

Research paper

Gender disparities and depressive symptoms over the life course and across cohorts in China

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ABSTRACT

Background: Gendered depressive symptom trajectories have long been documented. In the past few decades, China has witnessed volatile gender equity development, while it is unclear how gendered depression trajectories vary by age and cohort under this uneven social change.

Methods: Using three-wave (2012, 2016, and 2018) data from the China Family Panel Studies (N = 33,858, 72,653 person-years), this study examines how gendered depression trajectories evolve over the life course (ages 16–65) and vary across birth cohorts.

Results: The gender gap in depressive symptoms has been growing as people get older. The cohort comparisons show that the depression levels are higher among younger cohorts than among older cohorts. The gender disparity in depressive symptoms has narrowed among younger rural cohorts, mainly driven by the deteriorated mental health of rural males instead of the improved mental health of rural females.

Limitations: Data covering a six-year span can hardly reveal how the period effects shape depression trajectories and thus are unable to simultaneously show age, period, and cohort effects.

Conclusions: Overall, this study suggests that social changes, such as gender equity development, may shape the age and cohort variations in gender disparity in depressive trajectories. Scholars and policymakers should pay more attention to the worsening mental health condition of younger cohorts, especially in rural areas.

Introduction

It is well-documented that females usually demonstrate higher rates of depression than males do (e.g., Rosenfield and Mouzon, 2013; Seedat et al., 2009; Weissman, 1993). However, little is known about how these gender disparities vary over the life course and across birth cohorts, especially in a society experiencing rapid and uneven progress in gender equity development. Using an ongoing nationally representative longitudinal survey, we investigate how depressive symptoms evolve as people age and differ across birth cohorts.

China has witnessed a volatile gender equity development in the past few decades. In Maoist China (1949–1976), the government promoted the “gender sameness” propaganda that “women can hold up half the sky” and encouraged institutional support (e.g., childcare and children education) for families, effectively increasing women’s employment rate. However, during the transition toward a market-oriented economy, China witnessed a waning of egalitarian ideology and a rising emphasis on biological differences, regarding women’s labor value as inferior to men’s (Ji et al., 2017; Wu, 2009). In the meantime, to pursue economic

profits, the privatized enterprises ceased providing subsidized childcare services, which once largely alleviated women’s family responsibilities and supported their labor market participation (Cook and Dong, 2011). Consequently, women’s labor market participation deteriorated (Zhao, 2018). In contrast to the increasing gender gap in labor market participation, the gender gap in educational attainment has narrowed. Women have begun to outperform men in school with the rapid educational expansion in China (Hannum et al., 2019). This volatile and uneven gender equity development provides a unique opportunity to understand how females and males psychologically responded to these social changes, thus yielding basic but essential vital health data that can guide governments and clinicians to proactively plan equal and sustainable healthcare frameworks.

Females have been found to show more depressive symptoms than males, which probably results from gendered parenting, socialization, and roles. For instance, during childhood, females are more likely to experience neglect and sexual abuse than males (Serafini et al., 2017). The negative effect of child maltreatment on depression is more severe for females than for males (Wan et al., 2020). The gendered socialization

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Table 1
Descriptive statistics (CFPS 2012, 2016, and 2018)

Measures	Urban (N = 8,338) Mean (95% CI) or %	Rural (N = 25,520) Mean (95% CI) or %
CES-D	4.56 (4.51, 4.62)	5.53 (5.50, 5.56)
Gender (females = 1, males = 0)	49.82	51.26
High school degree	61.09	18.58
Log individual annual income ¹	6.35 (6.27, 6.42)	3.92 (3.88, 3.95)
Employment (employed =1, not employed = 0) ²	62.91	71.23
Marital status		
Single	12.54	11.78
Married	81.72	84.00
Divorced/Widowed	5.74	4.21
Presence of children (age<15) in the household	40.76	51.71
Self-rated health		
Very healthy	9.46	13.74
Healthy	16.47	19.06
Relatively unhealthy	45.24	35.49
Unhealthy	17.48	15.71
Very unhealthy	11.35	16.00
Birth cohort		
1990–1999	9.37	14.13
1980–1989	21.63	19.75
1970–1979	22.78	20.79
1960–1969	23.62	25.37
1950–1959	22.49	19.96
Age (uncentered)	43.68 (43.49, 43.87)	42.67 (42.55, 42.79)
Attrition in any waves	27.25	22.69
Person-Years	17,411	55,242

¹ Individual annual income is measured in RMB.

