

Socioeconomic Structural Resources and Depressive Symptoms among Postpartum Women in China: Evidence of Rising Rural Depression Risk from a Repeated Cross-Sectional Study Using CFPS 2016-2022

Zhaohui Jiang

The Reproductive Hospital of Guangxi Zhuang Autonomous Region

Yanjiao Hua

The Reproductive Hospital of Guangxi Zhuang Autonomous Region

Quanhai Luo

The Reproductive Hospital of Guangxi Zhuang Autonomous Region

Li Deng

13471161280@139.com

The Reproductive Hospital of Guangxi Zhuang Autonomous Region

Research Article

Keywords: postpartum depression, structural resources, urban–rural disparities, CFPS

Posted Date: September 23rd, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10676236/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Using four waves (2016–2022) of nationally representative data from the China Family Panel Studies (CFPS), this study examined the association between a composite structural resource index-comprising education and personal income-and postpartum depressive symptoms, and focus on temporal and urban-rural differentials in depression risk over the study period.

Methods

The sample included 743 mothers of infants aged 0 years. Principal component analysis was used to construct a two-dimensional structural resource index. Depressive symptomatology was assessed using the Center for Epidemiologic Studies Depression Scale (CES-D), with a cut-off of ≥ 36 indicating depression positivity. Linear and logistic regression models were fitted with adjustment for confounders. Stratified analyses by urban/rural residence and educational level were performed, along with two robustness checks.

Results

Each one-unit increase in the structural resource index was associated with a 20.4% lower odds of depression positivity (OR = 0.796, 95% CI: 0.670–0.944, $P = 0.009$). Notably, the odds of depression positivity among rural postpartum women increased three-fold from 2016 to 2022, whereas no significant temporal change was observed among their urban counterparts. Sensitivity analyses confirmed the stability of these findings.

Conclusions

Structural resources-education and income-are consistently and inversely associated with postpartum depressive symptoms. The escalating depression risk among rural mothers over the 2016–2022 period highlights a persistent structural mental health inequality between urban and rural areas. Targeted psychological interventions for low-educated, rural postpartum women are needed to narrow the perinatal mental health gap.

Background

Postpartum depression (PPD) is a major global public health concern, with prevalence varying substantially across countries. In high-income nations, the 12-month prevalence of depressive symptoms after childbirth is estimated at 8%-16%, whereas in low- and middle-income countries (LMICs) the burden is considerably heavier-approximately 25.8% in low-income and 20.8% in middle-income settings, meaning that about one in five mothers experiences clinically relevant postpartum emotional disturbances^[1–3]. These disparities point

to the potentially critical role of socioeconomic structural factors in shaping the occurrence and distribution of PPD.

Structural resources refer to macro-level social position indicators embedded within economic and institutional systems that shape individuals' health opportunities; they typically include educational attainment, income, employment status, and residential location^[4]. Rather than exerting direct effects on mental health, these resources operate indirectly by structuring living conditions, social support networks, healthcare access, and stress-coping capacities, thereby influencing vulnerability to PPD.

The social causation theory posits that low socioeconomic status entails greater chronic stress exposure, fewer coping resources, and weaker social support, consequently increasing the risk of psychiatric disorders^[5]. The perinatal period represents a uniquely stressful life phase for women, compounded by childcare demands, physical recovery, and identity transition. Resource scarcity may amplify negative emotional states: women with limited education may lack symptom recognition skills; those with low income may find counselling or treatment financially prohibitive; and rural residents-constrained by geographical isolation and information scarcity-may become emotionally detached from available support systems.

