The State of Mental Health Among the Elderly Chinese

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Abstract

China introduced its stringent family planning policies from the early 1970s, known as the "Later, Longer, Fewer" policies, and followed it with the One-Child Policy from 1979. The number of children born to Chinese parents significantly decreased from 5.7 in late 1960s to 2.5 in 1988. In Chen and Fang (2019), we show that family planning policies have drastically different effects on elderly parents' physical and mental well-beings. Whereas parents more exposed to the family planning policies consume more and enjoy slightly better physical health status, they report more severe depression symptoms. In this paper, we present a more complete picture of the difference in mental health among residents in rural and urban areas, between males and females, between different education groups, between those with one child and those with more than one children, and between widowed and non-widowed. We highlight the role of family support (from children and spouse) for the mental health status among the elderly Chinese.

Keywords: Family Planning; Mental Health; Socioeconomic Status; Family Support

JEL Classification Numbers: H31, I15, I18, J13

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1 Introduction

It has been almost fifty years since China initiated its family planning policies in the early 1970s, when a raft of intensified family-planning policies, including the famous "*Later, Longer Fewer*" campaign, was introduced. In 1979, a more stringent and better-known One-Child Policy came into effect. Figure 1 plots the time series of China's total fertility rate. The rate declined drastically from 5.7 in 1969 to 2.7 in 1978 (Lu and Zhai, 2009), and during the succeeding decade, however, the rate only marginally dropped to 2.5 children in 1988.[1] These family planning policies ushered in China's "quality-quantity" trade-off, whereby Chinese couples have fewer children but make more investment to each of their children.

[Figure 1 About Here]

The early cohorts of Chinese parents affected by the family planning policies are now turning into their sixties and seventies. In Chen and Fang (2019), we showed that the smaller number of children born to Chinese couples following the family planning policies has drastically different implications regarding the parents' physical wellbeings and their mental healths in their old age. On the physical wellbeing side, it can be argued that the reduction in the number of children does not necessarily lead to a deteriorated old-age life for two reasons. First, having fewer children spares resources that can be redirected to parents. The reallocation of resources leads to an improved nutrition intake (Wu and Li, 2012) as well as a higher body mass index (Canning and Schultz, 2012). Moreover, child-raising can be stressful for parents. Having fewer children also reduces parents' burden of childbearing and may benefit their physical and mental health (Gove and Geerken, 1977; Umberson and Gove, 1989; Cáceres-Delpiano and Simonsen, 2012). Second, parents can turn to other measures as the substitutes of children for old-age security. For example, it has been well documented that Chinese households increase their savings in response to the family planning policies (Banerjee et al., 2010; Curtis et al., 2015; Choukhmane et al., 2016; Ge et al., 2018). Indeed, in Chen and Fang (2019), regarding physical well-being, we find that parents with greater exposure to the family planning policies maintain a higher level of consumption. Their physical health is slightly better, and they spend less on medical services.

In contrast, the impact of family planning policies on the elderly parents' mental well-being is much less optimistic. The reduction of the quantity of children due to family planning policies is likely to lead to less companionship, visitations, co-residence, or having children living nearby. The quality-quantity trade-off would imply that children will be more educated, and more educated children are more likely to be mobile and live away from their birthplaces. Therefore, the countervailing channels that may offset the negative effect of fewer children on the parents' physical well-being do not necessarily apply for mental well-being. First, the elderly who are more affected by family planning not only have fewer

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[1] Total fertility rate aggregates the fertility behavior of a group of people at a given time. Women of child-bearing age (15–49 years) are divided into several five-year age groups. Dividing the number of children born to women of a specific age group by the number of women in that group generates the age-specific fertility rate. Summing up the age-specific fertility rates and multiplying them by five gives us the total fertility rate. The total fertility rates represent the number of children a hypothetical woman would give birth to if she immediately went through her entire fertile history given the fertility pattern of the current population.

children to accompany them but also receive fewer contacts and visits per child. What makes things worse is that children with better education and higher income are even less attached to their parents. That is to say, the quantity-quality tradeoff is pushing children further away from parents in terms of geographic proximity. Second, whereas parents can save their earned income when they are young to prepare for the old-age life, they can never "save" children's company. We find in Chen and Fang (2019) that parents more exposed to the family planning policies are more likely to be depressed, and the effect is larger for women and rural parents. Therefore, our study calls for greater attention to the elderly's mental health.

We would like to emphasize that the mental health status of the elderly is of first-order policy importance. China's national elderly suicide rates (ESR) are four to five times higher than the Chinese general population and more than twice the global average of the ESR (Li et al., 2009). The share of suicides committed by the elderly aged 65 or above monotonically increases from 16.9% in 1987 to 41.2% in 2014 (Zhong et al., 2016).

In this paper, we consider the broad picture of the mental health among the near retirement Chinese population, focusing on the differences in the measures of mental depressions between urban vs. rural population, rich vs. poor provinces, male vs. female, educated vs. uneducated, those with one child vs. those with more than one children, widowed vs. non-widowed, as well as the age profiles of these measures. We will then draw some policy lessons from these data patterns. Our study complements but differs from Ichimura et al. (2017), who carry out an international comparison among the elderly population in China, Japan, and Korea. Our study solely focused on the mental issues of the elderly Chinese, with greater emphasis on the age pattern, the role of children, and how the number of children interacts with the age pattern. For example, one novel finding of this study is that parents wither fewer children would experience a steeper increase in depressive symptoms as they become older.

The remainder of the paper is structured as follows. In Section 2, we describe the main data set used for our analysis; in Section 3, we conduct a basic comparison of the elderly mental health landscape between the U.S. and China; in Section 4, we present the descriptive patterns on how various potential influencing factors are correlated with elderly mental health in China; and finally in Section 5, we conclude and discuss the policy implications of our findings.

2   Data and Variable

The data we use for this analysis is the China Health Aging Retirement and Longevity Study (CHARLS), waves of 2011, 2013, and 2015. CHARLS is a nationally representative sample of Chinese residents aged 45 and older, and is the sister study of the U.S. Health and Retirement Study (HRS). The survey covers 150 counties/districts in 28 provinces in mainland China. Different from Chen and Fang (2019) who focus on a sample of individuals aged 60 or more, we use the sample of individuals aged 45 or more in this paper. We use the sample weight in CHARLS throughout our analysis.

The measurement of mental health we use is the CES-D scale (Center for Epidemiologic Studies Depression Scale). CES-D is a brief self-report questionnaire to measure the severity of depressive

symptoms. CHARLS asks ten questions related to depression, eight of which are about negative behaviors and two of which are about positive behaviors (see Appendix B for more details). For the eight negative behaviors, we assign 0 points to "rarely or none of the time"; 1 point to "some or a little of the time (1–2 days a week)"; 2 points to "occasionally or a moderate amount of the time (3–4 days a week)"; 3 points to "most or all of the time (5–7 days a week)." Points are assigned in the opposite order (from 3 to 0 points) for the two positive behaviors. Summing up the points from ten questions gives us the CES-D scale ranging from 0 to 30. The threshold for depression is 10 (Andresen et al., 1994). The share of missing values of CES-D is about 12.4%. The missing values originate from two sources. First, depression-related questions are asked only if the main respondent is present. Second, even if the main respondent is present, he/she may choose not to answer some questions. Following the standard procedure (Andresen et al., 1994), we will code the scale to missing if two or more items are missing.

Figure 2 presents how mental health (measured by CES-D) is associated with self-rated life satisfaction and self-reported health. The box becomes darker when moving towards the lower-right corner, suggesting the elderly who are less satisfied with life or feel less healthy report more severe depressive symptoms. Interestingly, when we calculate the correlation matrix in Table 1, we find that the life-satisfaction is more closely related to mental health (correlation=0.329) than self-reported health (correlation=0.206) and this pattern is consistent across all the subsample (female/male, rural/urban). Of course, we cannot establish the causality of mental health upon life satisfaction. However, the empirical facts above suggest that mental health status at least serves as a strong indicator for subjective well-being.