² “Not employed” includes those who were unemployed and out of the labor market.

makes females more likely to associate themselves to the notions of femininity while males to masculinity, which leads to different stressor responses, coping resources, and pathways toward expressing psychologic stress for females and males. Females thus may be more likely to struggle with internalizing disorders (e.g., depression and anxiety), while males are more likely to develop more externalizing disorders (e.g., alcohol and drug abuse) (Horwitz and White, 1987; Rosenfield and Mouzon, 2013; Seedat et al., 2009).

Drawing on a life course perspective (Elder, 1998; Elder et al., 2003) and gender role theories (Gibson et al., 2016; Hankin and Abramson, 1999; Rosenfield and Mouzon, 2013), scholars have further investigated age and cohort variations on the gender disparity in depression. Regarding age variations, prior studies found that the gender difference in depression increases with age, especially after the transition into adulthood and perhaps throughout the life course (e.g., Adkins et al., 2009; Hargrove et al., 2020; Leupp, 2017; Mirowsky, 1996). This is probably because females' cumulative disadvantaged roles as they grow older situate them in an increasingly disadvantaged position. For cohort variations, some empirical studies have discovered that, although gender differences in depression were persistent across cohorts, a significant narrowing trend could be observed in recent cohorts, due to changes in the traditional female gender roles (e.g., Seedat et al., 2009).

Nevertheless, prior studies have almost exclusively focused on Western societies. The lack of research on the age and cohort differences in depressive symptoms in developing contexts restricts the development of existing theories. Given that China has the largest population in the world, examining the above topics in China is not only helpful for testing the generality of existing theories but also practically relevant. Further, empirical studies have consistently observed a higher prevalence of depression in rural people than in urban people (e.g., Lee et al., 2009; Phillips et al., 2009; Qin et al., 2018), because China has experienced a long history of the rural–urban divide in terms of economic and

cultural development, partly due to household registration (i.e., *hukou* system) (Chan and Zhang, 1999).¹ This rural–urban difference may complicate the picture of gender disparity in depression. Thus, we also contribute to prior studies on gender disparity in depression by differentiating the age trajectories and cohort variations of depressive symptoms between rural and urban people.

The present study aims to (1) examine how the gender disparity in depression varies over the life course and across birth cohorts; (2) investigate how life-course and cohort variations in the gender disparity of depression differ by rural and urban people. To achieve these aims, we use the Center for Epidemiologic Studies Depression Scale from three-wave data of the China Family Panel Studies, a nearly nationally representative longitudinal survey, to analyze depression trajectories from 8,338 urban and 25,520 rural respondents, adjusted for the potential confounders. The present study provides new documentation of the potential for cultural context to shape gender disparity in depression in the largest population in the world.

Methods

Study population

We used data from the China Family Panel Studies (CFPS), which are nearly nationwide, comprehensive, longitudinal social surveys initiated in 2010 by Peking University and collected on a biennial basis since then.² The CFPS design incorporated learnings from the approaches and experiences in earlier successful survey projects, such as the Panel Study of Income Dynamics (PSID), the National Longitudinal Surveys of Youth (NLSY), and the Health and Retirement Study (HRS). Multistage probability proportional to size sampling (PPS) was adopted, representing 94.5 percent of the total population in mainland China.³ All members over age nine in a sampled household were interviewed. It collected individual-, family-, and community-level data, consisting of intergraded modules for rural and urban interviews (Xie and Hu, 2014). The 2010 baseline survey successfully interviewed almost 14,960 households, including about 33,600 adults and 8,990 children. The response rate in 2010 was 81.3 percent at the household level and 84.1 percent at the individual level.

These data were ideal for this study because they used consistent measures to capture depressive symptoms across three waves, spanning six years. The data also encompass multiple birth cohorts and allow us to examine the age trajectories of depressive symptoms across birth cohorts.

We used three-wave data (2012, 2016, and 2018) and restricted the sample as follows. First, according to the survey, only respondents aged 16 and over would answer the questions on depressive symptoms in the adult questionnaire (N = 43,492, person-years = 93,518). To retain enough data for estimating the average level of depression at each specific age, we further constrained the sample to include respondents aged up to 69 at the time of the interviews, excluding 6,243 observations (person-years = 12,716; <1% for each specific age). Then, we removed individuals who did not report their *hukou* status or were non-Chinese citizens (<2% in each wave). Finally, observations with missing values in the measures of interest (approximately 10%) were excluded, yielding a final analytical sample with 8,338 urban respondents (17,411 person-years) and 25,520 rural respondents (55,242 person-years). We stratified the analytic sample by *hukou* status because of the long history of the rural–urban divide in economic and cultural development (Chan and Zhang, 1999) and a higher prevalence of depression in rural people than in urban people (Phillips et al., 2009).

