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Understanding Rural-Urban Differences in Depressive Symptoms Among Older Adults in China

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Abstract

Objectives—Studies have reported that rural elders in China have higher levels of depression than their urban peers. We aimed to examine the extent to which four sets of factors (socioeconomic status (SES), healthcare access, health status, social support and participation) account for such rural-urban differences.

Methods—Cross-sectional data from the 2011 China Health and Retirement Longitudinal Study were analyzed. A representative sample ($N = 5,103$) of older Chinese (age 60+) was included. Depressive symptoms were measured by the CESD-10. Multilevel linear regression was conducted.

Results—Rural elders had more depressive symptoms than urban elders. When SES at the individual-, household- and community-level was simultaneously controlled, the rural-urban difference lost its statistical significance. Health status, social support and social participation accounted for some, whereas healthcare access explained almost none, of the rural-urban difference.

Discussion—Results suggest that SES is the predominant factor accounting for the rural-urban depression gap in China.

Keywords

CHARLS; *hukou*; late-life depression; SES

Studies in China have consistently reported that rural older adults have higher levels of depressive symptoms than their urban counterparts (Chen, Hu, Qin, Xu, & Copeland, 2004; Chen et al., 2005; Dong & Simon, 2010; Ma et al., 2008; Li et al., 2011). A recent meta-analysis shows that the mean pooled prevalence rate of depression in rural older Chinese was 29.2%, significantly higher than it was in urban older Chinese (20.5%) (Zhang, Xu, Nie, Zhang, & Wu, 2012). Most prior studies have not controlled for other factors when examining the association between rural-urban strata and late-life depression. An exception

was Ma et al. (2008) who, drawing on a regional sample of older persons in Beijing, found that rural older adults were three times more likely to have depression than urban older adults, adjusting for age, sex, marital status, education, household income, and major medical conditions.

The pattern of rural-urban differences in depression observed among older adults in China is very different from that found in other countries (e.g., Britain, Canada, Japan, Korea, Taiwan and United States) where either no significant difference (Abe, Fujise, Fukunage, Nakagawa, & Ikeda, 2012; Kim, Shin, Yoon, & Stewart, 2002; St John, Blandford, & Strain, 2006) or a rural advantage (Chiu, Chen, Huang & Mau, 2005; Evans, 2009; Friedman, Conwell, & Delavan, 2007; Kim, Stewart, Shin, Yoon, & Lee, 2004; Walters et al., 2004) has been reported. Why is the prevalence of depression higher in rural than urban older adults in China? The current study aims to assess the extent to which a series of social and health characteristics at the individual, household, and community levels accounts for rural-urban differences in depressive symptoms among older Chinese. These characteristics include: (a) socioeconomic status (SES), (b) healthcare access, (c) health status, and (d) social support and participation.

Possible Explanations for Rural-Urban Differences in Depression Among Older Chinese

First, sharp social and economic disparities exist between the rural and urban populations. Since the 1950s, China has implemented a household registration system (*hukou*), which requires every citizen, upon birth, to register as belonging to agricultural (rural) or non-agricultural (urban) groups. The identity given by *hukou* is practically for life, as change of *hukou*, especially from rural to urban, is very difficult (Wang, 2005). While urban residents have access to a broad range of state-sponsored public goods—including jobs, subsidized housing, education, medical care, and pensions—rural residents have limited access to such community resources and opportunities as quality schools and formal employment with pension benefits. Thus rural residents have fewer prospects for moving up the social ladder and accumulating wealth, and they are at a greater risk of poverty in old age (Cai, Giles, O’Keefe, & Wang, 2012). In addition, despite accumulation of national wealth in recent decades, development of public facilities and amenities that help to improve quality of life have been slow in rural areas (Park, 2008), which may increase sense of relative deprivation and abandonment among rural residents (Hill & Maimon, 2013). Research in the West as well as in China has demonstrated that people with low SES are vulnerable to develop depressive symptoms (Lorant et al., 2003; Ma et al., 2008). Beyond individual-level SES, studies have shown that neighborhood socioeconomic disadvantages could undermine mental health (Julien, Richard, Gauvin, & Kestens, 2012).

Second, health systems and policies for China’s urban and rural populations vary widely (Yip, 2010). Many studies have shown that rural residents were at a disadvantage regarding healthcare access (Liu & Griffiths, 2011; Yip, 2010). In recent years, the Chinese government has invested substantial resources to expand health insurance coverage and reduce healthcare disparity (Yip et al., 2012). Some recent studies report that rural residents

had equal or better healthcare access than urban residents (Fang, Chen, & Rizzo, 2009; Liu, Zhang, Lu, Kwon, & Quan, 2007), others suggest that the rural-urban gap remained, as evidenced by rural residents' greater likelihood of early self-discharge from the hospital due to financial reasons (Jian, Chan, Reidpath, & Xu, 2010). Healthcare disadvantages may be particularly detrimental to the mental health of older adults as their need for healthcare is greater than that of younger people.