[Figure 2 About Here]

[Table 1 About Here]

When choosing the influencing factors of mental health, we focus on variables that are mostly predetermined before people get old and cannot be reversely affected by the health status of the elderly. Those factors fall into three categories: basic demographic variables (gender and age), socioeconomic factors (such as *hukou* (rural/urban), education, region (western/middle/eastern)), and family-related information (such as number of living children, and widowhood). We try to avoid variables that would respond to the health status of the elderly, such as living arrangements, financial transfer, and medical expenses. Table 2 reports the summary statistics of our data. Our sample on average were 60.3 years old and have 2.71 children; 70.1% of them have rural *hukou*; 52.9% are female; 13.0% are widowed elderly. Elderly Chinese are generally poorly educated—one-fourth of them are illiterate, and only 36.8% received some post-primary education.

[Table 2 About Here]

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3 Challenges Faced by the Elderly Chinese: a China-U.S. Comparison

Table 1 shows that over 30% of the elderly Chinese report to be depressed (CES-D$\geq$10). However, we cannot judge the severity of this number without a benchmark. We attempt to understand the challenges in the mental health issues faced by the elderly Chinese through a China-U.S. comparison. Note that the international comparison can be tremendously difficult and our discussion here is more suggestive than conclusive.

Because CHARLS in China is a sister study of HRS in the U.S., it is natural to use those two studies for the comparison purpose. We restrict the CHARLS sample to those aged above 50 to match the age range in HRS. We also pick two waves in HRS (2012 and 2014) to make the time range close between the two studies. However, the central difficulty is to construct a comparable index for mental health status. CHARLS adopts a CES-D 10 scale with ten questions. HRS instead adopts a CES-D 8 scale with eight questions only. Two scales share six common questions. They are: felt depressed; felt everything I did was an effort; sleep was restless; (positive) was happy; felt lonely; could not get "going." Therefore, we construct a new index using only those six questions. Note that the combination of six questions is not a standard way to measure depression in the psychology or medical literature and its validity is subject to debate. A second difficulty is that the number of options is also different. CHARLS has four options for each question (from "rarely or none of the time (<1 day)" to "most or all of the time (5-7 days)." HRS has only "yes" or "no" option. For example, "Much of the time during the past week, you felt depressed. Would you say yes or no?"

To make the China-U.S. comparison, we first take six common questions from CHARLS and HRS. Then we transform the four options in CHARLS to yes/no answer. We try two methods. One is to treat frequencies$\geq$3-4 days a week as "yes." The other is to treat frequencies$\geq$1-2 days a week as "yes." Figure 3 compares the newly constructed CES-D scale for six common questions. Even with the more conservative method that treats $\geq$3-4 days a week as "yes," Chinese elderly report more depressive symptoms than their U.S. counterparts through the entire elderly life.

[Figure 3 About Here]

We complement our previous discussion with a more subjective (but also more extreme) measure—age-specific suicide rate. We take the year 2017 as the benchmark. The U.S. suicide data come from the CDC (Centers for Disease Control and Prevention), and the Chinese data come from China Hygiene and Health Statistical Yearbook 2018. Figure 4 presents interesting findings. Whereas the youth suicide rates are much higher in the U.S., the rates are flat when people get old. The suicide rates are generally low for the Chinese youth, but they begin to rise quickly since the mid-50s. The situation is more worrisome for the elderly in rural China. The combination of Figures 3 and 4 reveal the challenge of mental health issues for the Chinese elderly, more so than their American counterparts.

[Figure 4 About Here]

4 Potential Influencing Factors for Mental Health

We discuss in this section potential influencing factors for mental health. We first present important heterogeneity (across *hukou*, gender and age) in the mental health status in the elderly population. We then show how socioeconomic factors are correlated with mental health. Next, we highlight the importance of family companions from children and spouse. We conclude this section with a regression analysis that simultaneously incorporates previously mentioned factors.

4.1 Population Heterogeneity in Mental Health

Rural (Female, respectively) residents have worse mental health than urban (male, respectively) residents. Figure 5 plots the kernal distribution by *hukou* status and gender, respectively. The occurrence rate of depression is as high as 35.4% for rural residents, compared to a rate of 22.5% for their urban counterparts. Women are more likely to feel depressed than men do (37.7% versus 24.6%). Table 2 reports the summary statistics of the four groups.[2] Unsurprisingly, the rural-urban difference is huge in almost every aspect. Urban residents are better educated, have fewer children, and report fewer depressive symptoms. They also self-report to better enjoy life and have a better health status. The rural-urban discrepancy casts a shadow on the mental-wellbeing of the rural elderly, which echoes their higher suicide rates (Figure 4).

[Figure 5 About Here]

The measurement of mental health (CES-D scale) is constructed from ten subjective questions. Can the heterogeneity above simply originate from one or two questions? Table A1 divides the CES-D scale into ten smaller items and suggests this is not the case—rural and female residents get higher scores on all ten depressive symptom than their urban and male counterparts. This consistent pattern gives some support to the robustness of CES-D scale as a measure of mental health.

Figure 6 plots the age pattern for four groups (rural, urban, female, and male). The depressive symptoms become more severe for the older population, which is consistent with the fact China's suicide rates start to rise rapidly with age after the mid-fifties (Figure 4). Figure 6 also shows that the gender gap in CES-D is stable across age, but the rural-urban gap seems to become larger as people become older. This is again consistent with the pattern of the suicide rates—the rising trend with age is more salient in rural China.

[Figure 6 About Here]

Table 3 reports the summary statistics by groups of age (45–54, 55–64, 65–74, 75+). CES-D scale rises steadily as people age. The increase is largest from age 45–54 to 55–64 (mean CES-D scale increases from 7.07 to 7.83). The scale becomes relative stable afterward. Note that the no-response rate becomes high when people reach age 75 (28.7%), which is not surprising because the elderly need to answer those

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[2]Note that the no-response rates are similar among the four groups, suggesting that the selective response cannot explain the rural-urban gap and the female-male gap.

questions on their own. If we assume the elderly who are not able to answer those subjective questions themselves have worse mental health, the situation of mental health of the elderly Chinese could be even worse than that suggested in the data. Table A2 presents the age pattern of each CES-D question. Up till age 75, people report more depressive symptoms in nine out of ten questions as they turn older (the only exception is "bothered by things that don't usually bother me"). The largest contributor to the increase in CES-D is that older people are feeling less hopeful about the future.

[Table 3 About Here]

4.2 Socioeconomic Factors and Mental Health

Figures 7 and 8 compare mental health across education level (illiterate/some primary education/secondary education or above) and region (western/middle/eastern). The eastern coastal provinces are the most developed areas of China and a vast western region remains relatively under-developed. Figures 7 and 8 suggest that the elderly with higher levels of education and those in eastern China have fewer mental problems. All those pieces of evidence indicate a positive association between mental health and socioeconomic status (SES).

[Figures 7 and 8 About Here]

It is worth emphasizing here that rural-urban differentials are also partially in line with the positive correlation between mental health and SES. Urban elderly are generally believed to be economically better off and they also enjoy better mental health. Fang and Feng (2018) provide a comprehensive review of the pension system in China. Rural and urban residents fall into different pension schemes, a fact which explains an important part of the inequalities in the pension system. Urban employees are either entitled to the Basic Old Age Insurance (BOAI) for enterprise employees or to the more generous Public Employee Pension (PEP) for civil servants and employees in the non-profit public sector. BOAI has a target replacement rate (pension benefit as a percentage of pre-retirement wage) of 59.2% (the rate is as high as 75–90% back to the mid-1990s), and PEP has an even higher replacement rate of 80–90%. In contrast, the pension system in rural China is vacant until the establishment of New Rural Resident Pension (NRP) in 2009. The national-wide replacement rate is as low as about 20% of rural per capita net income.