Measures

Depressive symptoms

Depression was measured using the Center for Epidemiologic Studies Depression Scale (CES-D). The CES-D is a brief self-report questionnaire

Table 2

Estimates for gender disparity in the CES-D over the life course from conditional growth curve models by hukou status.

Variable	Urban		Rural	
	Intercept	Slope	Intercept	Slope
Females	0.176 (-0.055, 0.406)	0.008 (-0.001, 0.017)	0.141* (0.007, 0.274)	0.017*** (0.011, 0.022)
Cohort	-0.748*** (-1.067, -0.429)	0.001 (-0.011, 0.013)	-0.678*** (-0.860, -0.496)	0.006 (-0.001, 0.014)
Age (centered at 16)	0.120*** (0.086, 0.154)	-0.002** (-0.003, -0.001)	0.081*** (0.027, 0.099)	-0.001*** (-0.002, -0.001)
Covariates				
Attrition	-0.401*** (-0.649, -0.154)	0.010* (0.000, 0.020)	-0.162* (-0.304, -0.020)	0.009** (0.003, 0.015)
High school degree	-0.653*** (-0.954, -0.352)	0.010 (-0.000, 0.021)	-0.646*** (-0.796, -0.496)	0.008* (0.000, 0.015)
Log individual annual income	-0.017** (-0.029, -0.005)		-0.007* (-0.014, -0.000)	
Employed	-0.121 (-0.252, 0.010)		-0.120*** (-0.200, -0.060)	
Marital status (ref. = Single)				
Married	-0.571*** (-0.777, -0.366)		-0.589*** (-0.712, -0.465)	
Divorced/ Widowed	0.842*** (0.526, 1.158)		1.480*** (1.268, 1.692)	
Presence of children (age < 15)	0.066 (-0.049, 0.180)		-0.000 (-0.068, 0.068)	
Self-rated health (ref. = Very healthy)				
Healthy	0.386*** (0.199, 0.572)		0.451*** (0.352, 0.551)	
Relatively unhealthy	1.39*** (1.221, 1.558)		1.262*** (1.170, 1.354)	
Unhealthy	2.090*** (1.892, 2.288)		1.831*** (1.721, 1.941)	
Very unhealthy	4.019*** (3.793, 4.244)		3.820*** (3.701, 3.938)	
Random Effects				
Variance Components				
Level 2: Individual level				
Var(Constant, Age)	0.062*** (0.059, 0.064)		0.067*** (0.065, 0.068)	
Level 1: Person-year level				
Var(Residuals)	2.809*** (2.771, 2.848)		3.096*** (3.073, 3.119)	
Person-Years	17,411		55,242	

Note: 95% CI in parentheses.

* $p < .05$.

** $p < .01$.

*** $p < .001$ (two-tailed tests).

developed by Radloff (1977) to measure the severity of depressive symptoms in the general population. The original scale consists of twenty items, and various modifications have been made by large longitudinal surveys for practical or theoretical reasons. Though responses to the complete twenty items were available in 2012 and 2016, only eight items were included in the questionnaire of the 2018 wave. To keep consistency, we created the CES-D based on these eight items for each wave. The respondents were asked to report the frequency of

feeling depressed, feeling that everything they did was an effort, feeling that sleep was restless, feeling happy, feeling lonely, enjoying life, feeling sad, and feeling that they cannot get “going” in the week before the survey. A four-point scale was used to measure frequency: most or all of the time (5–7 days), occasionally or a moderate amount of the time (3–4 days), some or a little of the time (1–2 days), and rarely or none of the time (less than 1 day). We weighed the frequencies of the eight items separately and summed them into a composite index, ranging between 0 and 24, with higher scores indicating more depressive symptoms. The Cronbach’s alpha is over 0.78 for each wave, and the mean across the three waves is 0.78. As illustrated in Table 1, depression was more prevalent in rural people than in urban people, consistent with prior evidence (Phillips et al., 2009).

Predictors

According to the inclusion/exclusion criteria, all the observations ranged from age 16 to 69. However, there are only a limited number of observations between age 65 and 69. Therefore, observations older than 65 were top-coded (i.e., recoded to age 65). Thus, the age variable ranged from 16 to 65. The second predictor is the birth cohort. The respondents were grouped into five birth cohort groups (born in 1950–1959, 1960–1969, 1970–1979, 1980–1989, and 1990–1999). The birth cohort variable was treated as a continuous variable (Chen et al., 2010), with the latest cohort group equaling 1 and the earliest cohort group equaling 5. For gender, males were treated as the reference group.

