

Labor-force participation transitions and depressive symptom onset and remission among middle-aged and older adults in China: a longitudinal analysis of CHARLS 2011–2018

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Abstract

Background

Labor-force participation is an important social context for health, yet evidence on how transitions into and out of work relate to changes in depressive symptoms remains limited. Most previous studies have focused on static employment or retirement status or on changes in symptom scores. We examined associations of labor-force participation transitions with incident depressive symptoms and remission among middle-aged and older adults in China.

Methods

Using CHARLS data from 2011, 2013, 2015, and 2018, we constructed person-period records for three adjacent transition intervals. The 2018–2020 interval was retained as a measurement/context sensitivity analysis. Depressive symptoms were defined as CESD-10 score ≥ 10 . Labor-force transitions were classified as stable working, labor exit, labor entry, and stable non-participation. Primary outcomes were incident depressive symptoms and remission. Logistic generalized estimating equations with exchangeable working correlation and robust standard errors were used with sequential covariate adjustment.

Results

The primary analysis included 42174 eligible person-period transition observations from 19570 unique participants. In the fully adjusted model, labor exit, compared with stable working, was associated with higher odds of incident depressive symptoms ($OR = 1.16$, 95% CI : 1.05–1.28, $P = 0.003$) and lower odds of remission ($OR = 0.84$, 95% CI : 0.75–0.95, $P = 0.003$). Labor entry was not clearly associated with incident depressive symptoms ($OR = 0.99$, 95% CI : 0.87–1.12) or remission ($OR = 1.07$, 95% CI : 0.94–1.23). Associations for labor exit were similar after additional adjustment for health-selection variables and baseline CESD-10 score and when analyses were restricted to observations with complete CESD-10 items. In the 2018–2020 interval alone, labor exit was not clearly associated with incident depressive symptoms ($OR = 1.00$, 95% CI : 0.83–1.21).

Conclusions

Labor exit was associated with both higher odds of incident depressive symptoms and lower odds of remission. These findings suggest that transitions out of work may mark a period of increased mental-health vulnerability and may warrant attention in public health strategies addressing population ageing, delayed retirement, and social participation. More detailed information on reasons for labor exit and heterogeneous non-working states is needed to identify groups most likely to benefit from support.

Background

Population ageing and labor-market change are increasingly intertwined public health challenges in China. In 2020, approximately 264 million people in China were aged 60 years or older, accounting for 18.70% of the total population and representing an increase of 5.44 percentage points from 2010 [1]. The World Health Organization has projected that people aged 60 years and older will account for approximately 28% of China's population by 2040 [2]. Healthy ageing therefore involves not only disease prevention and functional maintenance but also adaptation across families, communities, labor markets, and social security systems [3]. The gradual increase in the statutory retirement age, implemented from 2025, further highlights the public health relevance of labor-force participation, labor exit, and retirement adaptation among middle-aged and older adults [4].

Depressive symptoms are an important population-health outcome in middle and later life because they are common, dynamic, and closely related to social and health conditions. The World report on ageing and health emphasizes the

importance of understanding older-age health through the lens of functional ability and social environments [5]. The World Health Organization also notes that income reduction, reduced sense of purpose, chronic diseases, and functional limitations after retirement may increase mental health risks in older adults [6]. In China, a systematic review and meta-analysis reported a pooled prevalence of depressive symptoms of approximately 20.0% among older adults [7]. Evidence from the national CHARLS baseline also showed that depressive symptoms in middle-aged and older adults are closely related to socioeconomic status, education, and health status [8], while longitudinal research has identified social, family, and individual factors associated with incident and prevalent depressive symptoms [9]. Identifying social transitions associated with both symptom onset and recovery may therefore help clarify when population-level prevention and supportive services could be targeted.

Labor-force participation may influence mental health through multiple pathways. Retirement research suggests that labor exit is not a single event, but a life-course transition accompanied by changes in social roles, identity, economic resources, and daily structure [10]. Continuity theory proposes that older adults adapt to later-life changes by maintaining prior lifestyles, social connections, and role structures [11]. Perspectives on successful ageing and productive ageing also emphasize that continued engagement in meaningful social and productive activities may help maintain identity, social connectedness, and functional ability [12–14]. Labor-force participation may therefore influence mental health through income, daily routines, social interaction, and self-efficacy. At the same time, work may involve physical burden, job stress, and work-care conflict, and its health implications may differ by labor sector, work intensity, reason for exit, and social security arrangements.

Existing studies have examined labor-force participation, retirement, employment type, and mental health in later life from several perspectives. A study using CHARLS 2018 data found that employment was associated with better mental health among older Chinese adults [15]. Multi-wave CHARLS analyses have also reported that employment was associated with fewer depressive symptoms among older adults, with heterogeneity by sex, employment type, and urban/rural residence [16]. In rural areas, local non-agricultural employment and entrepreneurship may improve mental health through income, social interaction, and self-worth [17]. Conversely, a study using CHARLS 2011–2018 data suggested that retirement may increase the odds of depressive symptoms among Chinese employees [18]. Jing et al. further distinguished agricultural and non-agricultural sectors using CHARLS 2011, 2015, and 2018 data and found that transitions from labor sectors to retirement were associated with increases in CESD-10 scores, whereas re-entry into the labor force was associated with better mental health [19]. Studies on self-employment, re-employment, and work after retirement also suggest heterogeneous health implications of employment type and work motivation [20–22]. International systematic reviews and meta-analyses show that the association between retirement and depression is inconsistent and may be modified by voluntary versus involuntary retirement, institutional context, and health selection [23–26]. Recent longitudinal evidence from Taiwan and cross-sectional evidence from the United States have likewise linked employment or workforce participation with fewer depressive symptoms, although these studies primarily characterized employment status or work attributes rather than transitions between working and non-working states [27, 28]. A prospective Swedish study of formal retirement found an overall reduction in depressive symptoms around the retirement transition, further illustrating heterogeneity in mental-health responses to later-life work transitions [29].

However, several gaps limit understanding of how later-life work changes relate to population mental health. First, many studies have focused on employment status at a single time point or continuous changes in CESD-10 scores, whereas incident depressive symptoms and remission represent distinct processes with different implications for prevention and recovery. Second, static employment or retirement status cannot distinguish a recent exit from long-term non-participation or identify re-entry into work. Third, later-life employment is dynamic, and labor-force entry and exit may have different associations with mental health. Studies of work trajectories, depressive symptom trajectories, social activity trajectories, and multi-state transitions all suggest that late-life depressive symptoms should be understood as dynamic processes rather than single time-point states [30–35]. Fourth, labor variables in CHARLS 2020 may be affected by pandemic context and measurement changes, and direct inclusion of 2020 in the primary analysis may introduce cross-wave incomparability. Accordingly, this study used 2011–2018 as the primary analytic period and a person-period transition design to examine associations of four labor-force participation transitions—stable working, labor exit, labor entry, and stable non-participation—

with incident depressive symptoms and remission. The 2018–2020 interval was treated as a measurement/context sensitivity analysis because labor-variable measurement changed and the interval coincided with the COVID-19 period.