4.3 Companion from Family Members

We discuss in this subsection the importance of family members (children and spouse) on elderly' mental well-being. Previous studies stressed social isolation as an important risk factor for depression (Cappeliez and Flynn, 1993) and claimed that children play vital roles in parents' social network and in preventing loneliness in old age (Bures et al., 2009). Two important changes in the past several decades can cause future elderly Chinese feel more lonely compared with the earlier cohorts. First, as a result of both the strict family planning policies and the rapid economic development, younger cohorts are likely to end up with very few children when they become old. Second, in the background

of mass migration, the size of the migrant population reached 247 million in 2015.[3] Because of the high living costs and difficulty in obtaining the local *hukou* in destination cities, a large proportion of the population migrate on their own—creating problems of not only left-behind children but also left-behind elderly. Previous studies uncovered the association between having migrant children and older parents' increased depressive symptoms (Connelly and Maurer-Fazio, 2016; Song, 2017).

Figure 9 highlights the importance of children. Admittedly, more dedicated work is necessary to draw a causality inference, but Figure 9 presents two patterns that suggest children can play a vital role in elderly's mental health. First, it is unclear that the elderly with more children have a higher level of depression. Recall that SES is negatively associated with depression (Figures 7 and 8) and is also negatively associated with fertility. The lack of a positive association between fertility and depression suggests the positive impact of children offset the disadvantage of SES. Second and more importantly, people with fewer children would experience a faster increase in CES-D as they grow old. The rising trend is most prevalent for single-child parents (the red line). To the best of our knowledge, this observation is novel in the literature.

[Figure 9 About Here]

The age pattern of parents' mental health in relationship to the number of children documented in Figure 9 suggests a potential reason for the low fertility desire by the current generations of Chinese parents. A typical explanations for low fertility desire is the high *financial* cost of raising children; but Figure 9 highlights that higher *mental* stress from having two or more children when parents are younger than 65 could be another reason. The mental health benefits of having two or more children are not experienced by the parents until they are 65 or older, but they have to endure much more mental stress until then. Previous literature has documented both time and financial pressure of children for young parents (Milkie et al., 2009; Cáceres-Delpiano and Simonsen, 2012; Ruppanner et al., 2019). This life-cycle trade-off of the mental costs from raising one vs. two or more children can also play a role in parents' low desired fertility.

Figure 10 presents the association between widowhood and depression symptoms. Unsurprisingly, female are more likely to be widowed, especially for the very elderly. There are two notable findings. First, widowed elderly report much higher CES-D scores. Second, the gap between widow and non-widow is especially large before the seventies, when widowhood is not that prevalent. This suggests the unexpected early widowhood is especially detrimental to one's mental health status. Figures 9 and 10 highlight the crucial role of family members' companion in the mental well-being of the elderly Chinese.

[Figure 10 About Here]

4.4   Children and Mental Health in the United States

A novel finding from Figure 9 is that the number of children is associated with the *age profile* of the mental health—parents with fewer children would experience a faster increase in depression symptoms

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[3]Data source: Migrant Population Service Center, National Health Commission of China.

as they become older. It is helpful to understand whether this pattern is unique in China, probably due to some China-specific factors such as the One-Child Policy. We plot in Figure 11 similar age profiles for the U.S. elderly using the 2012 and 2014 waves of HRS. Recall that the measurement of CES-D in HRS is different from that of CHARLS. It contains eight instead of ten questions (with one question being positive) and simplified four frequency options to a yes-or-no answer.

[Figure 11 About Here]

We observe both differences and similarities from the China-U.S. comparison (Figures 9 and 11)—whereas the general age patterns of mental health are different in two countries, having too few children seems to be problematic for the very elderly in both countries. Different from a steadily-increasing age profile since mid-forties in China, the age profile of CES-D in the U.S. gradually declines until the early seventies and then starts to increase. Note that the elderly in the U.S. with only one child also experience the steepest increase since the early seventies. Another interesting finding from Figure 11 is that mental problems generally decrease if parents have fewer children—but only if the number of children is two or more (4+ children>3 children>2 children<1 child). The elderly with only one child have worse mental health than those with two children. The main takeaway here is that children play a vital role in the mental health status of the elderly in both China and the U.S., and we should pay attention to the effect of children on the *age profile* of depression in addition to the *level* of depression.

4.5   A Regression Framework

Previous subsections investigate different influencing factors one by one. Table 4 adopts a regression framework that incorporates those factors in a single equation.[4] The regression results confirm that our previous findings still hold while controlling for other covariates. Residents with urban *hukou* are less likely to be depressed; mental health becomes worse as people become older up until age 75;[5] better-educated people have better mental health; widowhood is detrimental for the mental well-being of the elderly.

[Table 4 About Here]

The coefficients of the number of children (and its interaction with age) worth further attention. Columns (1), (3), (5) and (7) do not control the children-age interaction and seemingly suggest the association between number of children and mental health status is weak. However, new patterns show up after we control for the children-age interaction (columns (2), (4), (6) and (8)). Parents with fewer children are mentally better-off at age 45 but have a steeper depression-age profile. Take the results from Column (2) in Table 4 as an example. The CES-D scale of a woman with only one child is 1.324

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[4]Table 4 uses the number of currently living children as the measure of children number. Alternatively, Table A3 instead uses the number of children ever born. Those two numbers can differ because of adoption and children's early decease. The two tables yield almost identification results.

[5]Because of the high chances of missing CES-D for elderly people aged over 75, the coefficients before aged 75+ should be interpreted with caution.

lower than that of a woman with more than four children. However, after each year the woman with single child would experience 0.058 more increase in CES-D, which means her mental health would turn worse after age 68, relative to a woman with more than four children.

5   Conclusion and Policy Implications

After four decades of rapid economic growth, the material needs of the Chinese people are increasingly satisfied. We foresee that people's mental well-being will receive growing attention in the future. We look into the mental health issues among the elderly Chinese in this paper using three waves (2011/2013/2015) of CHARLS data. We have three main findings. First, we document the generally worrisome situation of the mental health status of the Chinese elderly. More than 30% of the elderly Chinese are diagnosed as depression (CES-D≥10). The situation becomes worse as they become older. The suicide rate (number of committed suicide per 100,000) is 3.57 for the urban population aged 45–49. This rate experiences an almost three-fold increase to 14.03 in the next 30 years (75–79). The rise in the suicide rate is even more salient for the rural elderly—from 6.11 in age 45–49 to 31.57 in age 75–79. Second, we identify several factors that are associated with an even worse mental health status: being women, having rural *hukou*, living in inland provinces, and being less-educated. These findings help to pinpoint the elderly who need greater attention. Third, we highlight the crucial role of spouse and children in supporting the mental well-being of the elderly. Widowhood, especially early widowhood, is disastrous for one's mental health. One novel finding of this study is that the negative consequences of having fewer children do not show up when the parents are not that old (in their forties or fifties). But their mental health gets worse at a faster pace compared to parents with many children.

Our empirical analysis has important implications for the evolution of the mental health status of the Chinese elderly in the future. There are good news and bad news. The good news is: future Chinese elderly are much better-educated and have a higher SES status, which is beneficial to their mental health. Increasing urbanization rates and a more mature pension system can also improve their mental well-being. The bad news is: with the enforcement of family planning policies, they will end up with much fewer children, which can be a potential concern. Greater social interaction (e.g., community elderly care) can be a possible substitute for the decreasing psychological support from children. Of course, to what extent social support can substitute family support is an open question.

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Figure 1: National Total Fertility Rate, 1949–2002
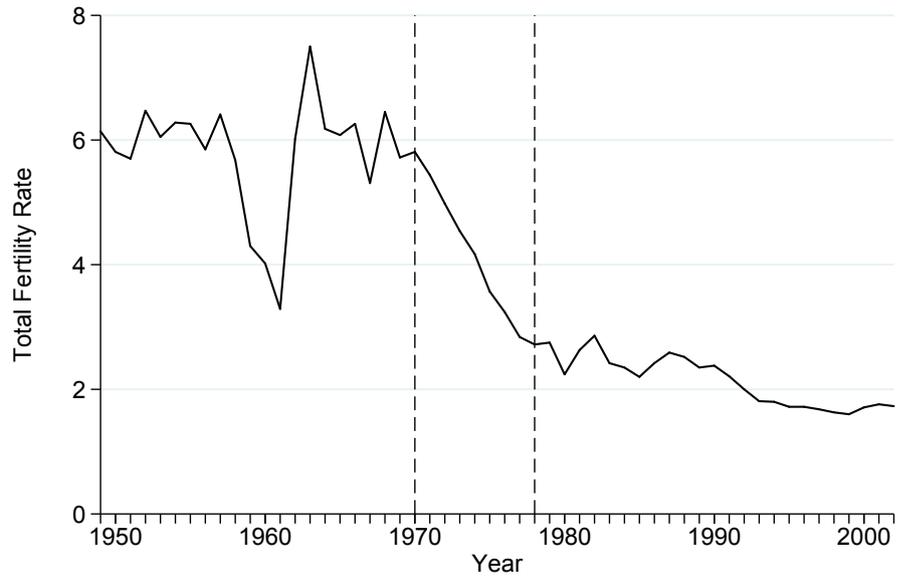
Data source: Total fertility rates 1949–2002 come from Lu and Zhai (2009) "Sixty Years of New China Population."