Third, some studies have suggested that rural elders in China had worse health status, faster decline in physical function and higher rates of mortality than urban elders (Zimmer, Kaneda, & Spess, 2007; Zimmer, Wen, & Kanda, 2010; Yu et al., 2012), although others report that older adults in rural China had better physical functioning and overall health than their urban counterparts (Feng et al., 2011; Wen & Gu, 2011; Zeng, Vaupel, Zhenyu, Chunyuan, & Yuzhi, 2002). Physical illness and disability have been known to increase risks of depression in older persons (Blazer, 2003).

Fourth, compared to their urban peers, older adults in rural China may have lower levels of social support and social participation. As mentioned above, mortality rates are higher in rural than urban older adults, thus rural elders are more likely to be widowed and lack spousal support (Zimmer et al., 2007). In addition, older persons in rural villages may be less likely than those in the city to have children living close by to provide instrumental and emotional support, due to out-migration of rural youths (National Bureau of Statistics of China, 2012). Rural older adults also may not have as many opportunities as their urban peers to participate in social and community activities—in part because fewer organizations and amenities exist in rural villages to facilitate social interaction of older adults. Social support and participation have been suggested to have mental health consequences for older adults (Chiao, Weng, & Botticello, 2011; George, 2011).

Late-life depression is a serious public health issue in China (Zhang et al., 2012). Identifying the factors that are responsible for rural-urban differences in depressive symptoms among older adults can inform interventions to improve mental health of older Chinese and reduce mental health disparities, ultimately lowering health and related costs (Hu, He, Zhang, & Chen, 2007).

Methods

Data and Sample

Data for this analysis were taken from the 2011 baseline survey of the China Health and Retirement Longitudinal Study (CHARLS), which was based on the Health and Retirement Study (HRS) in the United States and related aging surveys around the world (charls.ccer.edu.cn/en). The sample was obtained through multistage probability sampling. It began with randomly selecting 150 county-level units from a sampling frame containing all county-level units which had been stratified by region, and within region urban district or rural county and GDP per capita. Then three primary sampling units (PSUs, administrative villages in rural areas and neighborhoods in urban areas) were selected from each county-level unit. Within each PSU, dwellings were randomly selected. If a household had one or more members age 45 and older, only one was randomly selected as the main respondent. If

the main respondent's spouse was available, he/she was also interviewed. The survey had a response rate of 80.5% (Zhao et al., 2013).

In addition to collecting individual-level data, CHARLS collected information related to the social, economic and policy environments of the community in which respondents resided by interviewing community leaders (persons in charge of village/neighborhood committees). Community leaders were asked to look up certain statistics of the village/neighborhood when completing the community survey. Respondents who comprised the analyzed sample resided in 447 communities.

This study focused on older adults, so we included in our sample only CHARLS respondents who were 60 years old or older. If a household had two age eligible respondents (i.e., both the main respondent and his/her spouse), we included the main respondent only so to avoid interdependency of sampling units within the same household. The final sample was composed of 5,103 older Chinese adults.

Variables and Measures

Depressive symptoms—Our dependent variable was *depressive symptoms*, measured by the 10-item Center for Epidemiologic Studies Depression Scale¹ (CESD-10), which has been widely used in prior studies (Andresen, Malmgren, Carter, & Patrick, 1994), validated in older Chinese in Hong Kong (Boey, 1999; Cheng & Chan, 2005), and has demonstrated factorial validity in the CHARLS sample (Chen & Mui, 2014). 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*). With two items reversed coded, the sum of the CESD-10 scores ranged from 0 to 30 (Cronbach's alpha = 0.81).

Rural-urban—The official household registration (*hukou*) system has been the legal division of rural and urban populations since the establishment of the People's Republic of China (Chan, 2009). We used respondents' report of current *hukou* status to classify them as rural (agricultural) or urban (non-agricultural) residents. More recently, some areas have abolished the *hukou* differentiation and included both agricultural and non-agricultural *hukou* as unified residency *hukou*. For respondents who reported to have unified residency *hukou* (n=28), their prior *hukou* status was used.

Socioeconomic status—We used indicators of SES at the individual (education, pension benefit), household (asset), and community (infrastructure) levels to capture socioeconomic resources available to respondents. *Education* was coded in four categories—illiterate, less than primary but can read and write, primary school, and junior high or more. *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. Low, medium, and high benefits were based on dividing the amount of benefits, among respondents receiving pensions, into tertiles.