Methods

Study design and data source

This observational study was based on nationally representative longitudinal survey data from the China Health and Retirement Longitudinal Study (CHARLS). CHARLS is a nationally representative longitudinal survey of Chinese residents aged 45 years and older and their spouses, collecting information on demographics, socioeconomic status, health, labor, retirement, and other domains [36]. Harmonized CHARLS was used to harmonize selected cross-wave variables and map respondent identifiers across waves [37]. This study was reported with reference to the STROBE guidelines for observational studies [38].

The primary analysis used CHARLS 2011, 2013, 2015, and 2018 data to construct three adjacent transition intervals: 2011–2013, 2013–2015, and 2015–2018. Because the 2020 labor variables differed from previous waves and corresponded to the COVID-19 pandemic period, the 2018–2020 interval was used only as a measurement/context sensitivity analysis.

Study population and unit of analysis

Depressive symptoms and labor participation variables were constructed separately for each survey wave, and the data were then organized into a long-format dataset. For the 2011 wave, the original 11-character respondent ID was mapped to a unified 12-character ID using ID_w1 from Harmonized CHARLS. For 2013, 2015, 2018, and 2020, the original 12-character ID was used directly as the unified person_id. Person-period transition data were then constructed based on adjacent survey waves, with each record representing one transition interval between two adjacent waves for the same respondent.

The full 2011–2020 data yielded 57066 eligible person-period transition observations from 20479 unique participants. The primary analysis was restricted to the three 2011–2018 intervals and included 42174 eligible transition observations from 19570 unique participants. The 2018–2020 interval included 14892 observations and was treated as a measurement/context sensitivity analysis. No a priori sample-size calculation was performed; all eligible person-period transitions meeting the prespecified analytic criteria were included.

Assessment of depressive symptoms and transition outcomes

Depressive symptoms were assessed using the 10-item Center for Epidemiologic Studies Depression Scale (CESD-10). The original CES-D was developed by Radloff for screening depressive symptoms in the general population [39]. The short CESD-10 has shown acceptable predictive validity among older adults, and a cutoff score of 10 or higher is commonly used to identify depressive symptoms [40]. The Chinese short form has also been validated in older Chinese populations [41]. In this study, items dc009–dc018 were used in 2011, 2013, 2015, and 2018. Negative items were scored from 0 to 3, and positive items were reverse-coded. The total score ranged from 0 to 30. If two or fewer items were missing, the total score was estimated by multiplying the mean score of non-missing items by 10. If more than two items were missing, the total score was set to missing. A CESD-10 score of 10 or higher was defined as the presence of depressive symptoms.

Four depressive symptom transition categories were constructed based on depressive symptom status at adjacent waves: stable non-depressed, incident depressive symptoms, remission from depressive symptoms, and persistent depressive symptoms. The primary models used two binary outcomes: incident depressive symptoms, defined as no depressive symptoms at wave t and depressive symptoms at wave $t + 1$; and remission, defined as depressive symptoms at wave t and no depressive symptoms at wave $t + 1$.

Labor-force participation and labor-force transitions

Labor-force participation status in each wave was constructed using agricultural work, non-agricultural work, and current work variables from work and retirement modules. In 2011, 2013, and 2015, variables fa001, fa002, fa003, and fc014 were mainly used. In 2018, fa002_w4, fa003, fc008, and fc001 were used. To enhance cross-wave comparability, the primary exposure defined each wave's labor-force status as a binary variable indicating participation versus no participation.

Based on labor-force participation status in adjacent waves, four labor-force transition categories were defined: stable working, labor exit, labor entry, and stable non-participation. Stable working indicated labor-force participation at both wave t and wave $t + 1$. Labor exit indicated labor-force participation at wave t and no labor-force participation at wave $t + 1$. Labor entry indicated no labor-force participation at wave t and labor-force participation at wave $t + 1$. Stable non-participation indicated no labor-force participation at either wave.

Because a binary labor-force participation definition may mask heterogeneity between agricultural and non-agricultural work, supplementary analyses were conducted using relatively comparable 2011–2018 agricultural and non-agricultural work variables. Coarse sector-specific transition categories included agricultural exit, nonfarm exit, entry to agricultural work, and entry to nonfarm work. Because employment-type variables in 2020 were not comparable with earlier waves, 2020 was not used in sector-specific transition analyses.

Covariates

Covariates were constructed preferentially from Harmonized CHARLS to improve cross-wave comparability. When Harmonized variables had substantial missingness or were unavailable, raw wave-specific data were used as supplements. Main model covariates included categorical transition interval (represented by the start wave), age, sex, education, marital status, urban/rural residence, chronic disease count, activities of daily living (ADL) disability, and instrumental activities of daily living (IADL) disability. All time-varying covariates used in the primary models were measured at wave t . Sex was coded as 0 for female and 1 for male. Education was measured using the Harmonized CHARLS variable raeduc1 and categorized as less than lower secondary, upper secondary/vocational training, or tertiary education. Household economic measures were not included in the final primary models because the available expenditure measures were not defined consistently across study waves. Chronic disease burden, functional limitations, and sleep were included in or examined through sensitivity analyses because previous studies have shown their associations with depressive symptoms among middle-aged and older adults in China [42–44].

Sleep duration, smoking, drinking, self-rated health, and health insurance were not included in the basic main model because of cross-wave comparability concerns and missingness in some waves, but they were included as additional covariates in a health-selection sensitivity model. To further account for baseline depressive symptom severity, another sensitivity model additionally adjusted for CESD-10 total score at wave t .

Statistical analysis

Labor-force transitions and depressive symptom transitions were first described in the 2011–2018 primary analysis sample. Baseline covariates at wave t were then summarized by labor-force transition category. Continuous variables were summarized as means and standard deviations, and categorical variables as frequencies and percentages. To evaluate baseline differences across labor-force transition groups, standardized mean differences (SMDs) were calculated for each group compared with the stable working group.

The primary analysis used logistic generalized estimating equations (GEE) to estimate associations of labor-force transitions with incident depressive symptoms and remission. The respondent identifier person_id was used as the clustering variable, and robust standard errors were used to account for within-person correlation arising from multiple person-period records contributed by the same respondent. Analyses were unweighted because CHARLS does not provide a single longitudinal

individual weight applicable to all three pooled person-period intervals (2011–2013, 2013–2015, and 2015–2018). GEE is appropriate for estimating population-averaged associations in longitudinal or repeated-measures data [45, 46]. The final primary models used an exchangeable working correlation structure; all six Model 1–3 specifications converged. Models used complete cases for variables included in each specification. Effect estimates were reported as odds ratios (ORs) with 95% confidence intervals (CIs). Variable-specific missingness within the incident and remission risk sets is summarized in Supplementary Table S11.

Three sequential models were fitted. Model 1 adjusted for labor-force transition, categorical transition interval, age, and sex. Model 2 further adjusted for education, marital status, and urban/rural residence. Model 3 further adjusted for chronic disease count, ADL disability, and IADL disability. Sensitivity analyses included additional adjustment for self-rated health, sleep duration, smoking, drinking, and health insurance; additional adjustment for CESD-10 total score at wave *t*; restriction to observations with all 10 CESD-10 items complete; comparison of estimates across the primary 2011–2018 analysis, the full 2011–2020 sample, and the 2018–2020 measurement/context sensitivity interval; and supplementary sector-specific, CESD-10 score-change, and exploratory sex- and period-interaction analyses.