Figure 2: The Associated between Self-Rated Life Quality and Mental Health
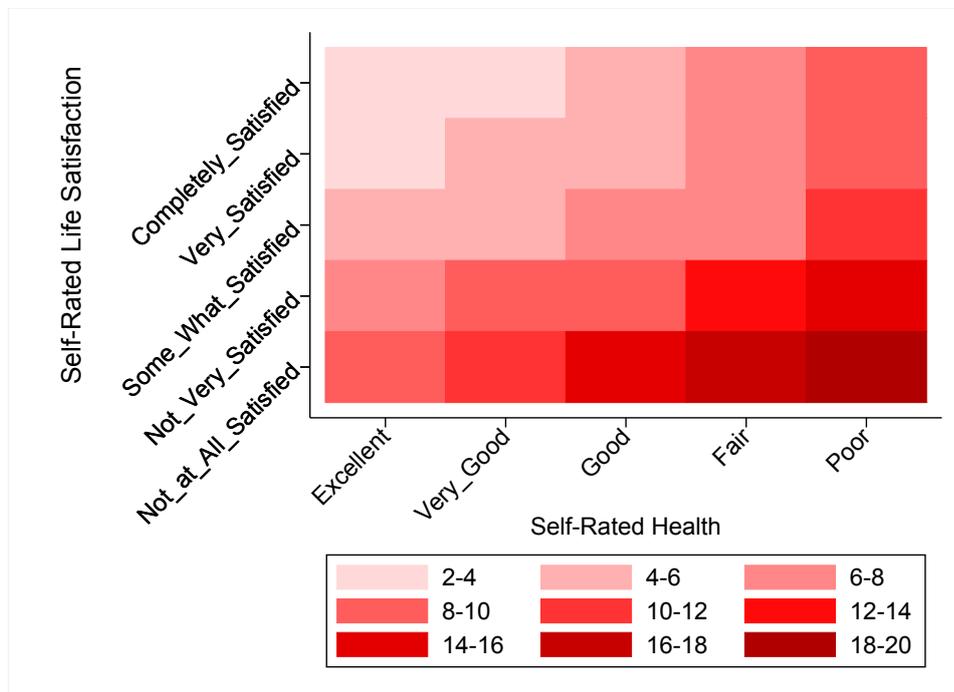
Figure 3: Mental Health, China versus U.S.
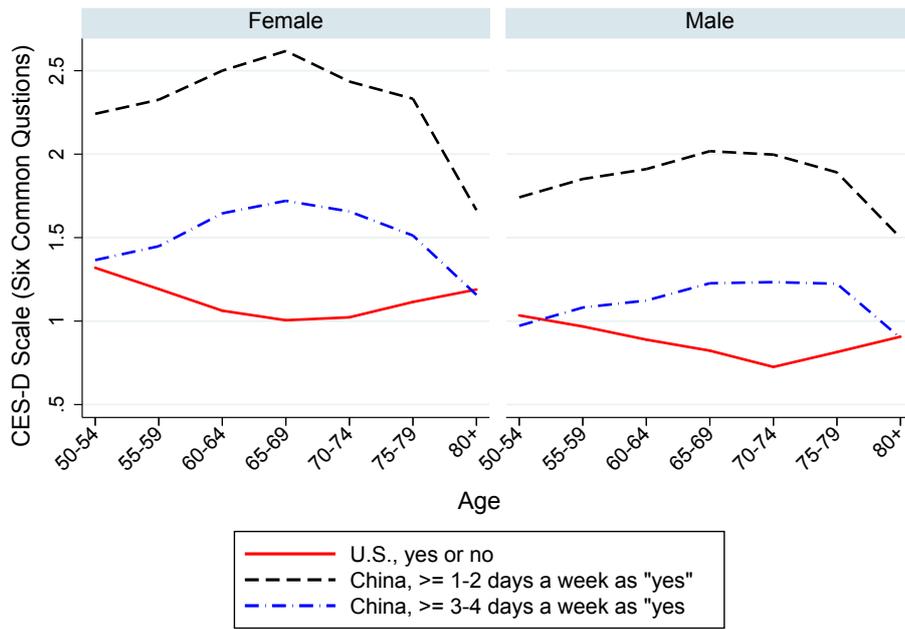
Figure 4: Suicide Rates, China versus U.S.
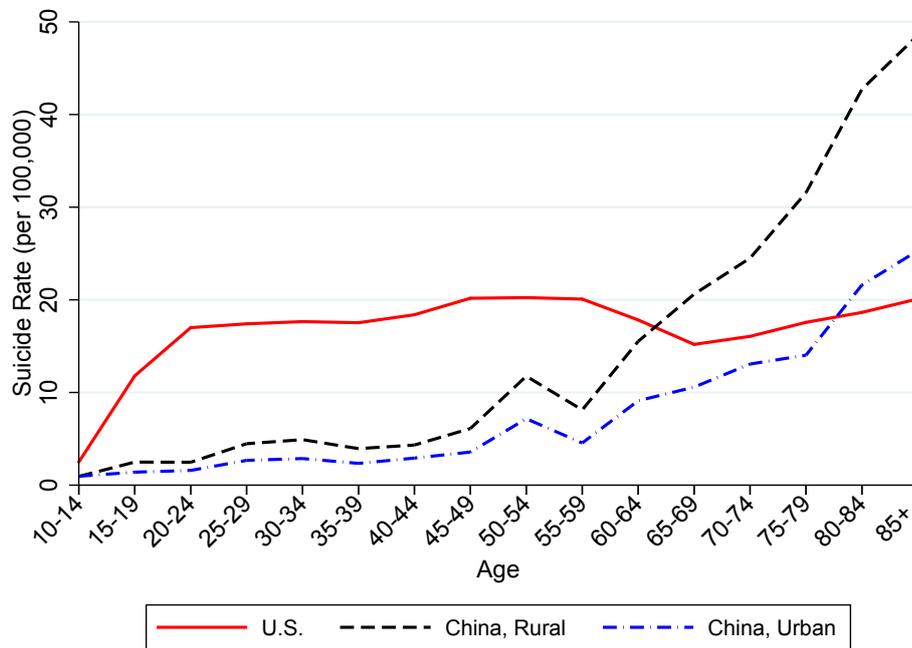
Figure 5: Distribution of CES-D Scale (Rural versus Urban, Female versus Male)
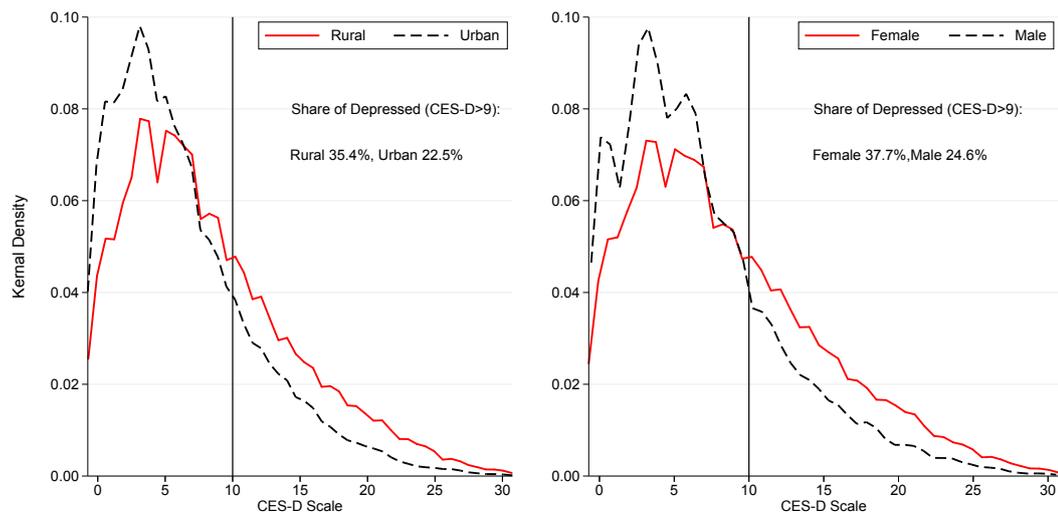
Figure 6: Age Pattern of Mental Health
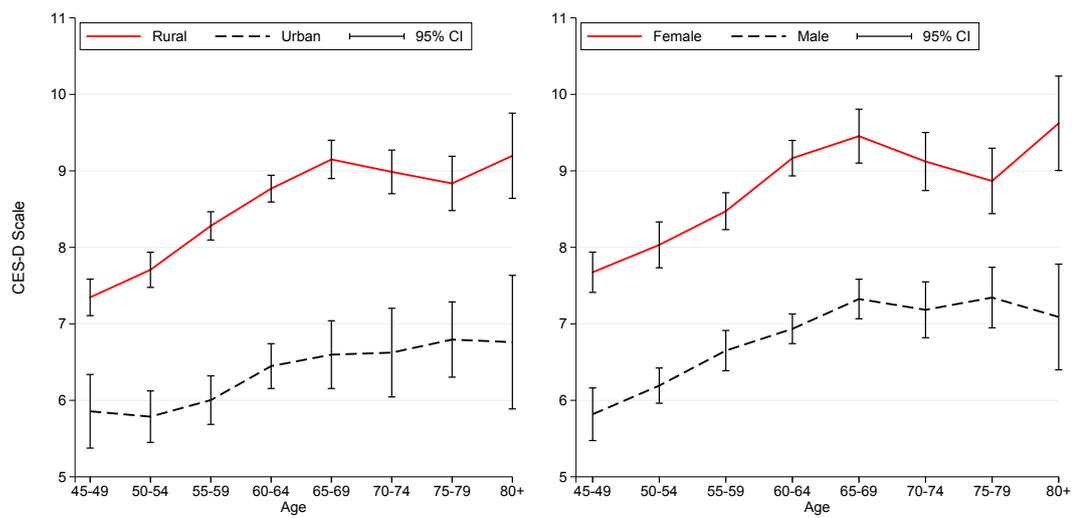
Figure 7: Comparing Mental Health across Education Levels