Numerous studies have linked low educational level, low income, unemployment or informal employment, and rural residence to elevated PPD risk^[1, 3]. Nevertheless, several gaps remain. First, most previous research examined structural variables in isolation rather than as a composite, thus failing to capture their joint effects. Second, the majority of evidence derives from single-time-point or single-region investigations, with a notable lack of trend analyses based on multi-wave national data. Third, whether the influence of structural resources on PPD exhibits unique, China-specific patterns against the backdrop of rapid urbanisation and social transition remains empirically untested. Wang et al. ^[6] excluded household income due to extensive missingness; our study, by contrast, used personal income to construct a two-dimensional resource index (education and income) for further investigation. To address these gaps, we proposed three hypotheses:

Hypothesis 1

Higher structural resource index scores are associated with lower total CES-D scores and a reduced odds of depression positivity;

Hypothesis 2

The inverse association between structural resources and depressive symptoms is stronger among disadvantaged subgroups-specifically, rural and less-educated women;

Hypothesis 3

A diverging urban-rural temporal trend in PPD risk exists over the 2016–2022 period.

Using multiple waves of the CFPS, we constructed a composite structural resource index to systematically evaluate its association with PPD and its heterogeneity across population subgroups, with the aim of informing targeted perinatal mental health interventions.

Methods

Data source

Data were drawn from the China Family Panel Studies (CFPS), a nationally representative, biennial longitudinal survey conducted by the Peking University Institute of Social Science Survey. The survey employs a multi-stage stratified probability-proportionate-to-size sampling design covering 25 provinces, autonomous regions, and municipalities directly under the central government^[7]. De-identified data are publicly available to academic researchers.

We extracted data from the 2016, 2018, 2020, and 2022 waves. By linking the child and adult databases, we identified mothers with an infant aged 0 years in the household. This study adopted a repeated cross-sectional design: each wave comprised an independent sample, and because the CFPS does not provide a unique individual identifier, the same woman could appear in multiple waves if she gave birth more than once, making it impossible to exclude repeated observations.

The CFPS overall study protocol was approved by the Peking University Biomedical Ethics Committee (approval number: IRB00001052-14010), and all participants provided written informed consent before enrolment. As this was a secondary analysis of anonymised public-use data, additional ethical approval was not required.

Study population

For each wave, we matched children's records to the family roster to identify biological mothers of infants aged 0 years. Inclusion criteria were: (i) presence of a 0-year-old child in the child database linked to the family roster; (ii) availability of the mother's individual questionnaire in the adult database; (iii) complete responses on the CES-D and core explanatory variables.

Responses coded as missing (e.g., -10, -9, -8, -2, -1, 78, 79) were treated as missing. Complete-case analysis (CCA) was applied, with acknowledgement of potential selection bias (see Limitations). Effective sample sizes varied across regression models because of differential missingness in covariates.

The initial pooled sample comprised 743 postpartum women (2016: 241; 2018: 254; 2020: 139; 2022: 109). After excluding observations with missing covariates, the fully adjusted analytical sample included 578 women. Post-hoc power calculations for logistic regression using the Hsieh algorithm (R software) indicated that, with a two-sided alpha of 0.05, a baseline depression positivity rate of 32.70%, and an assumed OR of 0.796, the achieved power was 0.73, suggesting adequate sensitivity to detect a moderate association between the structural resource index and PPD^[8]. The sample selection process is depicted in Fig. 1.

Variable measurement

Outcome: postpartum depressive symptoms

Depressive symptoms were assessed using the 20-item Center for Epidemiologic Studies Depression Scale (CES-D), with each item scored from 0 to 3 (positive items reverse-coded), yielding a total score ranging from 0 to 60; higher scores indicate more severe symptomatology. The CES-D has been validated for use among Chinese women of reproductive age, with established reliability, validity, and cultural appropriateness^[9, 10].

Two outcome specifications were employed:

1. Continuous outcome: CES-D total score, analysed using multiple linear regression;
2. Binary outcome: depression positivity defined as CES-D ≥ 36 , based on the validated cut-off for Chinese perinatal populations^[11]; a more stringent threshold (CES-D ≥ 40) was used in sensitivity analyses.

Note

Because the sample was defined solely by the presence of a 0-year-old infant, women at 1, 6, or 12 months postpartum could not be distinguished, resulting in a mixed group across the entire first year.

Core independent variable: two-dimensional structural resource index

Drawing on established approaches for constructing socioeconomic indices^[12–17], the primary analysis incorporated only educational attainment and maternal personal income.