This study was reported with reference to the STROBE reporting guideline for observational studies.

Use of AI-assisted language tools

GPT-based language tools were used to assist with English translation and language editing. All AI-assisted text was reviewed and revised by the authors, who take full responsibility for the manuscript content.

Results

Sample construction and distribution of labor-force transitions

Across all adjacent intervals from 2011 to 2020, 57066 eligible person-period transition observations from 20479 unique participants were constructed. The 2011–2018 primary analysis sample included 42174 observations from 19570 unique participants, whereas the 2018–2020 measurement/context sensitivity analysis included 14892 observations (Fig. 1). In the 2011–2018 primary sample, the 2011–2013, 2013–2015, and 2015–2018 intervals contributed 12621, 13942, and 15611 eligible transition observations, respectively.

In the primary analysis sample, 25572 observations were classified as stable working, 4658 as labor exit, 2883 as labor entry, and 9061 as stable non-participation. The number of labor exit observations increased across the three intervals, from 1227 in 2011–2013 to 1852 in 2015–2018. Regarding depressive symptom transitions, 6232 incident depressive symptom events, 5542 remissions, 8632 persistent depressive symptom observations, and 21768 stable non-depressed observations were observed from 2011 to 2018. The interval-specific distributions are shown in Table 2.

Baseline characteristics

Characteristics at the start of each transition interval by labor-force transition category are shown in Table 1. Compared with the stable working group, the labor exit, labor entry, and stable non-participation groups were older and had a higher proportion of women. The stable non-participation group differed substantially from the stable working group in age, urban/rural residence, chronic disease count, marital status, and ADL/IADL disability. The maximum absolute SMDs were 1.01 for age, 0.74 for urban/rural residence, and 0.48 for chronic disease count, indicating marked heterogeneity in the stable non-participation group.

Labor-force transitions and incident depressive symptoms

In the 2011–2018 primary analysis, the complete-case sample for Model 3 of incident depressive symptoms included 24846 person-period observations from 13092 unique participants, among which 5566 incident depressive symptom events occurred (Fig. 1). GEE model results are presented in Table 3 and Fig. 2. Compared with stable working, labor exit was associated with higher odds of incident depressive symptoms in Model 1 ($OR = 1.11$, 95% CI : 1.01–1.21). The association became stronger after further adjustment for sociodemographic variables (Model 2: $OR = 1.20$, 95% CI : 1.09–1.31) and remained in the fully adjusted model (Model 3: $OR = 1.16$, 95% CI : 1.05–1.28, $P = 0.003$). Labor entry was not clearly associated with incident depressive symptoms (Model 3: $OR = 0.99$, 95% CI : 0.87–1.12, $P = 0.839$). Stable non-participation was associated with lower odds of incident depressive symptoms (Model 3: $OR = 0.90$, 95% CI : 0.82–0.99, $P = 0.029$), but this finding should be interpreted cautiously given the heterogeneity of this group.

Labor-force transitions and remission from depressive symptoms

The complete-case sample for Model 3 of remission included 13060 person-period observations from 8219 unique participants, with 5096 remission events (Fig. 1). GEE model results are presented in Table 3 and Fig. 3. Compared with stable working, labor exit was consistently associated with lower odds of remission in Models 1, 2, and 3. In the fully adjusted model, the OR was 0.84 (95% CI : 0.75–0.95, $P = 0.003$). Labor entry was not clearly associated with remission after full adjustment ($OR = 1.07$, 95% CI : 0.94–1.23, $P = 0.315$). Stable non-participation was also not clearly associated with remission after full adjustment ($OR = 0.99$, 95% CI : 0.89–1.10, $P = 0.911$).

Sensitivity and supplementary analyses

When the 2018–2020 interval was treated as a measurement/context sensitivity analysis, the labor-exit estimate for incident depressive symptoms was $OR = 1.16$ (95% CI : 1.05–1.28) in the 2011–2018 primary analysis, $OR = 1.12$ (95% CI : 1.03–1.21) in the full 2011–2020 sample, and $OR = 1.00$ (95% CI : 0.83–1.21) in the 2018–2020 interval alone. For remission, the corresponding estimates were $OR = 0.84$ (95% CI : 0.75–0.95), $OR = 0.89$ (95% CI : 0.81–0.98), and $OR = 1.09$ (95% CI : 0.88–1.34), respectively. Exploratory interaction analyses did not provide evidence of period heterogeneity for labor exit and incident depressive symptoms (P for interaction = 0.464). A labor-exit-by-period interaction was observed for remission ($P = 0.017$), although the overall joint interaction test was not statistically significant ($P = 0.077$); pandemic-related context and changes in labor-variable measurement could not be disentangled (Additional file 1). Exploratory sex-interaction analyses showed an overall interaction for remission (overall $P = 0.004$; labor exit-by-sex interaction $OR = 0.79$, 95% CI : 0.63–1.00, $P = 0.047$), whereas the overall interaction for incident depressive symptoms was not statistically significant ($P = 0.063$). These exploratory findings were not used to define the primary conclusions (Additional file 1).

The health-selection sensitivity model showed that the association between labor exit and incident depressive symptoms remained after additional adjustment for self-rated health, sleep duration, smoking, drinking, and health insurance ($OR = 1.13$, 95% CI : 1.02–1.25, $P = 0.024$); the corresponding remission estimate was $OR = 0.86$ (95% CI : 0.76–0.97, $P = 0.016$). Results were similar after further adjustment for CESD-10 total score at wave t (incident: $OR = 1.16$, 95% CI : 1.05–1.29, $P = 0.003$; remission: $OR = 0.85$, 95% CI : 0.76–0.96, $P = 0.008$). Restricting analyses to observations with all 10 CESD-10 items complete also produced similar estimates (incident: $OR = 1.16$, 95% CI : 1.04–1.28, $P = 0.006$; remission: $OR = 0.84$, 95% CI : 0.74–0.95, $P = 0.005$). These sensitivity-analysis results for labor exit are summarized in Table 4.

Sector-specific labor-transition analyses and CESD-10 score-change analyses were retained as exploratory supplementary analyses using the final covariate structure. Because sector categories were coarse and sector switching generated heterogeneous subgroups, these analyses were not used to define the primary conclusions (Additional file 1).

Audit of non-working subtype variables suggested that the current analytic data could not reliably distinguish active retirement, involuntary unemployment, health-related exit, family caregiving, and other non-working subtypes across waves. Descriptive analysis using a health-deterioration proxy suggested a higher proportion of health deterioration in the labor exit

group than in the stable non-participation group, supporting the possibility of health selection in labor exit. Therefore, non-working subtype analyses were retained as supplementary descriptive analyses and are addressed as a limitation.

Discussion

Principal findings

Using three adjacent CHARLS intervals from 2011–2018, this study examined labor-force transitions as a time-varying social exposure and depressive-symptom onset and remission as distinct mental-health outcomes. Labor exit showed the most consistent association with depressive symptom course. Compared with stable working, labor exit was associated with both higher odds of subsequent incident depressive symptoms and lower odds of remission among those with existing depressive symptoms. These associations were similar after additional adjustment for health-selection variables and baseline CESD-10 severity and when analyses were restricted to observations with complete CESD-10 items. Labor entry was not clearly associated with either incident depressive symptoms or remission after full adjustment.