¹The 10 items of CESD-10 are: I was bothered by things that don't usually bother me; I had trouble keeping my mind on what I was doing; I felt depressed; I felt everything I did was an effort; I felt hopeful about the future; I felt fearful; my sleep was restless; I was happy; I felt lonely; and I could not get "going."

At the household level, *asset* indicates a household's wealth or long-term standard of living (Filmer & Pritchett, 2001). Compared to household income and expenditure—two commonly used indicators of household economic resources—composite asset index is less subject to measurement errors, particularly in the context of developing countries (Bollen, Glanville, & Stecklov, 2002.) Following the approach of Filmer and Pritchett (2001), we constructed an index derived from principle component analysis of 35 asset variables.²

Infrastructure deficiency was used to indicate SES at the community level. Adequate infrastructure supports proper community function and economic growth (Aschauer, 1989). The community survey of CHARLS collected data about the basic infrastructure of respondents' communities. Using these data we constructed an infrastructure-deficiency index using principal component analysis that included nine indicators in four areas: connectedness, sewer, waste management, and electricity.³ Based on index scores, communities were divided into four quartiles, from least to most infrastructure deficient.

Healthcare access—Five variables were used to measure healthcare access. The first was *distance to healthcare facility*. It was a community-level variable, measured by the distance from the village/neighborhood office to the closest healthcare facility. The distance was classified as within 1 kilometer or more than 1 kilometer. The other four variables were based on respondents' report of whether they had (a) *health insurance*, (b) *not visited a physician when ill in the month prior*, (c) *not been hospitalized when suggested by a doctor as needed in the year prior*, and (d) *discharged themselves from the hospital before recovery in the year prior*. Each was coded as a dichotomous variable.

Health status—Respondents' health status was indicated by *chronic conditions*, and *disability in activities of daily living (ADL)* and *instrumental activities of daily living (IADL)*. Respondents were asked whether they had been diagnosed with any of 14 chronic conditions (e.g., heart disease, diabetes, chronic lung disease). We used this information to classify respondents into one of four categories—no, one, two, and three or more chronic conditions. Items on the ADL included dressing, bathing/showering, eating, getting in and out of bed, using the toilet, and bladder and bowel control. Items on the IADL included doing household chores, preparing meals, shopping for groceries, managing money, and taking medications. For each ADL and IADL item, respondents reported levels of difficulty in performing the activity. Two dichotomous variables were used to indicate whether respondents had ADL and IADL disability, respectively. No disability was defined as having no difficulty in all corresponding items.

²The asset variables belonged to one of these three types: (1) Household ownership of consumption durables (automobile, electric bicycle, motorcycle, refrigerator, washing machine, TV, computer, stereo system, video camera, camera, air conditioner, mobile phone, valuable furniture, valuable musical instrument, valuable decorations and ornaments, jewelry or precious metal, antiques or valuable art work, other durable assets worth 500 yuan or more); (2) quality of dwelling (type of structure, compound or independent unit, having a balcony, number of toilets, number of living rooms, number of bedrooms, toilet with a seat, toilet flushable, electricity, running water, shower or bath facility, gas supply, cooking fuel, telephone connection, internet connection); (3) household ownership of residential properties (ownership of current residence, ownership of other residential properties).

³Indicators of connectedness included type of road, days roads not passable, and whether the community was accessible by bus. Indicators of sewer systems included whether the community had a sewer system and the main type of toilet in the community. Waste management was indicated by the method of waste disposal. Electricity indicators included whether all households used electricity, whether there were days without electricity, and whether there were hours without electricity.

Social support and participation—Four dichotomous variables—partnered status, children nearby, social participation, and elder activity center in community—were used to indicate social support and participation. *Partnered status* was measured as currently married/cohabiting (=1) and not (=0). *Children nearby* was coded yes (=1) if respondents lived with children or had children living in the same community; otherwise it was coded no (=0). *Social participation* was coded yes (=1) if respondents had engaged in any of the following seven activities in the month prior: spent time with friends; played cards, chess, or ma-jong with others; provided help to non-coresiding family members, friends or neighbors; visited a park or a social center to dance/exercise; participated in activities organized by community organizations; participated in volunteer work; and attended a class or training workshop. Otherwise it was coded no (=0). A community-level variable—whether respondents' community had an *elder activity center*—was used to indicate opportunities for social interaction and participation.

Age and sex—We included respondents' *age* (measured in years) and *sex* (1 = male; 0 = female) as control variables.