Covariates

We included several demographic and socioeconomic covariates in this study. The highest educational degree achieved (less than high school [reference group], and high school or above) and individual annual income (measured in RMB) were included. The individual annual income was transformed by the logarithm function to adjust for the skewed distribution. Measures denoting marital status (single [reference group], married, and divorced or widowed) and employment status (not employed [reference group] and employed) were also included. The category of “not employed” in employment status included unemployed respondents and those out of the labor market (e.g., full-time students). A dichotomous measure indicating whether the respondent had a child under 15 years of age living in the same household was used to assess the presence of parental responsibilities. Self-rated health was included to adjust for the influence of physical health conditions, which was measured based on a scale from 1 to 5, with 1 representing “very unhealthy” and 5 representing “very healthy” (reference group). A dichotomous measure indicating attrition in any of the three waves due to mortality or no response was included. All covariates except for education and attrition were time-varying (i.e., a within-person response may change in each wave).

Statistical methods

We implemented growth curve models (Fitzmaurice et al., 2012) within the mixed (or multilevel) model framework to account for variations between the group and individual intercepts and slopes in the panel data. Therefore, the growth curve models could test cohort variations in age trajectories (Miyazaki and Raudenbush, 2000; Raudenbush and Bryk, 2002). This analytical strategy allowed us to utilize unbalanced data, where each respondent may contribute to one or more observation waves. We nested person-year observations (level-1) within individual subjects (level-2). Age was used as the “growth” variable, indicating changes over the life course, and was centered at age 16, which is the starting age of our analytical sample. We did not explicitly incorporate period effects in the models for both methodological and substantive reasons. We could choose either time indicator (year or age) in the level-1 of a growth curve model to reflect the within-individual change (Singer and Willett, 2003), but not both to avoid the issue of perfect collinearity. Moreover, the CFPS spanned six years, which may

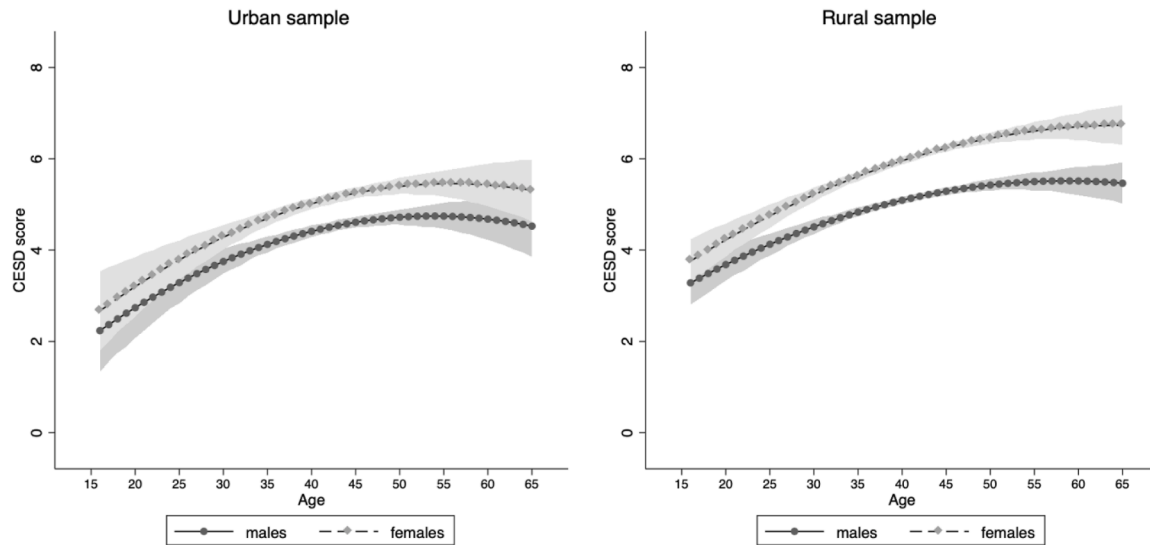


Fig. 1. Gendered trajectories of depressive symptoms across the life course by *hukou* status

Note: The results were estimated from growth curve models, including gender, cohort, age, and covariates (models in Table 2).

exhibit minor period effects on depression, and the period effects were not a focus in this study. As previous studies have reported a nonlinear relationship between depressive symptoms and age (Bell, 2014; Mir-owsky and Ross, 1992), we included a squared term for age (i.e., the slope for the age variable) in all models. As a robustness check, several different alternative cohort specifications were examined (e.g., five-year age cohorts), and the findings were consistent. All the analyses were performed using STATA 15.

