**</sup>	-0.79 (0.24) <sup>***</sup>	-0.79 (0.24) <sup>***</sup>
Education (reference: illiterate)			
Less than elementary	0.28 (0.31)	0.38 (0.30)	0.39 (0.30)
Up to elementary	0.11 (0.31)	0.22 (0.31)	0.22 (0.31)
Middle school and higher	-0.48 (0.41)	-0.43 (0.41)	-0.43 (0.41)
Household asset	-0.44 (0.06) <sup>***</sup>	-0.40 (0.06) <sup>***</sup>	-0.39 (0.06) <sup>***</sup>
Pension benefits (reference: no pension)			
Low	-0.87 (0.32) <sup>**</sup>	-0.87 (0.32) <sup>**</sup>	-0.88 (0.32) <sup>**</sup>
Medium	-0.97 (0.41) <sup>*</sup>	-0.64 (0.41)	-0.65 (0.41)
High	-2.14 (0.60) <sup>***</sup>	-1.96 (0.60) <sup>***</sup>	-1.94 (0.60) <sup>***</sup>
Proximity of children (reference: children in household)			
Children in same neighborhood	-0.36 (0.27)	-0.33 (0.27)	-0.33 (0.27)
Not children in the same neighborhood	-0.12 (0.29)	-0.13 (0.29)	-0.13 (0.29)
Monetary support from children (reference: no)	-0.35 (0.23)	-0.31 (0.23)	-0.31 (0.23)
Cognitive status	-0.17 (0.02) <sup>***</sup>	-0.17 (0.02) <sup>***</sup>	-0.17 (0.02) <sup>***</sup>
ADL limitations	3.60 (0.25) <sup>***</sup>	3.61 (0.24) <sup>***</sup>	3.61 (0.24) <sup>***</sup>
Chronic conditions	2.17 (0.24) <sup>***</sup>	2.13 (0.23) <sup>***</sup>	2.53 (0.31) <sup>***</sup>
<b>Neighborhood-level variables</b>			
Leisure amenities		-0.14 (0.09)	0.03 (0.13)
Voluntary associations		-0.30 (0.20)	-0.32 (0.20)
Neighborhood per-capita net income		-0.04 (0.03)	-0.04 (0.03)
<b>Interaction term</b>			
Chronic conditions X leisure amenities			-0.24 (0.12) <sup>*</sup>
<b>Random-effects parameters</b>			
Variance at the neighborhood level	1.64	1.53	1.52
Variance at the individual level	5.66	5.66	5.67
<b>Likelihood Ratio Test</b>		19.76 <sup>*** a</sup>	25.41 <sup>*** b</sup>

Note:

B: Coefficient.

SE: Standard error.

<sup>a</sup> Likelihood ratio tests comparing goodness of fit between Models 4 and 5.

<sup>b</sup> Likelihood ratio tests comparing goodness of fit between Models 4 and 6.

\*  $p < 0.05$ .

\*\*  $p < 0.01$ .

\*\*\*  $p < 0.001$ .

opportunities for these older adults to meet neighbors, foster social ties, and seek social support outside of one's own family, which in turn help reducing depressive symptoms.

In rural older Chinese, neighborhood leisure amenities serve to buffer the effect of chronic conditions on depressive symptoms. Compare to their urban counterparts, older adults living in rural China have greater challenges in managing chronic diseases, because of low quality health care, inadequate health insurance coverage, distance from health care providers, limited economic resources, and low health literacy (Jian, Chan, Reidpath, & Xu, 2010; Liu et al., 2009). Leisure amenities in the neighborhood may enable rural older people with chronic conditions to have physical and cognitive activities, which may help them control symptoms. Leisure amenities may also enhance social support of these older adults which help them cope with the stress associated with their chronic conditions.

The consistent benefits of leisure amenities for urban and rural older adults with poor health in China are worth noting, and suggest that building facilities for leisure and recreational activities may deserve high priorities in China's "Community Building" program. Also consistent across urban and rural settings is the lack of significant direct or buffering effects of voluntary associations. However, our measure of voluntary associations was limited, for example, we did not know how active these associations were and how many people were involved in these associations. Future studies to examine the role of voluntary associations in depression prevention need to find a better way to capture the size and activity levels of the associations.