Comparison with previous studies

Our findings are broadly consistent with previous research on retirement, employment, and mental health. Studies of static employment status, retirement, self-employment, and sectoral transitions have suggested that labor status is related to mental health in middle-aged and older adults [15–22]. Jing et al. used CHARLS 2011, 2015, and 2018 data and found that transitions from agricultural or non-agricultural sectors to retirement were associated with increased CESD-10 scores, whereas re-entry into the labor force was associated with decreased CESD-10 scores, with stronger associations among men [19]. Xu et al. also reported that retirement may increase the odds of depressive symptoms among Chinese employees using CHARLS 2011–2018 data [18]. Building on these studies, our analysis distinguished between incident depressive symptoms and remission and showed that labor exit was associated not only with higher subsequent odds of depressive symptoms but also with a lower likelihood of recovery from existing symptoms.

Recent studies also illustrate the heterogeneity of mental-health findings across later-life work transitions. A prospective Swedish study reported an overall reduction in depressive symptoms around formal retirement, whereas longitudinal evidence from Taiwan and cross-sectional evidence from the United States associated employment or workforce participation with fewer depressive symptoms [27–29]. These findings are not necessarily contradictory because formal retirement, employment status, workforce participation, and labor exit represent different constructs. In the present study, labor exit was defined as a transition from labor participation to non-participation and could not be reliably separated into voluntary retirement, involuntary unemployment, health-related exit, caregiving-related exit, or other forms of work cessation. Differences in transition type, health selection, labor-market structure, and pension context may therefore contribute to variation across studies.

An important feature of this study is the restriction of the primary analysis to 2011–2018, with the 2018–2020 interval treated as a measurement/context sensitivity analysis. This approach reduces concerns arising from changes in labor-variable construction and the unusual social and labor-market context of the COVID-19 period. Point estimates for the 2018–2020 interval differed from those in the primary period, but formal exploratory interaction analysis did not support period heterogeneity for labor exit and incident depressive symptoms. An exploratory remission interaction was observed, although pandemic-related contextual changes and labor-variable measurement changes cannot be disentangled. The 2018–2020 results should therefore be interpreted as a comparability check rather than evidence that the pandemic itself modified the association. Exploratory sex-interaction results suggested heterogeneity in remission associations, but these secondary analyses involved multiple interaction terms and should be treated as hypothesis-generating rather than evidence of a robust sex-specific effect.

Sector-specific supplementary analyses were exploratory because cross-wave sector categories were relatively coarse and some transition subgroups were small or heterogeneous. They were therefore used to assess the plausibility of the binary

labor-transition findings rather than to identify one labor sector as the principal driver of the association. Future work with more consistently measured occupational histories should distinguish agricultural and non-agricultural exit, sector switching, and reasons for leaving work.

Potential mechanisms

Labor exit may be associated with worsening depressive symptoms through several mechanisms. First, labor exit may involve changes in social roles, identity, and daily routines. For many middle-aged and older adults, work is not only a source of income but also a source of social connection and self-worth. Sudden or involuntary exit from work may lead to role loss and disrupted daily rhythm, increasing psychological stress. Second, labor exit may reflect health selection: individuals with declining physical function, greater chronic disease burden, or poorer sleep may be more likely to leave work, and these health problems are themselves associated with depressive symptoms [42–44]. Although this study adjusted for chronic disease count, ADL/IADL disability, self-rated health, sleep, smoking, drinking, and health insurance and further adjusted for baseline CESD-10 score in sensitivity analyses, residual health selection and reverse causation cannot be fully ruled out.

Labor entry was not clearly associated with either incident depressive symptoms or remission after full adjustment. Re-entering work may have offsetting mental-health implications: it may increase social interaction, daily structure, purpose, and financial resources, but may also introduce physical burden, work stress, or economic pressure. The current data therefore do not support a clear net association between labor entry and depressive symptom onset or remission.

The association between stable non-participation and lower odds of incident depressive symptoms requires cautious interpretation. Stable non-participation is not a homogeneous low-risk state. It may include stable retirees, people who can afford not to work, long-term family caregivers, and individuals who have left work because of health problems. *SMD* results in Table 1 showed that this group differed markedly from stable workers in age, urban/rural residence, chronic disease burden, and functional limitations. Therefore, stable non-participation should not be interpreted as directly protective for mental health; rather, it should be viewed as a highly heterogeneous state.

Public health and policy implications

These findings support viewing labor exit as a potentially relevant transition point for population mental-health surveillance and support rather than treating non-employment as a single static state. In the context of population ageing and delayed retirement policies, middle-aged and older adults may experience increasingly heterogeneous pathways into and out of work. Public health and social policy responses should therefore consider not only whether people continue working but also why they leave work, their post-exit economic security, social participation, health status, and access to mental-health support. The findings should not be interpreted as evidence that continued employment is uniformly protective; rather, they support closer assessment around major work-status changes, particularly when labor exit coincides with deteriorating health or reduced social and economic resources. Retirement-preparation programs, community-based mental-health screening or referral, social participation support, and flexible re-employment or skills-support options could be evaluated as potential supports during these transitions.

Strengths and limitations

This study has several strengths. First, it used data from the nationally representative longitudinal CHARLS cohort and selected 2011–2018 as the primary analytic period to improve cross-wave comparability. Second, it adopted a person-period transition design, focusing on changes in labor participation status between adjacent waves rather than static employment status at a single time point. Third, it distinguished incident depressive symptoms from remission and evaluated robustness through health-selection adjustment, baseline CESD-10 adjustment, complete-item analyses, and measurement/context sensitivity analyses. Fourth, the models used GEE with robust standard errors clustered by individual to account for correlations arising from repeated transition records contributed by the same respondent.

This study also has limitations. First, as an observational study, it cannot support causal inference, and reverse causation and unmeasured confounding may remain. Second, the primary analysis used a binary labor participation definition, which

improved cross-wave comparability but could not fully distinguish agricultural work, nonfarm employment, self-employment, unpaid family work, active retirement, involuntary unemployment, health-related exit, and family caregiving. Third, the current analytic data could not reliably construct non-working subtypes across waves, limiting interpretation of the stable non-participation group. Fourth, CESD-10 is a screening instrument rather than a clinical diagnosis. Although this study allowed up to two missing items and used person-mean prorating, complete-item sensitivity analyses produced similar results; nevertheless, item missingness may not be completely random. Fifth, because 2020 involved labor-variable measurement changes and the COVID-19 context, the 2018–2020 interval was used only as a sensitivity analysis, and the main conclusions apply primarily to 2011–2018. Sixth, a household economic measure with a sufficiently consistent definition across the primary study waves was not available for the final primary models; residual confounding by household economic circumstances therefore cannot be excluded. Seventh, because no common longitudinal weight was available for the pooled person-period design, the estimates do not directly account for unequal sampling probabilities or longitudinal attrition and should be interpreted as associations within the observed analytic sample.