Data Analysis

We first tested differences between rural and urban older adults in depressive symptoms and the four sets of factors (SES, healthcare access, health status, social support and participation) thought to account for their depression gap. Then we conducted multilevel linear regression, because the data we analyzed involved individuals nested in communities and the dependent variable is a continuous variable. To assess the extent to which rural-urban differences in depressive symptoms were explained by a particular set of social and health characteristics, we estimated a series of models with different sets of covariates. Model 1 was a base model and simply included rural-urban, age, and sex as covariates. Models 2 to 5 each added SES, healthcare access, health status, and social support and participation, respectively, to the base model. Changes in the coefficient for rural-urban from the base model as different sets of covariates were added would indicate the extent to which the set of covariates accounts for differences in depressive symptoms between rural and urban older adults in China.

The independent variables had a modest amount of missing values (< 1%), but the dependent variable, depressive symptoms, had 13.5% missing. We conducted multiple imputation. Results reported here were based on analyses of five imputed datasets. We found similar results when repeating the analysis excluding cases missing depressive symptoms. All analyses were conducted using Stata 13.0 (StataCorp, 2013). Below, we first present the descriptive results that have been weighted. We then present the results from multilevel linear regression in which robust standard errors were employed (unweighted). The CHARLS provided only individual-level but not community-level weighting variables. As a form of sensitivity test, we had included a scaled individual-level weight in the multilevel regression models in an extra analysis. The weighted results (available upon request) are similar to the ones reported below.

Results

Characteristics of the Sample

Table 1 presents characteristics of the sample (weighted and not weighted). Based on the weighted sample, about 23% belonged to urban *hukou* and 77% belonged to rural *hukou*. They averaged 69.6 years old and 48% were male. Most had low education and 41% were illiterate. A majority (64%) did not have pensions. We classified the respondents into quartiles based on scores of the household asset index. Respondents' communities were also divided into quarters based on community infrastructure deficiency scores.

Only a minority of respondents indicated barriers in healthcare access—7% had no health insurance; 8% did not visit a physician when ill; 4% did not get hospitalized when needed; 3% discharged themselves from hospital before recovery; and 82% lived in communities that had a healthcare facility nearby. Slightly more than a quarter (26%) of the sample had no chronic conditions; 29, 22 and 24 percent, respectively, reported to have one, two, and three or more conditions. A majority had no ADL (77%) and IADL (71%) disability. About 63% of respondents were married/cohabiting. Most (80%) had children living close by. About 42% of the sample had some level of social participation, and 35% lived in communities that had an activity center for older people.

Rural-Urban Differences in Study Variables

Table 1 also shows differences in all study variables between rural and urban older adults. As expected, the former had significantly higher levels of depressive symptoms. All indicators of SES show that rural older adults were more disadvantaged than their urban counterparts: Rural elders had significantly lower education; and they were more likely to have no or low pension benefits, be in the lower household asset strata, and live in communities with deficient infrastructure. But rural-urban differences in healthcare access were almost negligible. They only differed in health insurance and distance to healthcare facility—rural older adults demonstrated a slight advantage over urban older adults in the former and a slight disadvantage in the latter.

In terms of health status, rural older adults were more likely to have ADL and IADL disability compared to urban older adults, but the former reported fewer chronic conditions. Regarding social support, rural elders were less likely to be married/cohabiting and more likely to have children living close by than their urban peers. A smaller proportion of rural older adults than urban older adults had some level of social participation and lived in communities that had activity centers for older people.

Accounting for Rural Disadvantages in Depressive Symptoms

Results of the multilevel linear regression analysis to examine the factors that account for rural-urban differences in depressive symptoms are presented in Table 2. The base model (Model 1) shows that rural older adults were 2.549 points (SE = .234, $p < .001$) higher than their urban peers on the measure of depressive symptoms (i.e., CESD-10), adjusted for age and sex. Age had a significantly positive relationship with depressive symptoms, and men had fewer symptoms than women. We had estimated an unconditional model (i.e., without

any covariates, not shown in Table 2) which suggests that the total variance in depressive symptoms was 42.139, of which 12.2% were between communities (community-level variance= 5.122, SE=.543) and 87.8% were between individuals (individual-level variance=37.017, SE=.811). The variance component of Model 1 shows that rural-urban, age and sex explained about 6.9% $\{[42.139-(4.028+35.205)]/42.139 \times 100\}$ of the total variance in depressive symptoms.

All the added SES variables in Model 2 were significantly correlated with depressive symptoms in the expected direction: Those with more education, higher pension benefits, more household assets, and who lived in neighborhoods with better infrastructure had fewer depressive symptoms. More importantly, the coefficient for rural-urban was reduced by almost 85% compared to that in Model 1, and it was no longer statistically significant ($\beta = .383$, SE = .292, $p > .05$). This suggests that rural-urban differences in depressive symptoms were largely accounted for by SES.