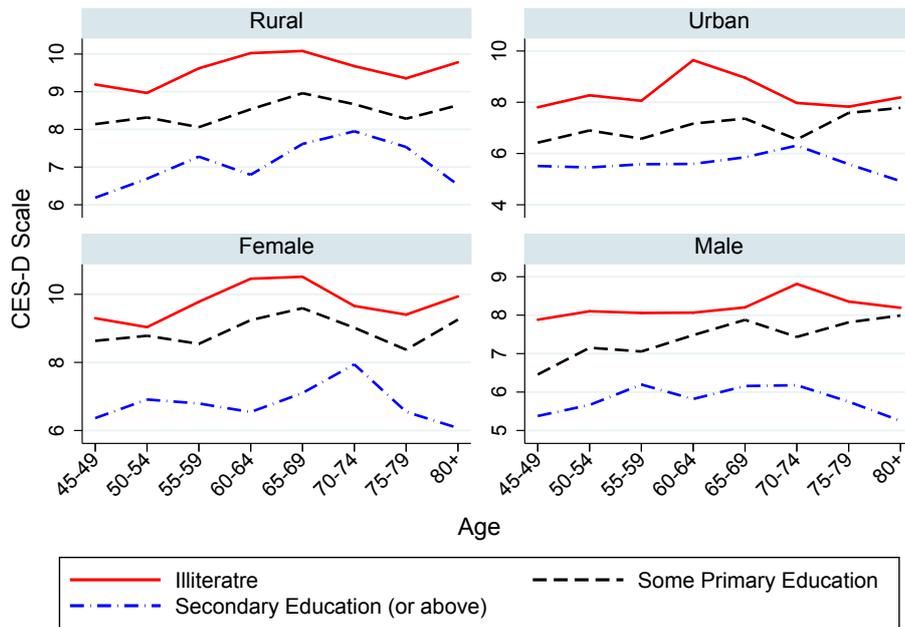
Figure 8: Comparing Mental Health across Regions
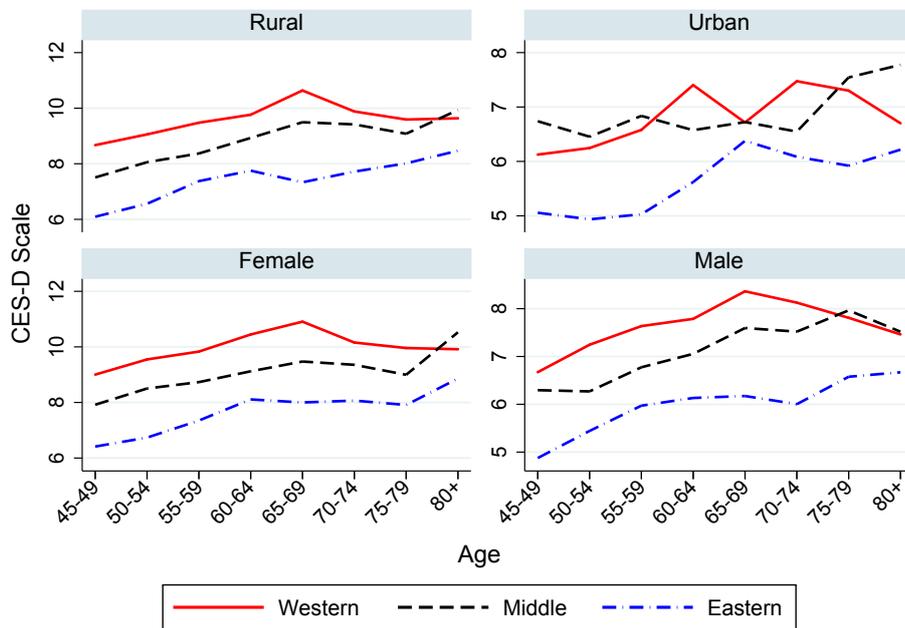
Figure 9: Comparing Mental Health across Number of Living Children in China using CHARLS
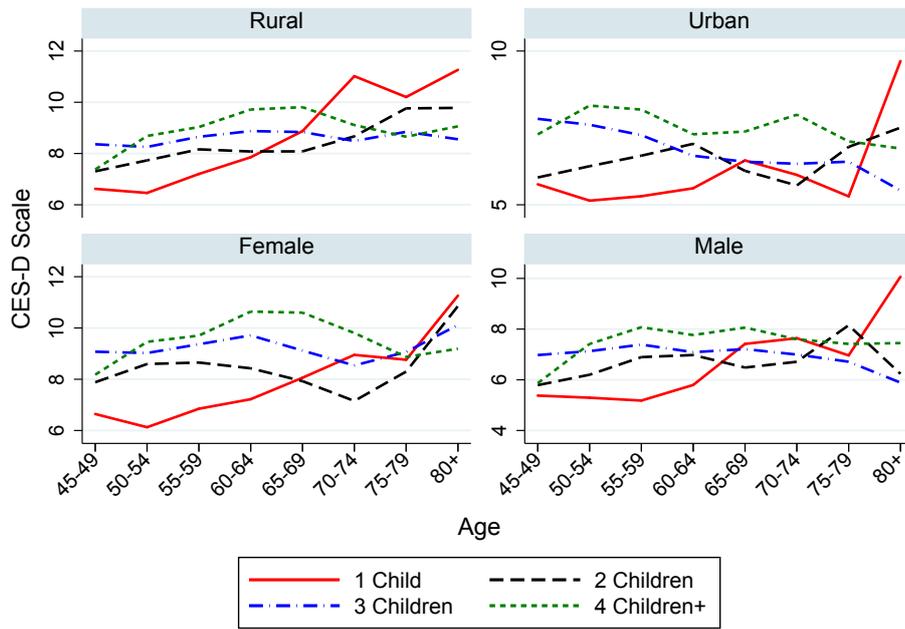
Figure 10: Widowhood and Mental Health
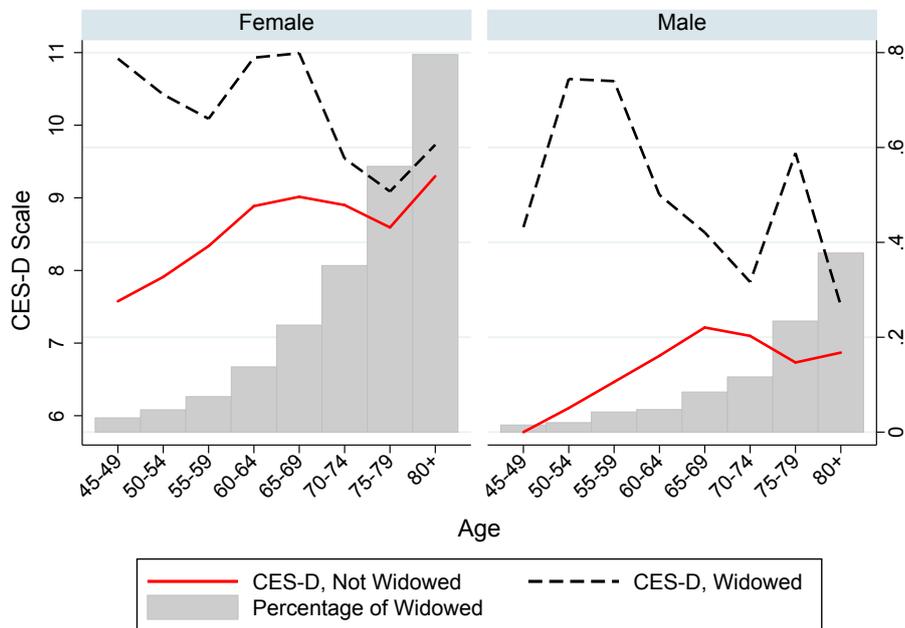
Figure 11: Comparing Mental Health across Number of Living Children in the United States using HRS
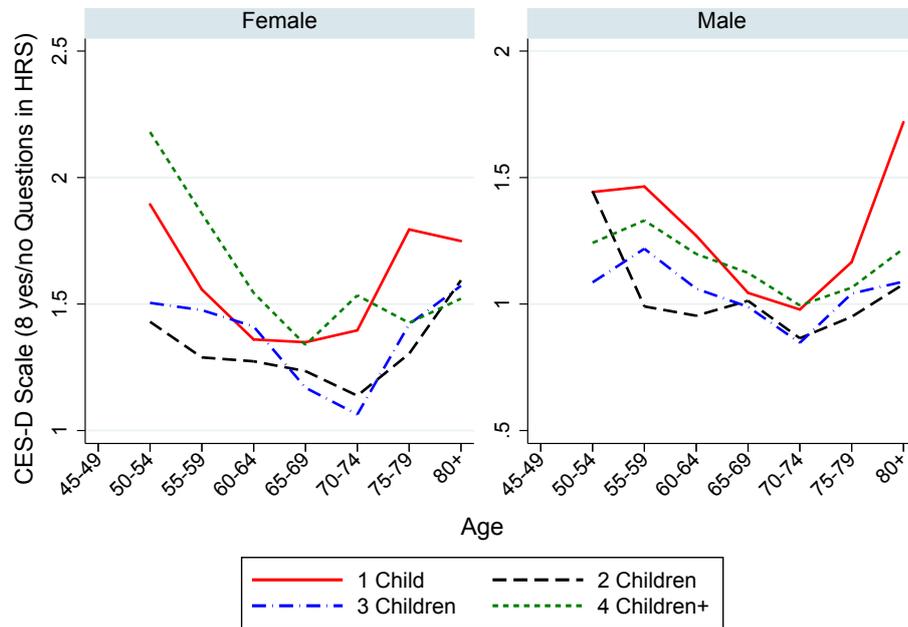
Table 1: Correlation Matrix among CES-D, Self-Rated Life Satisfaction, and Self-Rated Health