The basic models are as follows:

Level-1 Model:

$$y_{it} = \beta_{0i} + \beta_{1i}(Age_{it} - 16) + \beta_{2i}(Age_{it} - 16)^2 + \sum_{q=1}^{q=k} \beta_{3q}TVC_{it} + e_{it} \quad (1)$$

Level-2 Model:

Model for the intercept:

$$\beta_{0i} = \gamma_{00} + \gamma_{01}Gender_i + \gamma_{02}Cohort_i + \sum_{b=4}^{b=k} \gamma_{0b}TIC_i + u_{0i} \quad (2)$$

Model for the slope (age, linear):

$$\beta_{1i} = \gamma_{10} + \gamma_{11}Gender_i + \gamma_{12}Cohort_i + \sum_{b=4}^{b=k} \gamma_{1b}TIC_i + u_{1i} \quad (3)$$

The level-1 model characterizes within-individual changes over age. The outcome variables y_{it} for person i at age t are modeled as a function of the linear and quadratic terms of age. The coefficients β_{0i} , β_{1i} , and β_{2i} represent the intercept, the linear growth rate, and the quadratic growth rate with age, respectively. The level-2 model captures the heterogeneity in growth rate across individuals and examines how the individual depressive symptom trajectories differ between males and females from various cohorts. The coefficients β_{0i} and β_{1i} are further modeled as functions of individual attributes, with their coefficients denoted as γ .

We adjusted the depressive symptom trajectories by controlling for time-varying covariates (TVC) in the level-1 model and time-invariant covariates (TIC) in the level-2 model in both the intercept (β_{0i}) and the slope (β_{1i}). The effects of the time-varying predictors normally bypass the growth predictors and directly influence the repeated outcomes modeled in the level-1 model (McCoach, 2010). Moreover,

following prior research (Boen, 2016; Yang and Lee, 2009), the attrition variable and its interaction with the age trajectory were included in the model to account for the potential sample selection issue due to attrition. The random within-person error term e_{it} is assumed to be normally distributed, and the individual residual random errors u_{0i} and u_{1i} have a multivariate normal distribution.

In the following analyses, we first predicted the adjusted depressive symptom trajectories separately for urban and rural samples based on the above models. Based on the adjusted model, we further examined how gender disparity in depression varies across cohorts by adding an interaction between cohort and gender in both the intercept (β_{0i}) and slope (β_{1i}) of depressive symptoms trajectories in the level-2 model, while the level-1 model remains unchanged. The updated models are as follows:

Model for the intercept:

$$\beta_{0i} = \gamma_{00} + \gamma_{01}Gender_i + \gamma_{02}Cohort_i + \gamma_{03}Cohort_i * Gender_i + \sum_{b=4}^{b=k} \gamma_{0b}TIC_i + u_{0i} \quad (5)$$

Model for the slope (age, linear):

$$\beta_{1i} = \gamma_{10} + \gamma_{11}Gender_i + \gamma_{12}Cohort_i + \gamma_{13}Cohort_i * Gender_i + \sum_{b=4}^{b=k} \gamma_{1b}TIC_i + u_{1i} \quad (6)$$

Results

Gender differences over the life course

Table 2 presents the results from the conditional growth curve models adjusted by covariates predicting depressive symptoms scores by *hukou*. As illustrated, after controlling for other variables, females were more depressed than males at the youngest age observed (i.e., age 16) ($b = 0.141$, 95%CI = 0.007~0.274) for the rural sample. At the same time, the gender difference was not significant for the urban sample. The slope (i.e., rate of change) coefficient indicated that the growth in rural females' depressive symptoms was significantly more pronounced than in rural males' ($b = 0.017$, 95%CI = 0.011~0.022). However, the gender difference in the slope was not significant for the urban sample. Thus, we observe a widening gender difference over the life course only in the rural sample.

Table 3

Estimates for gender disparity in CES-D by birth cohorts from conditional growth curve models by *hukou* status.