Conclusions

In this person-period analysis of CHARLS 2011–2018, labor exit was associated with higher odds of incident depressive symptoms and lower odds of remission, whereas labor entry was not clearly associated with either outcome. These findings suggest that changes in labor-force participation may be relevant to population mental health and that labor exit warrants attention as a heterogeneous transition rather than a uniform retirement event. Future studies should distinguish voluntary retirement, involuntary unemployment, health-related exit, caregiving-related exit, and transitions between labor sectors to identify which forms of labor exit are associated with greater mental-health vulnerability.

Abbreviations

ADL
activities of daily living
CESD-10
10-item Center for Epidemiologic Studies Depression Scale
CHARLS
China Health and Retirement Longitudinal Study
CI
confidence interval
GEE
generalized estimating equations
IADL
instrumental activities of daily living
OR
odds ratio
SMD
standardized mean difference.

Declarations

Ethics approval and consent to participate

The CHARLS project was approved by the Biomedical Ethics Review Committee of Peking University (IRB00001052-11015) and was conducted in accordance with the Declaration of Helsinki. All survey participants provided informed consent. This study used de-identified CHARLS data for secondary analysis and did not involve new field investigation or additional human specimen collection.

Consent for publication

Not applicable. This study does not contain identifiable individual information.

Availability of data and materials

The CHARLS data used in this study are available from the China Health and Retirement Longitudinal Study website following registration and approval [47]. Because access to individual-level CHARLS data is governed by the CHARLS data use agreement, this article does not redistribute raw or derived individual-level data. Aggregate results supporting the conclusions are provided in the article and Additional file 1. Analytic code is available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

JL contributed to study conception, data curation, statistical analysis, interpretation of results, and drafting of the original manuscript. YL, WY, SC, and RH contributed to literature review, interpretation of results, and manuscript revision. LN supervised the study, managed the project, acquired funding, and critically reviewed the manuscript for important intellectual content. All authors read and approved the final manuscript.

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References

1. National Bureau of Statistics of China. Communiqué of the Seventh National Population Census (No. 5): Age Composition. 2021. https://www.stats.gov.cn/english/PressRelease/202105/t20210510_1817190.html. Accessed 29 Jun 2026.
2. World Health Organization. Ageing and health - China. <https://www.who.int/china/health-topics/ageing>. Accessed 29 Jun 2026.
3. Chen X, Giles J, Yao Y, Yip W, Meng Q, Berkman L, et al. The path to healthy ageing in China: a Peking University-Lancet Commission. *Lancet*. 2022;400(10367):1967-2006. doi:10.1016/S0140-6736(22)01546-X.
4. The State Council Information Office of the People's Republic of China. China implements gradual retirement age increase to address aging population. 2025. https://english.scio.gov.cn/chinavoices/2025-01/02/content_117641102.html. Accessed 29 Jun 2026.
5. World Health Organization. World report on ageing and health. Geneva: World Health Organization; 2015. <https://www.who.int/publications/i/item/9789241565042>. Accessed 29 Jun 2026.
6. World Health Organization. Mental health of older adults. 2025. <https://www.who.int/news-room/fact-sheets/detail/mental-health-of-older-adults>. Accessed 29 Jun 2026.
7. Tang T, Jiang J, Tang X. Prevalence of depressive symptoms among older adults in mainland China: a systematic review and meta-analysis. *J Affect Disord*. 2021;293:379-390. doi:10.1016/j.jad.2021.06.050.

8. Lei X, Sun X, Strauss J, Zhang P, Zhao Y. Depressive symptoms and SES among the mid-aged and elderly in China: evidence from the China Health and Retirement Longitudinal Study national baseline. *Soc Sci Med.* 2014;120:224-232. doi:10.1016/j.socscimed.2014.09.028.
9. Zhang X, Xue M, Zhang Z, Gao Z, Li C, Wu J, Niu W. Impact of social, familial and personal factors on depressive symptoms in middle-aged and older adults from the national CHARLS cohort. *BMC Public Health.* 2024;24(1):2669. doi:10.1186/s12889-024-20159-8.
10. Wang M, Shultz KS. Employee retirement: a review and recommendations for future investigation. *J Manage.* 2010;36(1):172-206. doi:10.1177/0149206309347957.
11. Atchley RC. A continuity theory of normal aging. *Gerontologist.* 1989;29(2):183-190. doi:10.1093/geront/29.2.183.
12. Rowe JW, Kahn RL. Successful aging. *Gerontologist.* 1997;37(4):433-440. doi:10.1093/geront/37.4.433.
13. Morrow-Howell N, Hinterlong J, Sherraden M. *Productive Aging: Concepts and Challenges.* Baltimore: Johns Hopkins University Press; 2001.
14. World Health Organization. Decade of healthy ageing: baseline report. Geneva: World Health Organization; 2020. <https://www.who.int/publications/i/item/9789240017900>. Accessed 29 Jun 2026.
15. Cheng Y, Lan J, Ci Q. Employment and mental health of the Chinese elderly: evidence from CHARLS 2018. *Int J Environ Res Public Health.* 2023;20(4):2791. doi:10.3390/ijerph20042791.
16. Wang H, Ge Q. Empirical analysis of the impact of employment on the elderly mental health in China. *Psychol Res Behav Manag.* 2025;18:1227-1240. doi:10.2147/PRBM.S521892.
17. Jia P, Yang Z, Zhang L, Wang D. Does participation in local non-agricultural employment improve the mental health of rural elderly adults? *Front Public Health.* 2021;9:746580. doi:10.3389/fpubh.2021.746580.
18. Xu F, Yuan J, Wu H. Association of depressive symptoms with retirement in Chinese employees: evidence from national longitudinal surveys from 2011 to 2018. *BMC Public Health.* 2023;23:961. doi:10.1186/s12889-023-15971-7.
19. Jing R, Chen Z, Lai X, Li L. Associations between mental health status and labor force transitions in China: a longitudinal study between agricultural and nonagricultural sectors. *Psychol Aging.* 2023;38(2):132-145. doi:10.1037/pag0000729.
20. Hu T, Chen YC, Halvorsen CJ. Self-employment transitions and health outcomes in later life: evidence from China. *Innov Aging.* 2024;8(9):igae073. doi:10.1093/geroni/igae073.
21. Zhou D, Zhan Q, Li L. The impact of self-employment on mental health of the younger elderly in China. *BMC Geriatr.* 2023;23:280. doi:10.1186/s12877-023-03948-5.
22. He L, Zhao J, Li M, Song Z, Ma Y, Yang Z. Work till old age: an analysis of self-employment's impact on depression among the older adults in China. *Front Psychiatry.* 2024;15:1426336. doi:10.3389/fpsy.2024.1426336.
23. Li W, Ye X, Zhu D, He P. The longitudinal association between retirement and depression: a systematic review and meta-analysis. *Am J Epidemiol.* 2021;190(10):2220-2230. doi:10.1093/aje/kwab125.
24. Odone A, Gianfredi V, Vigezzi GP, Amerio A, Ardito C, d'Errico A, et al. Does retirement trigger depressive symptoms? A systematic review and meta-analysis. *Epidemiol Psychiatr Sci.* 2021;30:e77. doi:10.1017/S2045796021000627.
25. Zhai L, Wang J, Liu Y, Zhang H. Involuntary retirement and depression among adults: a systematic review and meta-analysis of longitudinal studies. *Front Psychiatry.* 2022;13:747334. doi:10.3389/fpsy.2022.747334.
26. Mosconi G, Vigezzi GP, Bertuccio P, Amerio A, Odone A. Transition to retirement impact on risk of depression and suicidality: results from a longitudinal analysis of the Survey of Health, Ageing and Retirement in Europe (SHARE). *Epidemiol Psychiatr Sci.* 2023;32:e34. doi:10.1017/S2045796023000239.
27. Shih P, Lin MY, Guo YL. Employment status and depressive symptoms in Taiwanese older adults: an 11-year prospective cohort study. *BMC Geriatr.* 2024;24:671. doi:10.1186/s12877-024-05258-w.
28. Sun Z, Wang Y, Chen X, Qian D. Association of workforce participation with depression among US older adults: results from NHANES 2005–2018. *BMC Geriatr.* 2025;25:77. doi:10.1186/s12877-025-05712-3.
29. Hed S, Berg AI, Hansson I, Kivi M, Waern M. Depressive symptoms across the retirement transition in men and women: associations with emotion regulation, adjustment difficulties and work centrality. *BMC Geriatr.* 2024;24:643.