	CES-D	Self-Rated Life Satisfaction	Self-Rated Health
Total			
CES-D	1.000		
Self-Rated Life Satisfaction	0.3286	1.000	
Self-Rated Health	0.3514	0.2060	1.000
Female			
CES-D	1.000		
Self-Rated Life Satisfaction	0.3468	1.000	
Self-Rated Health	0.3548	0.2098	1.000
Male			
CES-D	1.000		
Self-Rated Life Satisfaction	0.3027	1.000	
Self-Rated Health	0.3356	0.1986	1.000
Rural			
CES-D	1.000		
Self-Rated Life Satisfaction	0.3311	1.000	
Self-Rated Health	0.3499	0.2080	1.000
Urban			
CES-D	1.000		
Self-Rated Life Satisfaction	0.3210	1.000	
Self-Rated Health	0.3319	0.1960	1.000

Table 2: Summary Statistics (Rural versus Urban; Female versus Male)

Sample	All	Rural	Urban	Female	Male
Basic Information					
Age	60.300 (10.391)	60.002 (10.363)	60.988 (10.410)***	60.025 (10.728)	60.611 (9.992)°°°
Rural	0.701 (0.458)			0.712 (0.453)	0.689 (0.463)°°°
Female	0.529 (0.499)	0.537 (0.499)	0.510 (0.500)***		
# Living Children	2.708 (1.576)	2.932 (1.592)	2.181 (1.404)***	2.790 (1.644)	2.615 (1.490)°°°
# Widowed	0.130 (0.336)	0.137 (0.344)	0.113 (0.316)***	0.179 (0.383)	0.075 (0.263)°°°
Education					
Illiteratre	0.249 (0.432)	0.313 (0.464)	0.093 (0.291)***	0.371 (0.483)	0.110 (0.313)°°°
Some Primary Education	0.383 (0.486)	0.428 (0.495)	0.277 (0.447)***	0.348 (0.476)	0.424 (0.494)°°°
Secondary Education (or above)	0.368 (0.482)	0.259 (0.438)	0.630 (0.483)***	0.281 (0.450)	0.466 (0.499)°°°
Region					
Western	0.399 (0.490)	0.397 (0.489)	0.405 (0.491)	0.396 (0.489)	0.404 (0.491)
Middle	0.305 (0.460)	0.285 (0.451)	0.352 (0.478)***	0.304 (0.460)	0.306 (0.461)
Eastern	0.296 (0.456)	0.318 (0.466)	0.244 (0.429)***	0.300 (0.458)	0.290 (0.454)°
Health					
CES-D Scale	7.699 (6.015)	8.314 (6.202)	6.247 (5.265)***	8.583 (6.354)	6.701 (5.438)°°°
Depression (CES-D$\geq$ 10)	0.316 (0.465)	0.354 (0.478)	0.225 (0.418)***	0.377 (0.485)	0.246 (0.431)°°°
CES-D No Response	0.124 (0.330)	0.122 (0.328)	0.128 (0.334)	0.122 (0.327)	0.126 (0.332)
Self-Reported Life Satisfaction	2.813 (0.749)	2.827 (0.769)	2.780 (0.699)***	2.832 (0.774)	2.791 (0.720)°°°
(from 1 to 5, smaller number means more satisfied)					
Self-Reported Health	3.421 (1.043)	3.473 (1.047)	3.296 (1.024)***	3.494 (1.031)	3.338 (1.050)°°°
(from 1=Excellent to 5=Poor)					
Observations	48935	37488	11415	25807	23117

Note: *, **, *** (°, °°, °°°) means statistically significant different at 10%, 5%, 1% for rural-urban (female-male) comparison. Standard deviations are in the parenthesis.