Variable	Urban		Rural	
	Intercept	Slope	Intercept	Slope
Females	0.391 (-0.118, 0.900)	-0.011 (-0.047, 0.025)	0.330* (0.053, 0.606)	-0.012 (-0.034, 0.010)
Cohort	-0.726*** (-1.084, -0.368)	-0.001 (-0.014, 0.012)	-0.685*** (-0.893, -0.478)	0.004 (-0.004, 0.011)
Females* Cohort	-0.046 (-0.355, 0.263)	0.004 (-0.003, 0.012)	0.012 (-0.174, 0.197)	0.005* (0.001, 0.100)
Age (centered at 16)	0.129*** (0.091, 0.168)	-0.002** (-0.003, -0.001)	0.095*** (0.074, 0.116)	-0.001*** (-0.002, -0.001)
Covariates				
Attrition	-0.402*** (-0.649, -0.155)	0.010* (0.000, 0.020)	-0.167* (-0.309, -0.025)	0.009* (0.003, 0.015)
High school degree	-0.658*** (-0.960, -0.357)	0.010 (-0.000, 0.021)	-0.653** (-0.803, -0.503)	0.008** (0.001, 0.016)
Log individual annual income	-0.017** (-0.029, -0.005)		-0.008* (-0.014, -0.001)	
Employed	-0.122 (-0.252, 0.009)		-0.130*** (-0.200, -0.060)	
Marital status (ref. = Single)				
Married	-0.572*** (-0.778, -0.366)		-0.590*** (-0.714, -0.466)	
Divorced/	0.839*** (0.522, 1.155)		1.468*** (1.256, 1.680)	
Widowed	0.063 (-0.052, 0.177)		-0.003 (-0.071, 0.066)	
Self-rated health (ref. = Very healthy)				
Healthy	0.386*** (0.199, 0.572)		0.451*** (0.352, 0.551)	
Relatively unhealthy	1.389*** (1.220, 1.558)		1.262*** (1.170, 1.353)	
Unhealthy	2.090*** (1.892, 2.288)		1.832*** (1.722, 1.942)	
Very unhealthy	4.017*** (3.791, 4.243)		3.820*** (3.699, 3.936)	
Level 2: Individual level				
Var(Constant, Age)	0.062*** (0.059, 0.064)		0.067*** (0.065, 0.068)	
Level 1: Person-year level				
Var(Residuals)	2.809*** (2.771, 2.848)		3.095*** (3.073, 3.118)	
Person-Years	17,411		55,242	

Note: 95% CI in parentheses.

* $p < .05$.

** $p < .01$.

*** $p < .001$ (two-tailed tests).

To facilitate interpretation, we depicted the gender differences in adjusted trajectories of depressive symptoms across the life course by *hukou* in Fig. 1. Overall, urban people demonstrated fewer depressive symptoms than their rural counterparts, which is consistent with the findings from previous studies (e.g., Phillips et al., 2009; Qin et al., 2018). Moreover, the depressive symptoms increased over the life course with a decreasing growth rate in both samples, which differs from

the U shape trajectory documented in the prior literature on Western populations (e.g., Mirowsky, 1996; Sutin et al., 2013). Specifically, the CES-D scores began to drop at the end of the age span for urban people but kept increasing for rural people. In terms of gender disparity, females were consistently more depressed than males. The increase in the CES-D scores over the life course was much faster for rural females than for rural males; however, this gender difference in the growth rate was not evident for the urban sample.

The model results also indicated that younger cohorts tended to demonstrate more depressive symptoms (urban: $b = -0.748$, 95%CI = $-1.067 \sim -0.429$; rural: $b = -0.678$, 95%CI = $-0.860 \sim -0.496$). This finding is consistent with prior studies on Western populations (e.g., Twenge, 2015). This cohort trend might be explained by rising individualistic and consumer culture emphasizing extrinsic values (e.g., money, fame, and image), increasing expectations, growing economic uncertainty, and reduced institutional support for families after the market transition in mainland China (Davis, 2005, 1992; Eckersley and Dear, 2002). This observed rising depression might also be related to the wider recognition and stigmatization of depression in later-born Chinese cohorts. Other covariates suggested that more educated people tended to have fewer depressive symptoms (urban: $b = -0.653$, 95%CI = $-0.954 \sim -0.352$; rural: $b = -0.646$, 95%CI = $-0.796 \sim -0.496$), while the educational differences became smaller for the rural sample over the life course (rural: $b = 0.008$, 95%CI = $0.000 \sim 0.015$). Those who remained single were more depressed than married individuals (urban: $b = -0.571$, 95%CI = $-0.777 \sim -0.366$; rural: $b = -0.589$, 95%CI = $-0.712 \sim -0.465$) but less so than divorced or widowed individuals (urban: $b = 0.842$, 95%CI = $0.526 \sim 1.158$; rural: $b = 1.480$, 95%CI = $1.268 \sim 1.692$). Physically healthier people also had fewer depressive symptoms.