Employment status and urban/rural residence were not included as constituents but were retained as stratification variables (the rationale being that education and income represent core human and economic capital, while residence is used for heterogeneity testing). A principal component analysis (PCA) was applied to derive a standardised composite score^[18, 19], with the following steps:

Educational attainment was coded as: 1 = primary school or below; 2 = junior high school; 3 = senior high school/vocational; 4 = college or above.

Maternal personal income was natural-log-transformed to reduce skewness, reflecting purchasing power and material security.

The two standardised variables were entered into PCA, and the first principal component was extracted as the structural resource index, with higher scores indicating greater socioeconomic resources.

PCA diagnostics: KMO value = 0.500 (at the lower bound of acceptability); Bartlett's test of sphericity: $\chi^2 = 138.357$, $P < 0.001$, indicating sufficient inter-item correlation for factor extraction. The first principal component had an eigenvalue of 1.424 and explained 71.2% of the total variance, with factor loadings of

0.844 for both indicators-essentially equivalent to an equally weighted average of the two standardised variables. Full PCA output is provided in Supplementary Table S1. In sensitivity analyses, we expanded the index to four dimensions by including employment status and urban/rural residence.

Covariates

Covariates were selected based on theoretical frameworks and empirical evidence from Chinese studies^[11, 16, 20–26], and were grouped into three categories:

Demographic characteristics: maternal age (continuous), urban/rural residence, infant sex, and marital status (married/cohabiting versus others);

Self-rated health: scored from 1 (excellent) to 5 (poor), with higher scores indicating worse perceived health;

Temporal control: survey year (categorical), with 2016 as the reference.

Statistical analysis

All statistical analyses were performed using SPSSAU (version 26.0). Two-sided $P < 0.05$ was considered statistically significant. Reporting followed the STROBE checklist for cross-sectional studies (Supplementary File S1). The analytical steps were:

Descriptive statistics: categorical variables were presented as counts (percentages) and compared using χ^2 tests; continuous variables were presented as means $\pm$ standard deviations and compared using one-way ANOVA.

Regression models:

1. (a) Multiple linear regression with CES-D total score as the dependent variable, reporting unstandardised coefficients (B), standardised beta coefficients, 95% confidence intervals, and variance inflation factors (VIF) to assess multicollinearity;
2. (b) Binary logistic regression with depression positivity ($\text{CES-D} \geq 36$) as the outcome, reporting odds ratios (OR) and 95% CI; model calibration was assessed using the Hosmer-Lemeshow test.

All models adjusted for survey year, demographic factors, and self-rated health.

Stratified analyses: regressions were repeated separately by urban/rural residence and by educational level (low: junior high school or below; high: senior high school or above).

Robustness checks: (i) re-estimating all models with an alternative CES-D cut-off (≥ 40); (ii) using the expanded four-dimensional resource index.

Results

Baseline characteristics

Baseline characteristics of the 743 postpartum women across the four survey waves are presented in Table 1. Statistically significant differences across years were observed for the proportion of women with personal income, educational distribution, marital status, maternal age, and structural resource index scores (all $P < 0.01$): the percentage of women with personal income rose from 17.84% in 2016 to 54.13% in 2022, while overall educational attainment, maternal age, and resource index scores increased progressively. No significant annual differences were found for urban/rural distribution, infant sex, employment proportion, self-rated health, or raw CES-D scores (all $P > 0.05$).

Table 1
Baseline characteristics of the study sample by survey wave, 2016–2022.