doi:10.1186/s12877-024-05228-2.

30. Chen H, Wu J. Work trajectory and depressive symptoms among older adults in rural China: a sequence analysis approach. *Longit Life Course Stud.* 2026;17(1):31-55. doi:10.1332/17579597Y2025D000000064.
31. Pei J, Hu M, Lu Q, Zhou P, Shang Y, Zhang H, Yang X, Li Y. Identifying the subgroups of depression trajectories among the middle-aged and older Chinese individuals with chronic diseases: an 8-year follow-up study based on CHARLS. *Front Public Health.* 2024;12:1428384. doi:10.3389/fpubh.2024.1428384.
32. Li J, Lin S, Pei L. Adverse childhood experiences and depressive symptoms trajectories among middle-aged and elderly - China, 2011-2018. *China CDC Wkly.* 2022;4(27):588-592. doi:10.46234/ccdcw2022.129.
33. Lin X, Liu S, Hu Z, Xu H. Social activities and long-term depressive-symptoms trajectories among middle-aged and older adults in China: a population-based cohort study. *Front Psychiatry.* 2023;14:1131084. doi:10.3389/fpsyt.2023.1131084.
34. Zhu J, Wei C, Wu Y, Chen H, Lin Y, Wang Z, Fang Y. Bidirectional transitions of depressive symptoms among middle-aged and older Chinese adults: a multi-state Markov model analysis. *Maturitas.* 2026;205:108822. doi:10.1016/j.maturitas.2025.108822.
35. Ma C, Lu T, Li Y, Chen S. Identifying important factors for depressive symptom dynamics in Chinese middle-aged and older adults using a multi-state transition model with feature selection. *Behav Sci (Basel).* 2025;15(11):1501. doi:10.3390/bs15111501.
36. Zhao Y, Hu Y, Smith JP, Strauss J, Yang G. Cohort profile: The China Health and Retirement Longitudinal Study (CHARLS). *Int J Epidemiol.* 2014;43(1):61-68. doi:10.1093/ije/dys203.
37. Phillips D, Green H, Petrosyan S, Shao K, Wilkens J, Lee J. Harmonized CHARLS Documentation: Version D (2011-2018), June 2021. Los Angeles: Center for Economic and Social Research, University of Southern California; 2021.
38. von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet.* 2007;370(9596):1453-1457. doi:10.1016/S0140-6736(07)61602-X.
39. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas.* 1977;1(3):385-401. doi:10.1177/014662167700100306.
40. Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: evaluation of a short form of the CES-D. *Am J Prev Med.* 1994;10(2):77-84.
41. Chen H, Mui AC. Factorial validity of the Center for Epidemiologic Studies Depression Scale short form in older population in China. *Int Psychogeriatr.* 2014;26(1):49-57. doi:10.1017/S1041610213001701.
42. Liu H, Zhou Z, Fan X, Shen C, Ma Y, Sun H, Xu Z. Association between multiple chronic conditions and depressive symptoms among older adults in China: evidence from the China Health and Retirement Longitudinal Study (CHARLS). *Int J Public Health.* 2023;68:1605572. doi:10.3389/ijph.2023.1605572.
43. Yan Y, Du Y, Li X, Ping W, Chang Y. Physical function, ADL, and depressive symptoms in Chinese elderly: evidence from the CHARLS. *Front Public Health.* 2023;11:1017689. doi:10.3389/fpubh.2023.1017689.
44. Lin L, Dai Y, Huang J, Zheng W, Liu Y. Association between changes in sleep duration and the risk of incident depressive symptoms among Chinese middle-aged and older adults. *PLoS One.* 2025;20(8):e0329797. doi:10.1371/journal.pone.0329797.
45. Liang KY, Zeger SL. Longitudinal data analysis using generalized linear models. *Biometrika.* 1986;73(1):13-22. doi:10.1093/biomet/73.1.13.
46. Zeger SL, Liang KY, Albert PS. Models for longitudinal data: a generalized estimating equation approach. *Biometrics.* 1988;44(4):1049-1060.
47. China Health and Retirement Longitudinal Study. CHARLS data. <https://charls.pku.edu.cn/>. Accessed 10 Aug 2026.

Tables

Table 1. Baseline characteristics by labor-force transition

Variable	Stable working	Labor exit	Labor entry	Stable non-participation	Max SMD
Age, mean (SD)	56.28 (7.72)	60.50 (8.88)	59.88 (8.80)	64.90 (9.30)	1.01
Female, <i>n</i> (%)	12054 (47.1)	2724 (58.5)	1777 (61.6)	5718 (63.1)	0.33
Education, <i>n</i> (%)					
Less than lower secondary	22767 (89.0)	4201 (90.2)	2594 (90.0)	7688 (84.8)	0.12
Upper secondary/ vocational training	2462 (9.6)	395 (8.5)	249 (8.6)	1116 (12.3)	0.09
Tertiary	343 (1.3)	62 (1.3)	40 (1.4)	257 (2.8)	0.10
Marital status, <i>n</i> (%)					
Married/partnered	23853 (93.3)	4024 (86.4)	2494 (86.5)	7227 (79.8)	0.40
Not married	1719 (6.7)	634 (13.6)	389 (13.5)	1834 (20.2)	0.40
Residence, <i>n</i> (%)					
Rural	18315 (71.6)	2852 (61.2)	1761 (61.1)	3340 (36.9)	0.74
Urban	7257 (28.4)	1806 (38.8)	1122 (38.9)	5721 (63.1)	0.74
Chronic disease count, mean (SD)	1.36 (1.36)	1.72 (1.55)	1.65 (1.53)	2.10 (1.68)	0.48
ADL disability, <i>n</i> (%)	3050 (12.2)	830 (18.1)	504 (17.8)	2321 (25.8)	0.35
IADL disability, <i>n</i> (%)	3581 (14.0)	935 (20.1)	612 (21.2)	2442 (27.0)	0.33
CESD-10 score, mean (SD)	7.77 (6.00)	8.42 (6.26)	8.56 (6.52)	8.33 (6.46)	0.13

Note: Values are based on the final 2011–2018 primary person-period sample. Percentages for categorical variables use non-missing denominators. Education was measured using Harmonized CHARLS raeduc1 and categorized as less than lower secondary, upper secondary/vocational training, or tertiary education. Max SMD is the maximum absolute standardized mean difference for each displayed variable or category across labor transition groups relative to stable working. ADL, activities of daily living; IADL, instrumental activities of daily living; CESD-10, 10-item Center for Epidemiologic Studies Depression Scale; SMD, standardized mean difference.