Model 3 shows that healthcare disadvantages, indicated by not visiting a physician when ill, not being hospitalized when needed, and early self-discharge from hospitalization, were significantly correlated with higher levels of depressive symptoms. But the rural-urban coefficient ($\beta = 2.534$, SE = .225, $p < .001$) remained almost unchanged compared to that in Model 1. The results thus suggest that healthcare access contributes little to rural-urban disparities in depressive symptoms.

Model 4 indicates that having more chronic conditions and disabilities in ADL and IADL were correlated with more depressive symptoms. After controlling for health status, rural-urban differences were reduced by 11% but remained statistically significant (Model 4, $\beta = 2.268$, SE = .215, $p < .001$). These results suggest that health status is not a primary factor responsible for the rural-urban depression gap.

In Model 5, living with a spouse/partner, having some level of social participation, and living in communities that had an elder activity center were significantly correlated with lower levels of depressive symptoms. The coefficient indicating rural-urban differences ($\beta = 1.922$, SE = .231, $p < .001$) in depressive symptoms was reduced by about 25% after controlling for the social support and participation variables, compared to the one estimated in the base model. But it remained statistically significant, suggesting that social support and participation accounted for some but not all variation between rural and urban older adults in depressive symptoms.

Finally, we estimated a full model including all covariates to take into account correlations among them (Model 6). While the magnitude of the coefficients for most covariates in the full model changed somewhat from those in previous models, the pattern remained and the rural-urban coefficient was not statistically significant ($.552$, SE = .294, $p > .05$). The full model explained about 26.7% $\{[42.139-(29.268+1.6)]/42.139 \times 100\}$ of the total variance in depressive symptoms. Overall, results support that socioeconomic differentials between rural and urban older adults in China largely account for rural disadvantages in depressive symptoms.

To understand the contribution of each component of SES to the rural-urban gap in depressive symptoms, we conducted additional analyses in which each SES component was added to separate models (Table 3). The results show that, among the four SES components, household assets had the largest relative effect in explaining the rural-urban gap. However, no SES component by itself, or in combination with one or two components, could reduce the rural-urban coefficient to statistically not significant. Only when all four SES components were controlled did the rural-urban coefficient become statistically not significant (Model 6, Table 2). This suggests that rural-urban differences in depressive symptoms among older Chinese are linked to socioeconomic disparities at the individual, household, and community levels.

Discussion

Consistent with several studies using regional survey data (Dong & Simon, 2010; Ma et al. 2008; Li et al., 2011), we found that on average, adjusting for age and sex, depression levels were significantly higher among rural older persons than their urban peers. We proposed four sets of factors that may explain such rural-urban differences and tested them in a systematic fashion by estimating a series of multilevel linear regression models. Overall, SES was shown to be the predominant factor that accounted for rural disadvantages in depressive symptoms among older persons in China. Not only was each of the four SES components (education, pension benefits, household assets, neighborhood infrastructure) related to depressive symptoms in the expected direction, but together they attenuated the rural-urban gap by nearly 85% and more importantly, to be statistically not significant.

We have defined rural and urban populations based on the *hukou* system. The National Bureau of Statistics of China (NBS) defined rural and urban areas based largely on population density (Chan, 2007). In our sample, there was high concordance (79%) between the *hukou* and NBS classification of rural and urban. To test the robustness of our findings, we had repeated the analysis with rural and urban coded according to the NBS definition and found a similar pattern of results (available upon request) as reported in the results section above.

The specific mechanisms that link each SES component to late-life depression may differ by component. Better-educated people tend to attain a greater sense of control, which in turn facilitates their adaptive strategies for coping with adversity (Williams, 1990). Pensions enable older adults to be financially independent and have a sense of security. Household assets represent economic resources available to the household—and by extension to individual members of the household—to mitigate poverty-related stress and to exchange for such health-generating resources as better housing conditions and healthcare (Elo, 2009). Ongoing exposure to a community with deficient infrastructure may increase the likelihood of experiencing allostatic load, which refers to the wear and tear that the body experiences in responding to repeated hardship and demand (McEwen & Giannaros, 2010). The four components of SES should be correlated. In our data, the highest correlation was between household asset and community infrastructure ($r = -.54$). But our analysis suggests that each was associated with depressive symptoms independent of the others (Model 2, Table 2). Yet none of the SES components alone can fully explain the rural-urban difference (Table 3).

The direction of the relationship between SES and depression is debatable, but increasing evidence supports that individuals with low SES are vulnerable to develop depressive symptoms (Lorant et al., 2003). Our analysis cannot examine causal relationships as cross-sectional data were used. More studies are needed to understand how SES at the individual-, household-, and community-level, separately and as a whole, is related to mental health of older persons in the context of China's *hukou* system.