Categorical variables[n(%)]	2016	2018	2020	2022	Statistic	P
Urban–rural residence					3.252	0.354
Rural	126(52.72)	114(45.78)	57(44.88)	49(46.23)		
Urban	113(47.28)	135(54.22)	70(55.12)	57(53.77)		
Child sex					3.417	0.332
Girl	108(44.81)	120(47.24)	53(38.13)	45(41.28)		
Boy	133(55.19)	134(52.76)	86(61.87)	64(58.72)		
Employment status					0.692	0.875
Not in employment	139(57.68)	140(55.12)	75(53.96)	59(54.13)		
In employment	102(42.32)	114(44.88)	64(46.04)	50(45.87)		
Income status					60.130	** <0.001
No income	198(82.16)	150(59.06)	73(52.52)	50(45.87)		
With income	43(17.84)	104(40.94)	66(47.48)	59(54.13)		
Educational attainment					126.574	** <0.001
Primary school or below	48(21.72)	32(12.60)	0(0.00)	0(0.00)		
Junior secondary school	67(30.32)	85(33.46)	10(7.19)	8(9.30)		
Senior secondary / vocational school	46(20.81)	61(24.02)	50(35.97)	27(31.40)		
Tertiary education or above	60(27.15)	76(29.92)	79(56.83)	51(59.30)		
Marital status					14.763	**0.002
Unmarried	89(36.93)	43(24.29)	18(18.95)	21(24.71)		
Married	152(63.07)	134(75.71)	77(81.05)	64(75.29)		
Continuous variables (mean ± SD)						
Maternal age (years)	27.64 ± 4.63	27.84 ± 4.43	28.93 ± 5.41	29.48 ± 4.89	5.319	**0.001
Structural resource index	0.561 ± 1.013	0.064 ± 1.227	0.577 ± 1.016	0.698 ± 1.016	43.978	** <0.001
Note: *P < 0.05; **P < 0.01. Categorical variables were compared using χ^2 tests; continuous variables using one-way ANOVA. Sample sizes vary due to missing data.						

Categorical variables[n(%)]	2016	2018	2020	2022	Statistic	P
Self-rated health score	2.539 ± 1.037	2.551 ± 0.917	2.424 ± 0.978	2.431 ± 0.886	0.832	0.476
Total CES-D score	32.33 ± 7.01	32.76 ± 6.60	32.74 ± 7.52	33.81 ± 8.07	1.071	0.360
Note: * $P < 0.05$; ** $P < 0.01$. Categorical variables were compared using χ^2 tests; continuous variables using one-way ANOVA. Sample sizes vary due to missing data.						

Structural resources and continuous CES-D scores: multiple linear regression

The fully adjusted linear regression model ($n = 578$) was statistically significant ($F(8,569) = 3.695$, $P < 0.001$) with an adjusted R^2 of 0.036; all VIFs ranged from 1.006 to 1.384, indicating no multicollinearity (Table 2). After controlling for all confounders, the structural resource index was significantly and inversely associated with CES-D total score: each one-unit increase in the index corresponded to a decrease of 0.553 points in the CES-D score ($B = -0.553$, $Beta = -0.091$, $P = 0.048$). In terms of temporal trends, relative to 2016, only the 2022 wave showed a significantly higher CES-D score ($B = 1.945$, $P = 0.048$); the 2018 and 2020 estimates were elevated but not statistically significant. Among covariates, poorer self-rated health was strongly associated with higher CES-D scores ($B = 1.266$, $P < 0.001$), while maternal age showed a marginal inverse association ($P = 0.061$). Marital status and infant sex were not significant.

Table 2
Multiple linear regression results for CES-D total score (n = 578).

Variable	Unstandardised coefficient B	Standard error	Standardised coefficient Beta	t value	P	VIF
Constant	31.92	2.042	-	15.63	** <0.001	-
Structural resource index	-0.553	0.279	-0.091	-1.981	*0.048	1.251
Survey year (reference: 2016)						
2018	1.011	0.737	0.065	1.372	0.171	1.324
2020	1.398	0.936	0.072	1.493	0.136	1.382
2022	1.945	0.98	0.095	1.984	*0.048	1.384
Maternal age	-0.133	0.071	-0.088	-1.875	0.061	1.305
Marital status (married = 1)	-0.177	0.751	-0.011	-0.236	0.813	1.307
Self-rated health score	1.266	0.304	0.171	4.164	** <0.001	1.009
Child sex (boy = 1)	0.903	0.596	0.062	1.514	0.131	1.006
Model fit						
Adjusted R²	0.036					
F value	F (8,569) = 3.695,p = < 0.001					
Note: *P < 0.05; **P < 0.01.						