Table 2. Transition distributions by interval

Interval	Analysis	Eligible <i>N</i>	Stable work	Exit	Entry	Stable non-work	Stable non-depressed	Incident	Remission	Persistent
2011–2013	Primary	12621	7746 (61.4)	1227 (9.7)	899 (7.1)	2749 (21.8)	6407 (50.8)	1540 (12.2)	2106 (16.7)	2568 (20.3)
2013–2015	Primary	13942	8411 (60.3)	1579 (11.3)	920 (6.6)	3032 (21.7)	7471 (53.6)	2044 (14.7)	1661 (11.9)	2766 (19.8)
2015–2018	Primary	15611	9415 (60.3)	1852 (11.9)	1064 (6.8)	3280 (21.0)	7890 (50.5)	2648 (17.0)	1775 (11.4)	3298 (21.1)
2018–2020	Context	14892	9004 (60.5)	1246 (8.4)	1172 (7.9)	3470 (23.3)	7147 (48.0)	2151 (14.4)	2011 (13.5)	3583 (24.1)

Note: The first three intervals constitute the primary 2011–2018 analysis. The 2018–2020 interval was retained as a measurement/context sensitivity analysis because the 2020 labor variables changed and the interval coincided with the COVID-19 period. Stable non-work denotes stable non-participation.

Table 3. Main transition models

Outcome	Exposure	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 3 P	Model 3 N/events
Incident depressive symptoms	Labor exit	1.11 (1.01, 1.21)	1.20 (1.09, 1.31)	1.16 (1.05, 1.28)	0.003	24846/5566
	Labor entry	0.94 (0.83, 1.05)	1.00 (0.89, 1.13)	0.99 (0.87, 1.12)	0.839	24846/5566
	Stable non-participation	0.80 (0.74, 0.87)	1.02 (0.93, 1.12)	0.90 (0.82, 0.99)	0.029	24846/5566
Remission from depressive symptoms	Labor exit	0.82 (0.73, 0.91)	0.79 (0.71, 0.88)	0.84 (0.75, 0.95)	0.003	13060/5096
	Labor entry	0.98 (0.86, 1.12)	0.95 (0.84, 1.08)	1.07 (0.94, 1.23)	0.315	13060/5096
	Stable non-participation	0.92 (0.83, 1.01)	0.82 (0.74, 0.91)	0.99 (0.89, 1.10)	0.911	13060/5096

Note: Stable working was the reference group. Model 1 adjusted for categorical transition interval, age, and sex. Model 2 additionally adjusted for education, marital status, and urban/rural residence. Model 3 additionally adjusted for chronic disease count, ADL disability, and IADL disability. All primary models used exchangeable GEE with robust standard errors and converged. OR, odds ratio; CI, confidence interval; GEE, generalized estimating equations.

Table 4. Sensitivity analyses for labor exit

Analysis	Outcome	OR (95% CI)	P	N/events	Interpretation
Primary 2011–2018	Incident depressive symptoms	1.16 (1.05, 1.28)	0.003	24846/5566	Primary estimate
Primary 2011–2018	Remission from depressive symptoms	0.84 (0.75, 0.95)	0.003	13060/5096	Primary estimate
Health-selection model	Incident depressive symptoms	1.13 (1.02, 1.25)	0.024	22426/5086	Additional adjustment
Health-selection model	Remission from depressive symptoms	0.86 (0.76, 0.97)	0.016	12074/4704	Additional adjustment
Baseline CESD model	Incident depressive symptoms	1.16 (1.05, 1.29)	0.003	24846/5566	Additional adjustment
Baseline CESD model	Remission from depressive symptoms	0.85 (0.76, 0.96)	0.008	13060/5096	Additional adjustment
CESD complete items	Incident depressive symptoms	1.16 (1.04, 1.28)	0.006	22466/4843	Missing-data check
CESD complete items	Remission from depressive symptoms	0.84 (0.74, 0.95)	0.005	11186/4470	Missing-data check
Full 2011–2020	Incident depressive symptoms	1.12 (1.03, 1.21)	0.011	33804/7668	Measurement/context check
Full 2011–2020	Remission from depressive symptoms	0.89 (0.81, 0.98)	0.023	18553/7061	Measurement/context check
2018–2020 sensitivity	Incident depressive symptoms	1.00 (0.83, 1.21)	0.962	8958/2102	Measurement/context check
2018–2020 sensitivity	Remission from depressive symptoms	1.09 (0.88, 1.34)	0.447	5493/1965	Measurement/context check

Note: All estimates compare labor exit with stable working. Primary estimates use the final Model 3 covariate structure. The health-selection model additionally adjusted for self-rated health, sleep duration, smoking, drinking, and health insurance; the baseline CESD model additionally adjusted for CESD-10 score at wave *t*; and the complete-item analysis required all 10 CESD-10 items to be observed. Full 2011–2020 and 2018–2020 analyses were treated as measurement/context sensitivity analyses.