Although the other three sets of covariates (healthcare access, health status, social support and participation) were also significantly correlated with depressive symptoms, their explanatory power for the rural-urban difference was somewhat limited. Controlling for healthcare access barely affected the estimated rural-urban gap, which was unsurprising given the negligible difference in our measures of healthcare access between rural and urban older adults. Some studies show that the Chinese government's recent investment in healthcare reforms has greatly increased healthcare utilization and reduced rural-urban gap in healthcare access (Meng, Xu, Zhang, et al., 2011; Yip et al., 2012). However, the quality of healthcare that rural and urban elders receive may differ. The CHARLS does not provide measures of healthcare quality.

The role health status played in the rural-urban gap in depressive symptoms was more complex than we had expected. Rural older adults reported fewer chronic conditions and more physical disabilities than urban elders. In the regression analysis, rural-urban differences increased after controlling for chronic conditions, countering the reduction in the rural-urban gap by controlling for ADL and IADL disability. Thus health status as a whole only accounted for a small portion of rural-urban differences in depressive symptoms. Although it was not our focus, the findings that rural elders had higher levels of physical disability than urban elders were contrary to some (Feng et al., 2011; Wen & Gu, 2011; Zeng et al., 2002) but consistent with other prior studies (He, Sengupta, Zhang, & Guo, 2009; Zimmer, Kaneda et al., 2010; Zimmer, Wen, & Kaneda, 2010). Many reasons, including variation in samples and measurement, may contribute to the mixed findings.

Social support and participation attenuated but did not eliminate the rural disadvantage in depressive symptoms. In the full model, only two indicators in this category—partnered status and social participation—were significantly associated with depressive symptoms. Rural older Chinese were less likely to be married/cohabiting than their urban counterparts, and less likely to have some level of social participation. Prior studies have shown that being unmarried and low levels of social participation increase risks of depression (Adams, Sanders, Auth, 2004; Chiao et al., 2011).

As mentioned in the introduction, relevant research in other countries tends to report either no significant differences (Abe et al., 2012; Kim et al., 2002; St John et al., 2006) between rural and urban older adults or an urban disadvantage (Friedman et al., 2007; Kim et al., 2004; Walters et al., 2004) in depressive symptoms. One reason for their findings may be that most of these studies were conducted in developed nations where urban life, relative to rural living, may be more stressful, due to faster pace, higher crime rates, more crowded environment, and higher levels of pollution (McKenzie et al., 2013). Social isolation may also be more prevalent in urban residents as community relationships may be weaker in the

city than in the countryside. Most urban cities in China may not have yet developed to the stage where urban hazards offset or outweigh the advantages associated with urban living. In addition, few countries have institutionalized SES inequalities between the rural and urban population like the *hukou* system in China.

Limitations of this study should be noted. First, our findings should be interpreted as correlations only because cross-sectional data were used. In particular, the factors that we hypothesized to influence depressive symptoms, e.g., healthcare access, social participation and physical disability, could be influenced by depressive symptoms. We have not established the direction of effects and cannot do so with cross-sectional data. Caution should be taken when interpreting the findings. Second, we have taken a static view on depressive symptoms, which by nature are dynamic. Further studies need to investigate how rural and urban older adults differ in the way they experience the onset and trajectory of depressive symptoms. Third, although we have used multiple indicators to measure the four sets of factors (SES, healthcare access, health status, social support and participation) that may account for the rural-urban difference in depressive symptoms, the constructs may not have been captured fully or precisely, which may have contributed to the modest power of some in explaining the rural-urban depression gap. Even with these limitations in mind, this study contributes to growing efforts to understand the rural-urban inequality in mental health among older adults in China and other developing countries where populations are aging and depression is emerging as a public health issue.

Given the cross-sectional nature of our analysis, it may be immature to discuss implications of the findings for practice. Nevertheless, we think that policies and programs that aim to reduce SES inequalities between rural and urban residents, such as expanding pension coverage among the rural population, improving village infrastructure and enabling rural households to accumulate wealth, should do many goods including preventing depression among older adults in rural China.