Structural resources and depression positivity: binary logistic regression

Among the 578 complete-case observations, 189 met the criteria for depression positivity (32.70%). The Hosmer-Lemeshow test yielded $\chi^2 = 12.546$, $df = 8$, $P = 0.128$, indicating acceptable model fit; Nagelkerke $R^2 = 0.059$ (Table 3). After full adjustment, the structural resource index emerged as a protective factor against depression positivity (OR = 0.796, 95% CI: 0.670–0.944, $P = 0.009$), corresponding to a 20.4% reduction in the odds of depression per unit increase in the index. Temporally, relative to 2016, the odds of depression positivity were significantly higher in 2020 (OR = 1.962, $P = 0.019$) and 2022 (OR = 1.869, $P = 0.038$). Poorer self-rated health was again associated with higher odds of depression (OR = 1.362, $P = 0.001$); maternal age, marital status, and infant sex showed no significant associations.

Table 3
Binary logistic regression results for depression positivity (CES-D $\geq$ 36, n = 578).

Variable	Regression coefficient β	Standard error	Wald χ^2	<i>P</i>	OR	95% CI for OR
Intercept	-0.908	0.622	2.128	0.145	0.403	0.119 ~ 1.366
Structural resource index	-0.229	0.087	6.846	**0.009	0.796	0.670 ~ 0.944
Survey year (reference: 2016)						
2018	0.316	0.227	1.942	0.163	1.372	0.879 ~ 2.142
2020	0.674	0.286	5.544	* 0.019	1.962	1.120 ~ 3.437
2022	0.626	0.302	4.291	* 0.038	1.869	1.034 ~ 3.378
Maternal age	-0.032	0.022	2.152	0.142	0.969	0.928 ~ 1.011
Marital status (married = 1)	-0.198	0.228	0.752	0.386	0.821	0.525 ~ 1.283
Self-rated health score	0.309	0.095	10.56	**0.001	1.362	1.130 ~ 1.641
Child sex (boy = 1)	0.2	0.184	1.181	0.277	1.222	0.851 ~ 1.753
Model fit						
Nagelkerke R ²	0.059					
Hosmer–Lemeshow test	$\chi^2=12.546$ <i>P</i> = 0.128					
Note: * <i>P</i> < 0.05; ** <i>P</i> < 0.01.						

Sensitivity analyses

Alternative CES-D cut-off ($\geq$ 40)

With the stricter threshold, 107 out of 578 women (18.51%) were classified as depression-positive. The structural resource index remained significantly inversely associated with depression (OR = 0.757, 95% CI: 0.614–0.933, P = 0.009), with direction and magnitude consistent with the primary analysis (Supplementary Table S2).

Four-dimensional structural resource index

When employment status and urban/rural residence were added to the index ($n = 563, 181$ positive cases), the expanded index still demonstrated a significant protective effect ($OR = 0.806$, 95% CI: 0.693–0.937, $P = 0.005$), confirming the robustness of the finding (Supplementary Table S3).

Stratified analyses

Urban-rural stratification

In both rural and urban subgroups, the inverse association between the structural resource index and depression positivity was observed, with a stronger magnitude in the rural group ($OR = 0.807$, $P = 0.123$) compared with the urban group ($OR = 0.854$, $P = 0.214$) (Supplementary Table S4). Regarding temporal differences, rural mothers showed significantly elevated odds of depression positivity in 2020 and 2022 relative to 2016 (2022: $OR = 3.248$, $P = 0.007$), whereas no such temporal increase was evident among urban mothers.