Table 3: Summary Statistics by Group of Age

Age Range	45–54	55-64	65–74	75+
Basic Information				
Age	49.628 (2.636)	59.419 (2.785)	69.020 (2.878)	80.377 (4.748)
Rural	0.726 (0.446)	0.701 (0.458)	0.678 (0.467)	0.667 (0.471)
Female	0.560 (0.496)	0.512 (0.500)	0.497 (0.500)	0.536 (0.499)
# Living Children	2.006 (0.972)	2.428 (1.236)	3.446 (1.632)	4.398 (2.046)
# Widowed	0.029 (0.168)	0.076 (0.264)	0.189 (0.391)	0.505 (0.500)
Education				
Illiteratre	0.123 (0.329)	0.251 (0.434)	0.292 (0.455)	0.531 (0.499)
Some Primary Education	0.335 (0.472)	0.397 (0.489)	0.473 (0.499)	0.318 (0.466)
Secondary Education (or above)	0.542 (0.498)	0.352 (0.478)	0.235 (0.424)	0.152 (0.359)
Region				
Western	0.421 (0.494)	0.401 (0.490)	0.356 (0.479)	0.403 (0.490)
Middle	0.293 (0.455)	0.314 (0.464)	0.317 (0.465)	0.296 (0.456)
Eastern	0.286 (0.452)	0.285 (0.452)	0.327 (0.469)	0.302 (0.459)
Health				
CES-D Scale	7.073 (5.797)	7.828 (6.051)	8.270 (6.206)	8.225 (5.988)
Depression (CES-D$\geq$ 10)	0.278 (0.448)	0.325 (0.468)	0.348 (0.476)	0.342 (0.474)
CES-D No Response	0.114 (0.318)	0.096 (0.295)	0.091 (0.287)	0.287 (0.452)
Self-Reported Life Satisfaction	2.862 (0.758)	2.831 (0.734)	2.760 (0.750)	2.691 (0.747)
(from 1 to 5, smaller number means more satisfied)				
Self-Reported Health	3.272 (1.039)	3.423 (1.041)	3.570 (1.018)	3.610 (1.038)
(from 1=Excellent to 5=Poor)				
Observations	16224	17768	10069	4607

Table 4: Regression of CES-D Scale on a Set of Individual Characteristics

	CES-D Scale				CES-D $\geq$ 10			
	Female		Male		Female		Male	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
N.Child (Ref: $\geq$4 children)								
No living child	0.823	-2.343**	-1.300	1.053	0.173**	-0.097	-0.096*	-0.116
	(0.985)	(1.070)	(1.006)	(1.158)	(0.074)	(0.080)	(0.050)	(0.098)
1 child	-0.374	-1.324***	-0.080	-0.710	0.009	-0.097***	-0.005	-0.091**
	(0.250)	(0.398)	(0.242)	(0.437)	(0.020)	(0.032)	(0.020)	(0.036)
2 children	-0.406**	-1.132***	-0.301	-1.052**	-0.007	-0.092***	-0.017	-0.107***
	(0.189)	(0.365)	(0.215)	(0.454)	(0.015)	(0.029)	(0.018)	(0.038)
3 children	-0.031	-0.725*	-0.286	-0.326	-0.005	-0.082***	-0.024	-0.068**
	(0.188)	(0.395)	(0.203)	(0.397)	(0.014)	(0.030)	(0.017)	(0.032)
N.Child*Age (Ref: $\geq$4 children)								
No living child $\times$ (Age-45)		0.178***		-0.146*		0.015***		0.000
		(0.066)		(0.079)		(0.005)		(0.005)
1 child $\times$ (Age-45)		0.058**		0.039*		0.006***		0.005***
		(0.023)		(0.021)		(0.002)		(0.002)
2 children $\times$ (Age-45)		0.035*		0.045**		0.004***		0.005***
		(0.020)		(0.020)		(0.002)		(0.002)
3 children $\times$ (Age-45)		0.033		-0.003		0.004**		0.002
		(0.021)		(0.018)		(0.002)		(0.001)
Age		-0.028		-0.015		-0.006**		0.000
		(0.030)		(0.027)		(0.002)		(0.002)
Age Group (Ref: 45–49)								
50-54	0.448***	0.362*	0.617***	0.540***	0.026*	0.027*	0.033**	0.013
	(0.165)	(0.193)	(0.189)	(0.197)	(0.013)	(0.016)	(0.013)	(0.016)
55-59	0.610***	0.464	0.857***	0.683**	0.041***	0.048*	0.052***	0.010
	(0.181)	(0.321)	(0.230)	(0.299)	(0.015)	(0.026)	(0.019)	(0.028)
60-64	0.797***	0.613	0.811***	0.596	0.057***	0.071**	0.053***	-0.007
	(0.200)	(0.446)	(0.204)	(0.402)	(0.016)	(0.035)	(0.015)	(0.035)
65-69	0.917***	0.748	1.185***	0.983*	0.061***	0.088*	0.068***	-0.003
	(0.245)	(0.586)	(0.221)	(0.523)	(0.018)	(0.046)	(0.017)	(0.046)
70-74	0.577*	0.476	1.020***	0.898	0.056*	0.103*	0.062***	-0.016
	(0.340)	(0.754)	(0.261)	(0.657)	(0.029)	(0.060)	(0.019)	(0.057)
75+	-0.090	-0.059	0.903***	0.854	0.012	0.093	0.041*	-0.042
	(0.317)	(0.908)	(0.306)	(0.839)	(0.025)	(0.070)	(0.024)	(0.071)
Education (Ref: Illiterare)								
Did not finish primary	-0.114	-0.141	0.193	0.207	0.009	0.006	0.017	0.018
	(0.181)	(0.180)	(0.212)	(0.212)	(0.014)	(0.014)	(0.017)	(0.016)
Primary	-0.371*	-0.400**	-0.416**	-0.408**	-0.013	-0.017	-0.020	-0.021
	(0.199)	(0.197)	(0.191)	(0.191)	(0.015)	(0.015)	(0.015)	(0.015)
Junior high	-0.982***	-0.983***	-0.934***	-0.925***	-0.067***	-0.067***	-0.044**	-0.043**
	(0.240)	(0.240)	(0.215)	(0.215)	(0.020)	(0.020)	(0.018)	(0.018)
Senior high or above	-1.750***	-1.740***	-1.440***	-1.444***	-0.127***	-0.126***	-0.088***	-0.088***
	(0.265)	(0.264)	(0.232)	(0.231)	(0.020)	(0.020)	(0.018)	(0.018)
Urban hukou	-0.410	-0.395	-0.748***	-0.730***	-0.013	-0.011	-0.045**	-0.043**
	(0.272)	(0.270)	(0.221)	(0.219)	(0.023)	(0.022)	(0.019)	(0.019)
Widowed	1.368***	1.370***	1.454***	1.444***	0.077***	0.079***	0.110***	0.108***
	(0.199)	(0.200)	(0.288)	(0.288)	(0.015)	(0.015)	(0.033)	(0.033)
R-Squared	0.171	0.172	0.150	0.151	0.132	0.134	0.115	0.117
Observations	21725	21725	19169	19169	21725	21725	19169	19169

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered at the household level. Community fixed effects and survey year fixed effects are also controlled for.

A Additional Figures and Tables

Table A1: Comparing Depression Symptoms across Different Groups (Rural versus Urban; Female versus Male)

Sample	All	Rural	Urban	Female	Male
Questions					
Bothered by things that don't usually bother me	0.848	0.903	0.715***	0.979	0.698°°°
Had trouble keeping my mind on what I was doing.	0.792	0.844	0.667***	0.885	0.687°°°
Felt depressed	0.807	0.881	0.629***	0.932	0.665°°°
Felt everything I did was an effort	0.823	0.926	0.577***	0.915	0.719°°°
(Positive) Felt hopeful about the future	1.339	1.405	1.182***	1.356	1.320°°
Felt fearful	0.286	0.322	0.200***	0.374	0.186°°°
Sleep was restless	1.015	1.056	0.917***	1.184	0.824°°°
(Positive) Was happy	1.129	1.209	0.937***	1.163	1.089°°°
Felt lonely	0.456	0.511	0.325***	0.531	0.371°°°
Could not get "going."	0.292	0.350	0.153***	0.358	0.217°°°
Observations	48935	37488	11415	25807	23117

Note: *, **, *** (°, °°, °°°) means statistically significant different at 10%, 5%, 1% for rural-urban (female-male) comparison. Standard deviations are in the parenthesis.