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Table 1

Sample Characteristics: Total, by Urban and Rural

	Unweighted				Weighted			
	Total (N = 5,103)	Urban (n = 1,192)	Rural (n = 3,911)	χ^2/τ^a	Total (N = 5,103)	Urban (n = 1,192)	Rural (n = 3,911)	F/ τ^a
Depressive Symptoms (range=0–30)	9.89 (6.49)	7.68 (5.90)	10.56 (6.52)	13.67***	9.99 (6.40)	8.18 (6.01)	10.53 (6.42)	8.7***
Age (in years, range=60–101)	68.65 (7.45)	68.86 (7.19)	68.59 (7.45)	1.11	69.57 (8.00)	69.49 (7.67)	69.59 (8.10)	0.31
Sex (% male)	50.01 52.60		49.22	4.18*	48.36	50.24	47.81	1.3
Socioeconomic Status (SES)								
Education (%)				950.78***				157.40***
Illiterate	38.59	15.77	45.54		41.04	18.65	47.68	
Can read and write	20.05	13.34	22.09		19.47	13.18	21.33	
Primary school	22.54	22.82	22.45		21.90	22.31	21.48	
Junior high or more	18.83	48.07	9.92		17.59	44.86	9.52	
Pension benefits (%)				2200***				540.31***
None	63.61	31.12	73.51		63.98	30.83	73.80	
Low	12.48	0.42	16.16		11.68	0.53	14.98	
Medium	11.93	20.47	9.33		12.18	19.37	10.05	
High	11.97	47.99	1.00		12.16	49.27	1.17	
Household asset (%)				1200***				297.63***
Poorest	25.77	6.54	31.63		23.81	5.79	29.14	
Second	26.10	13.17	30.04		24.92	11.51	28.89	
Third	24.46	20.89	25.54		25.54	19.77	27.25	
Richest	23.67	59.40	12.78		25.73	62.93	14.72	
Community infrastructure ^b (%)				1400***				1400***
Most deficient	24.85	3.36	31.40		24.85	3.36	31.40	
Second	25.14	9.14	30.02		25.14	9.14	30.02	
Third	23.87	21.39	24.62		23.87	21.39	24.62	
Least deficient	26.14	66.11	13.96		26.14	66.11	13.96	

	Unweighted				Weighted			
	Total (N = 5,103)	Urban (n = 1,192)	Rural (n = 3,911)	χ^2/α	Total (N = 5,103)	Urban (n = 1,192)	Rural (n = 3,911)	F/ α
Healthcare Access								
Health insurance (% no)	7.07	9.31	6.39	11.85**	7.43	9.72	6.75	8.04**
No physician visit when ill (%)	8.09	6.96	8.44	2.67	7.93	6.91	8.24	1.66
No hospitalization when needed (%)	4.62	3.94	4.83	1.64	4.32	3.75	4.49	1.07
Early self-discharge from hospital (%)	3.25	3.10	3.30	0.11	3.20	2.90	3.05	0.05
Distance to healthcare facility ^b (% within 1 km)	82.44	84.48	81.82	4.46*	82.44	84.48	81.82	4.46*
Health Status								
Chronic conditions (%)				41.96***				11.70***
No	25.85	22.15	26.98		25.93	21.39	27.27	
One	29.02	25.34	30.15		28.79	24.57	30.05	
Two	21.34	22.48	20.99		21.56	23.07	21.11	
Three or more	23.79	30.03	21.89		23.72	30.97	21.58	
ADL disability (% yes)	25.24	17.95	27.46	43.77***	26.27	19.31	28.33	24.47***
IADL disability (% yes)	31.00	20.89	34.08	74.35***	33.51	23.77	36.39	31.11***
Social Support and Participation								
Partnered status(% married/cohabiting)	67.86	73.49	66.15	22.59***	63.02	70.07	60.93	20.11***
Children nearby (% yes)	78.15	70.13	80.59	58.52***	80.37	71.27	83.07	49.46***
Social participation (% yes)	43.54	53.36	40.55	60.92***	42.09	51.61	39.27	34.46***
Elder activity center in community ^b (% yes)	35.27	59.82	27.79	410.3***	35.27	59.82	27.79	410.3***

Note:

^a Pearson chi-squared and t statistics were used to test differences between rural and urban respondents. In the weighted sample, the Pearson chi-squared statistics were converted to F statistics to get a valid p-value because of the complex sampling design.

* p < .05;

** p < .01;

*** p < .001.

^bWeighting was not applied to community-level variables.