Education stratification

The inverse association was present in both low-education (junior high school or below) and high-education (senior high school or above) groups; the association approached statistical significance in the high-education group ($OR = 0.784$, $P = 0.064$), while the low-education group exhibited a wide confidence interval and was not statistically significant ($OR = 0.806$, $P = 0.410$) (Supplementary Table S5). Temporally, the low-education group displayed a sharp increase in depression risk in 2022 ($OR = 4.929$, $P = 0.053$) with limited precision, while the high-education group showed a significant elevation in 2020 ($OR = 1.921$, $P = 0.049$).

Discussion

Using four waves of nationally representative repeated cross-sectional data from the CFPS (2016–2022), this study quantified the association between a two-dimensional structural resource index and postpartum depressive symptoms, examined heterogeneity by urban/rural residence and educational level, and documented temporal changes in depression risk over a six-year period. Two sets of sensitivity analyses confirmed the stability of the primary findings. The most striking result was the progressive increase in depression risk exclusively among rural postpartum women, with no parallel change among urban women—a pattern indicative of structural mental health inequality between urban and rural China. Although the protective trend was consistent across subgroups, the rural and low-education strata were underpowered due to limited sample sizes.

Socioeconomic structural resources as stable protective factors for PPD

After adjusting for demographic, health, and temporal confounders, each one-unit increase in the structural resource index was associated with a 20.4% reduction in the odds of depression positivity. Although the effect size at the individual level is moderate, given the large number of postpartum women with limited resource endowments in China, the population-level potential for mental health improvement is substantial. This finding aligns with Boakye et al. ^[13], who identified socioeconomic status as a core determinant of

perinatal mental health, and with Wainaina et al. [6, 27], who reported protective effects of women's economic empowerment on maternal mental health in rural Kenya.

Consistent with the social causation framework, three pathways may explain this inverse association. First, the material resources pathway: stable income and higher education provide financial security, alleviating economic pressures associated with childrearing and reducing the direct mental health impact of financial strain [12]. Second, the health literacy pathway: education enhances health literacy, facilitating early recognition of depressive symptoms and promoting help-seeking behaviour [13]. Third, the social capital pathway: higher socioeconomic status is linked to richer social support networks and greater autonomy in household decision-making [27].

Interpretation of low model fit

The linear model yielded an adjusted R^2 of 0.036 and the logistic model a Nagelkerke R^2 of 0.059-both modest. Postpartum depressive symptoms are influenced by numerous factors beyond socioeconomic resources, including genetic predisposition, partner relationship quality, parenting stress, prior psychiatric history, and family conflict. Our primary aim was not to build a predictive model for clinical depression but to isolate the independent net association of structural resources after controlling for measured confounders. The fact that the direction and significance of the association remained consistent across continuous and binary outcomes, two resource index specifications, and two depression cut-offs is more informative than the absolute R^2 value alone.

Urban-rural temporal divergence reflects deep-seated structural health inequality

The stronger inverse association observed in rural areas-though not statistically significantly different from urban areas-may be interpreted through the lens of diminishing marginal returns in health sociology: rural women start from a lower resource baseline, so equivalent gains in education or income may yield greater emotional benefits. However, this gradient did not reach statistical significance, possibly because mental health services-including psychiatric and counselling resources-remain heavily concentrated in tertiary urban hospitals, whereas rural primary care facilities lack routine perinatal psychological screening and trained personnel [28].

It is also noteworthy that the 2020–2022 period overlapped with the COVID-19 pandemic, during which lockdown policies, income shocks to farming households, and strain on primary maternal health services may have disproportionately affected rural women's mental health relative to their urban counterparts [29, 30]. This is an important external confounder that may have contributed to the rising rural depression risk. While the urban-rural interaction term was not statistically significant, the sustained widening of the urban-rural mental health gap over six years carries important policy implications.

Education stratification: differential resource conversion capacity

The protective trend was present in both education groups, but approached significance only in the high-education group. This suggests that economic and educational advantages do not automatically translate into improved postpartum mood; rather, the conversion depends on individual cognitive and healthcare utilisation patterns. Better-educated women tend to have more accurate depression awareness and lower mental health stigma, whereas less-educated women may normalise postpartum distress, fear being labelled an "unqualified mother," and consequently suppress emotions and avoid professional care ^[13]. Moreover, women with lower education are more likely to be in precarious informal employment, where career interruption due to childbirth may attenuate the emotional buffering effect of income ^[31].