Gender differences across cohorts

The interaction term between gender and cohort was included in the models in Table 3. Again, no significant gender difference was observed for the urban sample in either the intercept or slope of depressive symptoms across the life course. The interaction term between gender and cohort was also not significant for either intercept or slope. However, the results are different for rural people. For the youngest cohorts, rural females at age 16 had a higher level of depressive symptom scores than rural males ($b = 0.330$, 95%CI = $0.053 \sim 0.606$). The difference remained over their life course as indicated by the insignificant slope. A significant positive moderation effect of birth cohort on gender in the growth rate of the depressive symptom trajectory suggested that, at older ages, the gender difference was much larger for older cohorts ($b = 0.005$, 95%CI = $0.001 \sim 0.100$).

Fig. 2 illustrates the gendered trajectories of depressive symptoms over the life course and across birth cohorts for rural people. As depicted, for the older cohorts, the gender difference in depression became larger as people aged, while the gender difference grew modestly for younger cohorts when they grew older. Comparisons across cohorts within the same gender revealed that the level of depressive symptoms was much higher among younger cohort males than older cohort males when they were at the same age, leading to a narrowing gap between females and males for younger cohorts than for older cohorts.

Discussion and conclusion

Using three-wave panel data, we found that gendered disparity in depressive symptoms has been growing over the life course but narrowing among younger cohorts (in rural areas) in the Chinese population. Specifically, the growth curve models revealed that depressive symptoms increased for both males and females as they aged. Moreover, we found a nuanced difference between rural and urban people—the level of depressive symptoms flattened after age 60 for urban people while increasing for rural people. This difference might result from the fact that, due to the urban–rural disparities in development levels (Chan

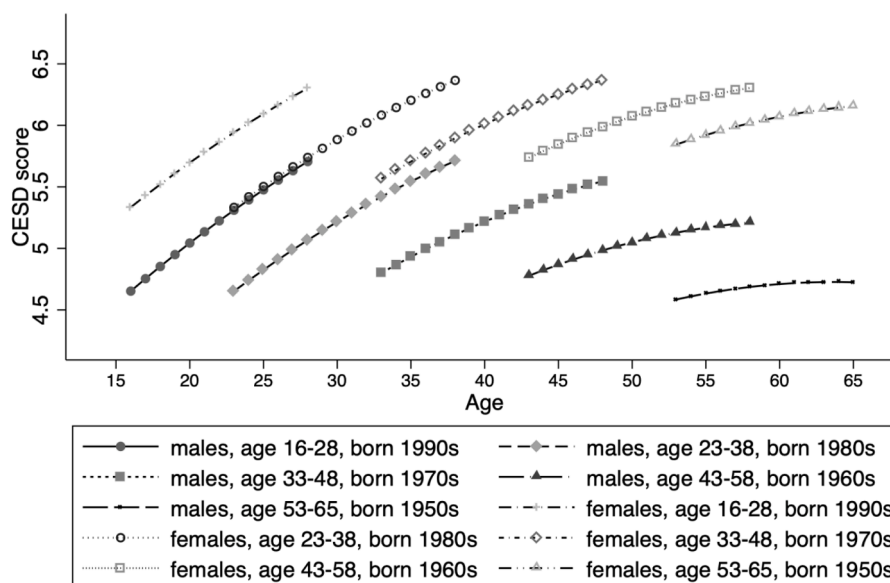


Fig. 2. Gendered trajectories of depressive symptoms across the life course by birth cohorts (rural sample)

Note: The results were estimated from the conditional growth curve model in Table 3 (rural sample).

and Zhang, 1999), urban older adults can access better retirement welfare, medical care, and various forms of support from their children than their rural counterparts. Rural females, but not urban females, also had a faster growth rate of depressive symptoms than rural males, leading to a growing gender gap over the life course. Due to more patriarchal and discriminative environments in both family and work spheres, rural females, compared to urban females, may have to face more frustrating and stressful gender roles (Zhao et al., 2020). This finding also echoes previous research on the high suicide rate among rural Chinese females (Phillips et al., 2002).

Regarding cohort differences in age trajectories, a higher level of depressive symptoms among younger cohorts than older ones was detected. As Eckersley and Dear (2002) highlighted, a plausible explanation is the rise of individualistic culture and a prosperous economy after the economic transition in China (Davis, 2005, 1992). The pursuit of extrinsic values (e.g., money, fame, and image) has pushed individual expectations of ideal life upward. However, the increased economic uncertainty, along with reduced institutional support for individual families, might lead to a higher probability of disappointment, frustration, and distress, which may increase depressive symptom levels among younger cohorts. Moreover, the wider recognition and destigmatization of depression in later-born Chinese cohorts (Parker et al., 2001) may also lend some explanation for the observed rising depression.