Table A2: Comparing Depression Symptoms by Group of Age

Age Range	45–54	55-64	65–74	75+
Questions				
Bothered by things that don't usually bother me	0.870	0.874	0.835	0.686
Had trouble keeping my mind on what I was doing.	0.763	0.789	0.833	0.817
Felt depressed	0.788	0.811	0.848	0.757
Felt everything I did was an effort	0.716	0.827	0.930	0.958
(Positive) Felt hopeful about the future	1.093	1.390	1.528	1.627
Felt fearful	0.279	0.287	0.297	0.283
Sleep was restless	0.952	1.028	1.049	1.118
(Positive) Was happy	1.042	1.155	1.191	1.203
Felt lonely	0.381	0.444	0.530	0.614
Could not get "going."	0.240	0.295	0.344	0.348
Observations	16224	17768	10069	4607

Table A3: Regression of CES-D Scale on a Set of Individual Characteristics (use number of biological children instead of living children)

	CES-D Scale				CES-D $\geq$ 10			
	Female		Male		Female		Male	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
N.Child (Ref: $\geq$4 children)								
No biological child	0.656	-1.968**	-0.493	-0.269	0.138**	-0.050	-0.038	-0.186**
	(0.710)	(0.915)	(0.745)	(1.005)	(0.056)	(0.073)	(0.043)	(0.080)
1 child	-0.509**	-1.365***	-0.282	-0.921**	0.002	-0.102***	-0.022	-0.096**
	(0.260)	(0.419)	(0.251)	(0.461)	(0.021)	(0.033)	(0.021)	(0.038)
2 children	-0.475**	-1.114***	-0.534**	-1.387***	-0.010	-0.086***	-0.038**	-0.121***
	(0.197)	(0.388)	(0.223)	(0.473)	(0.016)	(0.030)	(0.019)	(0.039)
3 children	-0.089	-0.463	-0.308	-0.502	-0.004	-0.062**	-0.029*	-0.068**
	(0.187)	(0.393)	(0.206)	(0.415)	(0.014)	(0.030)	(0.017)	(0.033)
N.Child*Age (Ref: $\geq$4 children)								
No biological child $\times$ Age		0.145***		-0.021		0.010**		0.008
		(0.055)		(0.078)		(0.004)		(0.005)
1 child $\times$ (Age-45)		0.056**		0.035		0.007***		0.004**
		(0.025)		(0.022)		(0.002)		(0.002)
2 children $\times$ (Age-45)		0.033		0.050**		0.004**		0.005***
		(0.022)		(0.021)		(0.002)		(0.002)
3 children $\times$ (Age-45)		0.014		0.004		0.003		0.001
		(0.021)		(0.019)		(0.002)		(0.001)
Age		-0.026		-0.021		-0.005**		0.000
		(0.031)		(0.028)		(0.002)		(0.002)
Age Group (Ref: 45–49)								
50-54	0.440***	0.366*	0.604***	0.535***	0.026*	0.028*	0.032**	0.014
	(0.165)	(0.193)	(0.189)	(0.196)	(0.013)	(0.016)	(0.013)	(0.016)
55-59	0.597***	0.480	0.829***	0.678**	0.040***	0.048*	0.050***	0.013
	(0.181)	(0.322)	(0.229)	(0.299)	(0.015)	(0.026)	(0.019)	(0.027)
60-64	0.769***	0.642	0.758***	0.571	0.056***	0.072**	0.048***	-0.004
	(0.201)	(0.446)	(0.203)	(0.402)	(0.016)	(0.035)	(0.015)	(0.035)
65-69	0.862***	0.781	1.093***	0.925*	0.058***	0.091**	0.060***	-0.003
	(0.246)	(0.583)	(0.221)	(0.524)	(0.019)	(0.046)	(0.017)	(0.046)
70-74	0.517	0.517	0.876***	0.789	0.053*	0.106*	0.050***	-0.020
	(0.343)	(0.752)	(0.266)	(0.656)	(0.029)	(0.060)	(0.019)	(0.057)
75+	-0.161	-0.029	0.744**	0.761	0.009	0.096	0.027	-0.046
	(0.322)	(0.906)	(0.308)	(0.840)	(0.025)	(0.070)	(0.024)	(0.071)
Education (Ref: Illiterare)								
Did not finish primary	-0.109	-0.135	0.188	0.188	0.009	0.006	0.017	0.017
	(0.181)	(0.181)	(0.211)	(0.211)	(0.014)	(0.014)	(0.017)	(0.016)
Primary	-0.363*	-0.389**	-0.436**	-0.441**	-0.013	-0.016	-0.022	-0.023
	(0.200)	(0.198)	(0.191)	(0.191)	(0.015)	(0.015)	(0.015)	(0.015)
Junior high	-0.970***	-0.978***	-0.937***	-0.937***	-0.066***	-0.067***	-0.044**	-0.044**
	(0.241)	(0.240)	(0.215)	(0.214)	(0.020)	(0.020)	(0.018)	(0.018)
Senior high or above	-1.726***	-1.720***	-1.440***	-1.444***	-0.125***	-0.126***	-0.088***	-0.088***
	(0.265)	(0.264)	(0.232)	(0.229)	(0.020)	(0.020)	(0.018)	(0.018)
Urban hukou	-0.405	-0.386	-0.736***	-0.725***	-0.012	-0.010	-0.044**	-0.043**
	(0.273)	(0.271)	(0.219)	(0.216)	(0.023)	(0.023)	(0.019)	(0.018)
Widowed	1.363***	1.377***	1.465***	1.464***	0.077***	0.080***	0.110***	0.110***
	(0.198)	(0.200)	(0.290)	(0.291)	(0.015)	(0.015)	(0.033)	(0.034)
R-Squared	0.172	0.172	0.150	0.151	0.132	0.134	0.115	0.117
Observations	21725	21725	19169	19169	21725	21725	19169	19169

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered at the household level. Community fixed effects and survey year fixed effects are also controlled for.

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B   CES-D 10 Scale

CES-D scale (The Center for Epidemiological Studies' Depression Scale) is first developed by Radloff (1977). The original version contains 20 self-report items (also known as CES-D 20). According to the frequency of feelings in each item, a score of 0–3 will be assigned. Therefore, CES-D 20 has a range of 0–60 and the suggested cutoff for depression is a score of 16 or more.

To simplify the survey process and increase the response rate, shorter forms of CES-D scale are developed. Andresen et al. (1994) proposed a 10-item CES-D (total score ranges from 0 to 30) and suggested a cutoff score of 10. CHARLS adopted this CES-D 10. One even shorter form is 8-item CES-D scale (Turvey et al., 1999). It not only reduces the number of question to eight but also reduces four-choice responses to *yes or no* responses. The possible range for CES-D 8 is 0–8 and a value of three is often used as the cutoff. HRS adopts CES-D 8 as the measurement of mental health.

CHARLS adopts CES-D 10, and it is administered to the subjects as follows. Below is a list of some of the ways you may have felt or behaved. Please indicate how often you have felt this way during the past week by checking the appropriate box for each question:

- Rarely or none of the time (less than 1 day)

- Some or a little of the time (1-2 days)

- Occasionally or a moderate amount of time (3-4 days)

- All of the time (5-7 days)

The 10 questions are:

1. I was bothered by things that usually don't bother me.

2. I had trouble keeping my mind on what I was doing.

3. I felt depressed.

4. I felt that everything I did was an effort.

5. (Positive) I felt hopeful about the future.

6. I felt fearful.

7. My sleep was restless.

8. (Positive) I was happy.

9. I felt lonely.

10. I could not "get going."

Additional References

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