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Table 2
Multilevel Linear Regression of Rural-Urban Differences in Depressive Symptoms Among Older Adults in China ($N = 5,103$)

	Model 1: Base	Model 2: SES	Model 3: Healthcare access	Model 4: Health status	Model 5: Social support & participation	Model 6: Base All covariates
Rural (omitted: Urban)	2.549 (.234)***	.383 (.292)	2.534 (.225)***	2.268 (.215)***	1.922 (.231)***	.552 (.294)
Age (in years, centered)	.077 (.012)***	.053 (.012)***	.073 (.011)***	.004 (.011)	.049 (.012)***	-.025 (.012)*
Male (omitted: Female)	-2.038 (.180)***	-1.670 (.185)***	-2.003 (.178)***	-1.464 (.169)***	-1.882 (.184)***	-1.119 (.178)***
Education (omitted: Illiterate)						
Can read and write		-.073 (.239)				.077 (.222)
Primary school		-.738 (.246)**				-.398 (.236)
Junior high or more		-1.537 (.296)***				-1.102 (.281)***
Pension benefits (omitted: None)						
Low		-.830 (.313)**				-1.039 (.276)***
Medium		-.492 (.292)				-.354 (.271)
High		-1.185 (.341)**				-1.004 (.319)**
Household asset (omitted: Poorest)						
Second		-1.072 (.258)***				-.870 (.231)***
Third		-1.794 (.268)***				-1.525 (.247)***
Richest		-2.607 (.319)***				-2.240 (.292)***
Community infrastructure (omitted: Most Deficient)						
Second		-1.125 (.360)**				-.721 (.309)*
Third		-1.560 (.346)***				-.794 (.309)*
Least deficient		-1.582 (.383)***				-.422 (.368)
No health insurance (omitted: Yes)			.506 (.332)		.111	(.318)
No physician visit when ill (omitted: No such experience)			2.969 (.325)***		1.998	(.296)***
No hospitalization when needed (omitted: No such experience)			3.908 (.438)***		2.369	(.409)***

	Model 1: Base	Model 2: SES	Model 3: Healthcare access	Model 4: Health status	Model 5: Social support & participation	Model 6: Base All covariates
Early self-discharge from hospital (omitted: No such experience)			2.037 (.489)***			.756 (.429)
Healthcare facility > 1 km (omitted: within 1 km)			.275 (.335)		.099	(.265)
Chronic conditions (omitted: No)						
One				.889 (.217)***		.908 (.208)***
Two				1.702 (.247)***		1.692 (.239)***
Three or more				2.677 (.264)***		2.495 (.257)***
ADL disability (omitted: No)				2.494 (.236)***		2.145 (.231)***
IADL disability (omitted: No)				2.651 (.228)***		2.295 (.225)***
Partnered (omitted: No)					-.931 (.220)***	-.738 (.200)***
Children nearby (omitted: No)					-.163 (.220)	-.032 (.200)
Social participation (omitted: No)					-1.829 (.186)***	-1.240 (.174)***
Elder activity center (omitted: No)					-1.478 (.249)***	-.215 (.240)
Constant 8.842	(.225)***	13.573 (.403)***	8.559 (.357)***	6.118 (.258)***	11.356 (.354)***	10.645 (.529)***
<i>Individual-level variance</i>	35.205 (.804)	34.357 (.797)	34.124 (.788)	30.906 (.722)	34.434 (.795)	29.268 (.697)
<i>Community-level variance</i>	4.028 (.482)	2.634 (.408)	3.330 (.431)	2.419 (.344)	3.290 (.448)	1.600 (.290)

Note.

^a Unstandardized regression coefficients and (robust standard errors) are presented.

b.

* p < .05;

** p < .01;

*** p < .001.

Table 3

Depressive Symptoms, Rural-Urban *Hukou*, and SES Components ($N = 5,103$)

	Model A: no SES variables	Model B: + only education	Model C: + only pension benefits	Model D: + only household assets	Model E: + only community infrastructure
Rural (omitted: Urban)	1.811 (.209)***	1.324 (.220)***	1.277 (.267)***	1.178 (.226)***	1.496 (.232)***
Education (omitted: Illiterate)					
Can read and write		-.018 (.226)			
Primary school		-.532 (.239)*			
Junior high or more		-1.473 (.279)***			
Pension benefits (omitted: None)					
Low			-.971 (.275)***		
Medium			-.510 (.274)		
High			-1.447 (.319)***		
Household asset (omitted: Poorest)					
Second				-.953 (.231)***	
Third				-1.635 (.248)***	
Richest				-2.495 (.280)***	
Community infrastructure (omitted: Most Deficient)					
Second					-.857 (.309)*
Third					-1.232 (.315)***
Least deficient					-1.449 (.357)***
<i>Individual-level variance</i>	29.929 (.710)	29.741 (.712)	29.803 (.703)	29.505 (.702)	29.919 (.710)
<i>Community-level variance</i>	1.903 (.307)	1.861 (.305)	1.823 (.302)	1.751 (.303)	1.710 (.283)

Note.

^a All models controlled for age, sex, health insurance, physician visit, hospitalization, early self-discharge, distance to healthcare facility, chronic conditions, ADL disability, IADL disability, partnered status, children nearby, social participation, and elder activity center in community.

b.

* $p < .05$;

1000 > d

; 100 < d

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