Two limitations of this study should be noted. First, using the cross-sectional data limits our capacity to infer causal relationships. Second, the measures of neighborhood resources are not perfect. The counts of types of leisure amenities and voluntary associations available in the neighborhoods may not fully capture the variation in the quality and frequency of utilization of various neighborhood resources. Future studies should improve measurement in order to further investigate the specific mechanisms linking different neighborhood resources and depressive symptoms of older adults.

Despite its limitations, this study provides new empirical evidence of the buffering effect of neighborhood leisure amenities in the association between physical health and depressive symptoms in older Chinese. Future studies using qualitative methods may help to explain why neighborhood leisure amenities are particularly important for urban elders with ADL limitations and for rural elders with chronic conditions.

In conclusion, this study found that leisure amenities alleviated the adverse effects of ADL limitations on depressive symptoms in urban older adults, and reduced the adverse effects of chronic conditions on depressive symptoms in rural older adults in China. Given the rapid growth of the elderly population in China, more research to understand the stress-buffering effect of neighborhood resources for older people would be a worthwhile effort.

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## References

- Andresen, E. M., Malmgren, J. A., Carter, W. B., & Patrick, D. L. (1994). Screening for depression in well older adults: evaluation of a short form of the CES-D. *American Journal of Preventive Medicine*.
- Aneshensel, C. S. (2010). Neighborhood as a social context of the stress process In: *Advances in the conceptualization of the stress process* (pp. 35–52). Springer, New York.
- Brandt, J., Spencer, M., & Folstein, M. (1988). The telephone interview for cognitive status. *Cognitive and Behavioral Neurology*, 1(2), 111–118.
- Bray, D. (2006). Building 'community': new strategies of governance in urban China. *Economy and Society*, 35(4), 530–549.
- Casciano, R., & Massey, D. S. (2012). Neighborhood disorder and anxiety symptoms: new evidence from a quasi-experimental study. *Health Place*, 18(2), 180–190.
- Chapman, D. P., Perry, G. S., & Strine, T. W. (2005). The vital link between chronic disease and depressive disorders. *Prev Chronic Dis*, 2(1), A14.
- Chen, R., Hu, Z., Qin, X., Xu, X., & Copeland, J. (2004). A community-based study of depression in older people in Heifei, China—the GMS-AGECAT prevalence, case validation and socio-economic correlates. *International Journal of Geriatric Psychiatry*, 19, 407–413.
- Chen, R., Wei, L., Hu, L., Qin, X., Copeland, J., & Hemingway, H. (2005). Depression in older people in rural China. *Archive of Internal Medicine*, 165, 2019–2025.
- Cheng, S. T., & Chan, A. (2005). The center for epidemiologic studies depression scale in older Chinese: thresholds for long and short forms. *International Journal of Geriatric Psychiatry*, 20(5), 465–470.
- Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological bulletin*, 98(2), 310.
- Cong, Z., & Silverstein, M. (2008). Intergenerational support and depression among elders in rural china: do daughters-in-law matter? *Journal of Marriage and Family*, 70(3), 599–612.
- DeGarmo, D. S., Patras, J., & Eap, S. (2008). Social support for divorced fathers' parenting: testing a stress-buffering model\*. *Family Relations*, 57(1), 35–48.
- Dong, X., & Simon, M. (2010). Health and aging in a Chinese population: urban and rural disparities. *Geriatrics and Gerontology International*, 10, 85–93.
- Elliott, M. (2000). The stress process in neighborhood context. *Health place*, 6(4), 287–299.
- Fiske, A., Wetherell, J. L., & Gatz, M. (2009). Depression in older adults. *Annual Review of Clinical Psychology*, 5, 363.
- Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state": a practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12(3), 189–198.
- Hybels, C. F., Blazer, D. G., Pieper, C. F., Burchett, B. M., Hays, J. C., Fillenbaum, G. G., & Berkman, L. F. (2006). Sociodemographic characteristics of the neighborhood and depressive symptoms in older adults: using multilevel modeling in geriatric psychiatry. *The American Journal of Geriatric Psychiatry*, 14(6), 498–506.
- Jian, W., Chan, K. Y., Reidpath, D. D., & Xu, L. (2010). China's rural-urban care gap shrank for chronic disease patients, but inequities persist. *Health Affairs*, 29(12), 2189–2196.
- Kawachi, I. (1999). Social capital and community effects on population and individual health. *Annals of the New York Academy of Sciences*, 896(1), 120–130.
- Li, N., Pang, L., Chen, G., Song, X., Zhang, J., & Zheng, X. (2011). Risk factors for depression in older adults in Beijing. *Canadian Journal of Psychiatry*, 56(8), 466–473.
- Liu, Z., Albanese, E., Li, S., Huang, Y., Ferri, C. P., Yan, F., & Prince, M. (2009). Chronic disease prevalence and care among the elderly in urban and rural Beijing, China—a 10/66 Dementia Research Group cross-sectional survey. *BMC Public Health*, 9(1), 1–11.
- Ma, X., Xiang, Y., Li, S. R., Xiang, Y., Guo, H., Hou, Y., & Tao, Y. (2008). Prevalence and sociodemographic correlates of depression in an elderly population living with family members in Beijing, China. *Psychological Medicine*, 38(12), 1723–1730.
- McKenzie, K. (2008). Urbanization, social capital and mental health. *Global Social Policy*, 8(3), 359–377.
- Ormel, J., Rijdsdijk, F. V., Sullivan, M., van Sonderen, E., & Kempen, G. I. (2002). Temporal and reciprocal relationship between IADL/ADL disability and depressive symptoms in late life. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 57(4), P338–P347.
- Pearlin, L. I., & Bierman, A. (2013). Current issues and future directions in research into the stress process In: *Handbook of the sociology of mental health* (pp. 325–340). Springer, Netherlands.
- Penninx, B. W., Van Tilburg, T., Kriegsman, D. M., Boeke, A. J. P., Deeg, D. J., & van Eijk, J. T. M. (1999). Social network, social support, and loneliness in older persons with different chronic diseases. *Journal of Aging and Health*, 11(2), 151–168.
- Pinquart, M., & Sörensen, S. (2000). Influences of socioeconomic status, social network, and competence on subjective well-being in later life: a meta-analysis. *Psychology and Aging*, 15(2), 187.
- Richard, E., Reitz, C., Honig, L. H., Schupf, N., Tang, M. X., Manly, J. J., & Luchsinger, J. A. (2013). Late-life depression, mild cognitive impairment, and dementia. *JAMA Neurology*, 70(3), 383–389.
- Ross, C. E. (2000). Neighborhood disadvantage and adult depression. *Journal of Health and Social Behavior* (pp. 177–187), 177–187.
- Shen, Y. (2014). Community building and mental health in mid-life and older life: evidence from China. *Social Science & Medicine*, 107, 209–216.
- White, I. R., Royston, P., & Wood, A. M. (2011). Multiple imputation using chained equations: issues and guidance for practice. *Statistics in Medicine*, 30(4), 377–399.
- Wickrama, K., & Bryant, C. M. (2003). Community context of social resources and adolescent mental health. *Journal of Marriage and Family*, 65(4), 850–866.
- Wight, R., Aneshensel, C., & LeBlanc, A. (2003). Stress buffering effects of family support in AIDS caregiving. *AIDS Care*, 15(5), 595–613.
- Xu, Q., Perkins, D.D., Chow, J.C., 2010. Sense of community, neighboring, and social capital as predictors of local political participation in China. *American Journal of Community Psychology* 45 (3–4), 259–271.
- Xu, Q., Gao, J., & Yan, M. C. (2005). Community centers in urban China: context, development, and limitations. *Journal of Community Practice*, 13(3), 73–90.