Figures

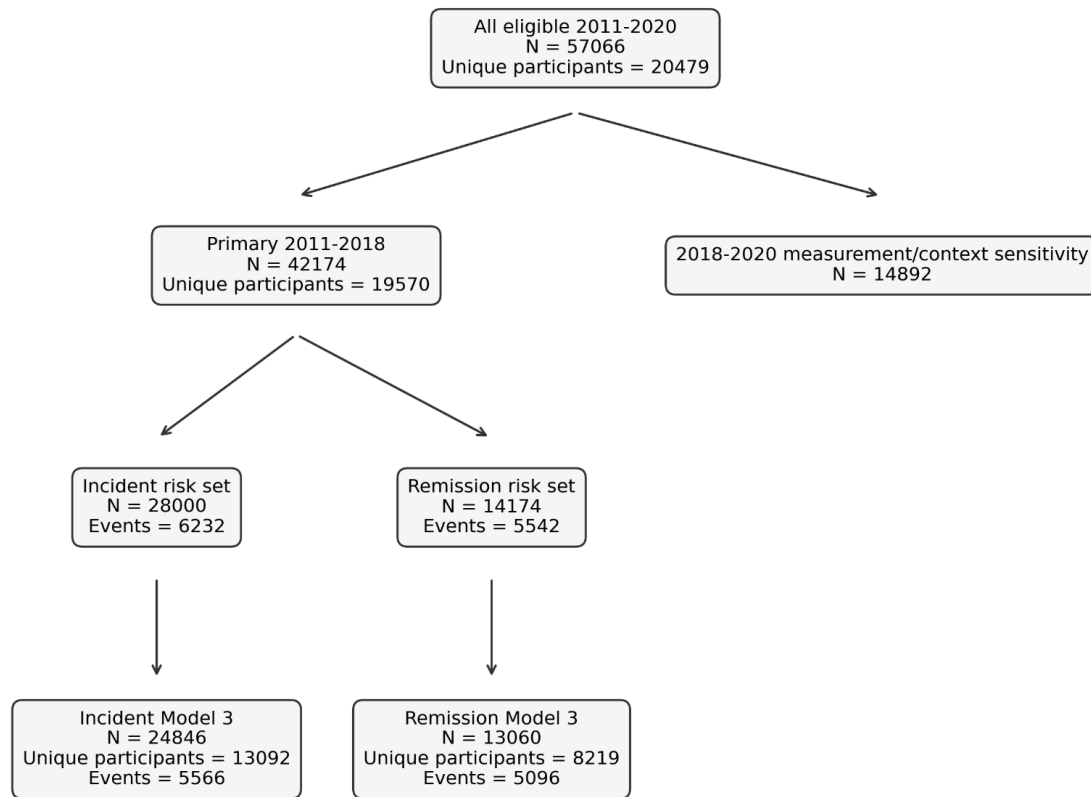


Figure 1

Sample construction and analysis design

The full CHARLS person-period dataset included 57066 eligible transition observations from 20479 unique participants from 2011 to 2020. The primary analysis was restricted to the 2011–2018 intervals (2011–2013, 2013–2015, and 2015–2018; 42174 observations from 19570 unique participants). The incident-depressive-symptom Model 3 included 24846 observations from 13092 unique participants with 5566 events; the remission Model 3 included 13060 observations from 8219 unique participants with 5096 events. The 2018–2020 interval was retained as a measurement/context sensitivity analysis. The incident risk set comprised transitions in which participants had no depressive symptoms at wave t ; the remission risk set comprised transitions in which participants had depressive symptoms at wave t .

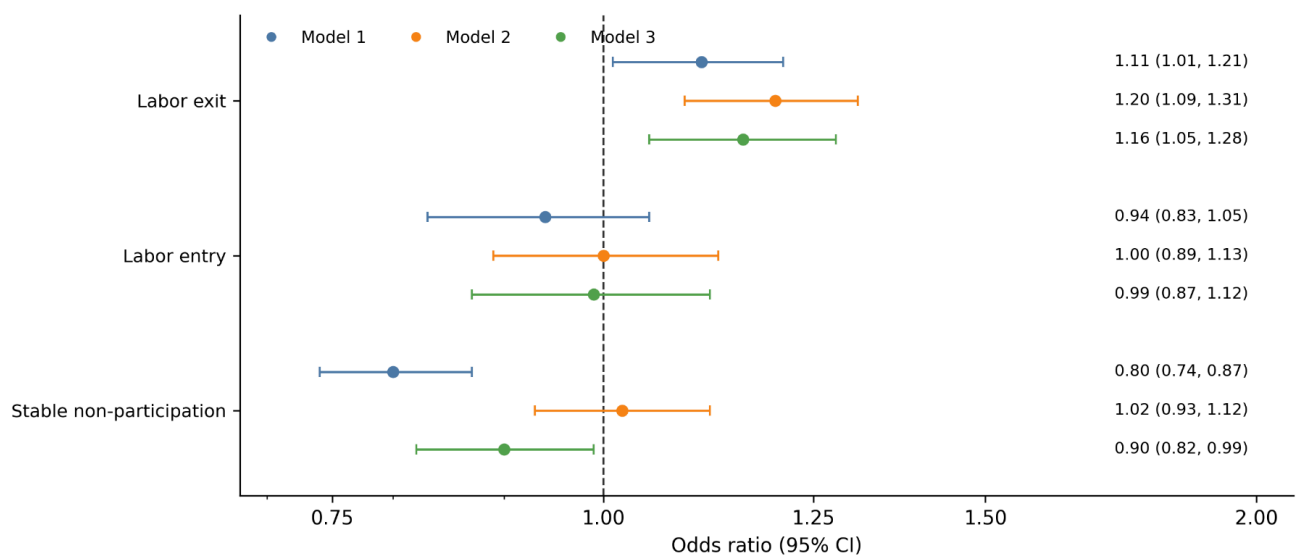


Figure 2

Labor-force transitions and incident depressive symptoms

Odds ratios are shown for incident depressive symptoms in the final 2011–2018 primary analysis. Stable working was the reference group. Model 1 adjusted for categorical transition interval, age, and sex. Model 2 additionally adjusted for education, marital status, and urban/rural residence. Model 3 additionally adjusted for chronic disease count, ADL disability, and IADL disability. *OR*, odds ratio; *CI*, confidence interval.

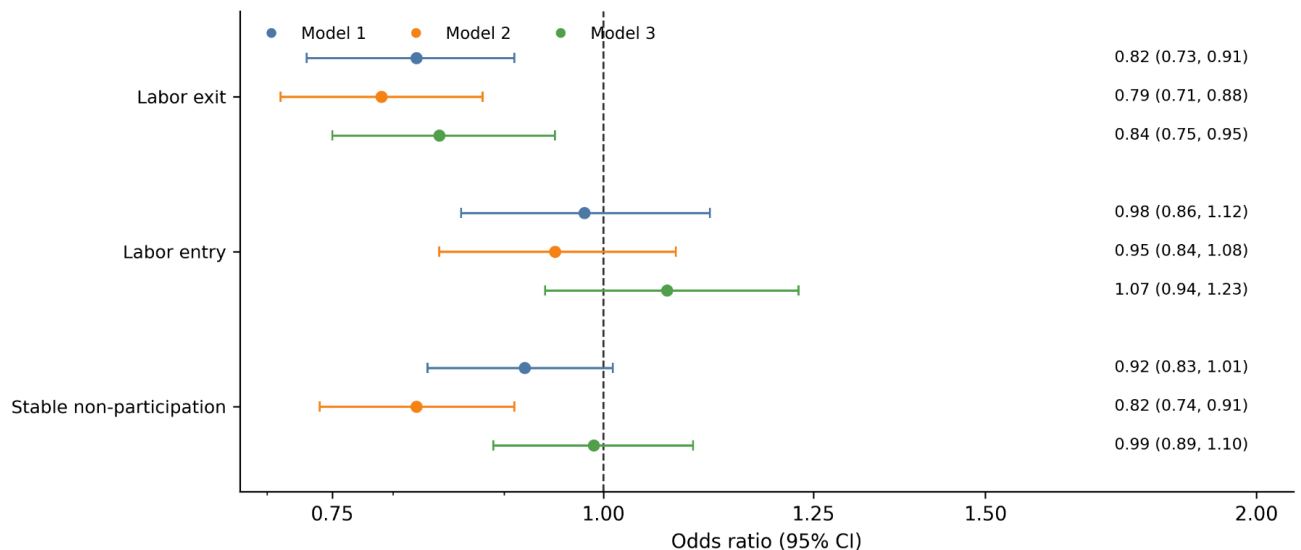


Figure 3

Labor-force transitions and depressive symptom remission

Odds ratios are shown for remission from depressive symptoms in the final 2011–2018 primary analysis. Stable working was the reference group. Model 1 adjusted for categorical transition interval, age, and sex. Model 2 additionally adjusted for

education, marital status, and urban/rural residence. Model 3 additionally adjusted for chronic disease count, ADL disability, and IADL disability. *OR*, odds ratio; *CI*, confidence interval.

Supplementary Files

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