For cohort variations in gendered trajectories, we discovered that the gender disparity in depressive symptoms has narrowed among younger rural cohorts. However, this trend is mainly driven by the deteriorated mental health of rural males instead of the improved mental health of rural females. Females' higher levels of depressive symptoms over males' persist across birth cohorts. In terms of the deteriorating mental health of rural males across cohorts, the lower socioeconomic status of the rural males from younger cohorts compared to the older cohorts and their marriage squeeze experiences (fewer available single females than males) in the marriage market might provide some explanations. Although the patriarchal tradition (emphasizing men's role as the breadwinner) persists, men's relative positions in terms of both economic power and daily lives have deteriorated in rural areas. During China's rapid economic growth in the last few decades, labor-intensive industries (e.g., textile) in urban areas attracted many female migrants from rural areas (Cai et al., 2008). Females' increasing incomes have accorded them a higher position in their rural hometowns, and their exposure to modern gender role ideologies has caused them to challenge

their subordinate positions in patriarchal traditions, leading to a relatively lower position of males. Moreover, the skewed sex ratio at birth (the ratio of the number of sons over the number of daughters) in rural China has made it difficult to find female partners for rural males (Jiang et al., 2014; Jiang and Sánchez-Barricarte, 2012). Some rural females choose to marry urban males and stay in cities, leading to fewer females in the marriage market in rural areas. Consequently, for rural males, their slower changes in gender ideology and lower competitiveness than their urban counterparts in the labor and marriage market may lead to a more rapid increase in depressive symptoms, especially among younger cohorts.

The present study has some limitations. First, the six-year span is too short to observe how the period effects shape depression trajectories. Though this study does not focus on the gender disparity in depression trajectories across survey years, the estimation of age and cohort variations would be more accurate if period effects are adjusted. Future studies drawing on more waves may detect a more accurate and broader age span of depressive symptom trajectories and examine age, period, and cohort effects simultaneously. Second, this study does not investigate the mechanisms of the cohort and age variations in gender disparities for rural and urban people, partially because this is beyond the scope of one study. Potential mechanisms may include differing gender attitudes, gender roles, gender gaps in education and employment, or sensory processing patterns (Serafini et al., 2016). Empirically examining the underlying mechanisms will further our understanding of how social changes may unevenly shape depression in a society with a long history of the rural–urban divide.

Overall, these findings provide an overview of depressive symptom trajectories by gender and *hukou* status and reveal the age and cohort variations in the gender disparity in depression in the Chinese population. To alleviate gender disparity in depression over the life course, policy efforts and interventions should improve females' work and family conditions and promote gender equity. Particularly, more policy attention should be paid to the mental health conditions of females in rural areas. This is because conditions of gender equity are still weaker in rural areas than in urban areas, evident in the greater gender gaps in education, employment participation, and earnings (Hannum, 2005; Hannum et al., 2009; Wu, 2019). Further, compared to urban areas, gender-egalitarian ideology has been less developed in rural areas (Fuligni and Zhang, 2004; Hu, 2015). Additionally, the rising depressive symptoms among recent rural young males also require serious research

and policy attention; we also call for future research to investigate the mechanisms behind this alarming trend, which may include frustrations in marriage partner search, poor working conditions and benefits, and low earnings. The provision of mental health consulting services and resources should be incorporated into the design of the healthcare framework, especially in rural areas.

Notes

1. Established in 1958, the *hukou* system was once a measure to regulate and control the movements of internal migrants in China. Various benefits are attached to specific *hukou* status.
2. The CFPS covers twenty-five provinces or their administrative equivalents (municipalities and autonomous regions) in China, excluding Hong Kong, Macao, Taiwan, Xinjiang, Tibet, Qinghai, Inner Mongolia, Ningxia, and Hainan (Xie and Hu, 2014).
3. All the subsamples in the CFPS were obtained through three stages: the primary sampling unit (PSU) was either an administrative district (in urban areas) or a county (in rural areas); the second-stage sampling unit was either a neighborhood community (in urban areas) or an administrative village (in rural areas); and the third-stage (final) sampling unit was the household.

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Author contribution

All authors significantly contributed to the conceptualization/design of the work, formal analysis, interpretation of data, and draft/review/editing of the work.

Declarations of competing interest

We declare no conflict of interests.

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