Theoretical and policy implications

This study applies social causation and social determinants of health theories to the Chinese postpartum population, using six years of national data to test their contextual applicability. The simplified two-dimensional resource index offers a parsimonious measurement tool for future research on maternal health equity in China.

Based on these findings, we propose the following recommendations: (1) continue to expand female access to compulsory and higher education, strengthen legislation on equal pay and employment protection for women of childbearing age, and incorporate structural resource indicators into national maternal health equity surveillance; (2) implement targeted rural interventions-integrate the Edinburgh Postnatal Depression Scale (EPDS) into routine primary care services, and train village doctors and maternal health workers in perinatal mental health identification; and (3) develop community-based psychoeducation programmes by embedding mental health promotion into antenatal and postnatal home visits, and utilise short-video platforms alongside traditional rural outreach to reduce stigma and encourage help-seeking.

Limitations

Several limitations should be acknowledged. First, the repeated cross-sectional design does not permit tracking individual women over time, and causal inference is precluded. Second, because the CFPS lacks unique individual identifiers, women who gave birth in multiple survey waves may have been included more than once, potentially introducing clustering bias. Third, the definition of the postpartum period was imprecise, as sampling was based solely on the presence of a 0-year-old infant without exact date of delivery, limiting comparability with studies that restrict to 12 weeks or 1 year postpartum. Fourth, stratified subgroup analyses-particularly for rural and low-education women-were underpowered, as reflected by wide confidence intervals. Fifth, the structural resource index was constrained by the available CFPS variables; occupational prestige, spousal income, and social insurance coverage could not be included. Sixth, mediating variables such as marital quality, parenting stress, and mental health stigma were not measured, precluding formal mediation analyses. Seventh, the use of complete-case analysis may have introduced selection bias, as respondents with missing data-potentially the more disadvantaged-were systematically excluded.

Future research should employ longitudinal mother-child cohorts, incorporate psychosocial mediators (e.g., social support, stigma), and test moderated mediation models to elucidate the mechanisms underlying the

resource-mental health pathway.

Conclusions

Using nationally representative repeated cross-sectional data from the CFPS 2016–2022, this study demonstrated a stable inverse association between a composite structural resource index-comprising education and personal income-and clinically relevant depressive symptoms among Chinese postpartum women. Two sensitivity analyses confirmed the robustness of this association. Over the six-year period, depression risk increased significantly and progressively only among rural postpartum women, suggesting an emerging structural mental health inequality between urban and rural China. Although the protective trend was consistent across all subgroups, the rural and low-education strata were underpowered. Economic and educational advantages do not automatically guarantee improved postpartum emotional health. Given the observational and cross-sectional nature of the data, causal inference is not warranted. Future longitudinal cohort studies with mediation analyses are needed to disentangle the underlying pathways, and priority should be given to implementing community-based psychological interventions for rural, less-educated postpartum women to bridge the urban-rural perinatal mental health gap.

Abbreviations

CFPS

China Family Panel Studies

CES-D

Center for Epidemiologic Studies Depression Scale

CI

Confidence interval

CCA

Complete-case analysis

EPDS

Edinburgh Postnatal Depression Scale

LMICs

Low- and middle-income countries

PCA

Principal component analysis

PPD

Postpartum depression

VIF

Variance inflation factor

Declarations

Ethics approval and consent to participate

The original CFPS study protocol was approved by the Peking University Biomedical Ethics Committee (IRB00001052-14010), and written informed consent was obtained from all participants prior to enrolment. This secondary analysis used only anonymised, publicly available data with no personally identifiable information; therefore, additional ethical approval was not required under relevant human research ethics guidelines. All procedures performed in this study involving analysis of publicly available social media data were conducted in accordance with the principles outlined in the Declaration of Helsinki.

Consent for publication

Not applicable. The content analyzed in this study is publicly available on social media platforms, and there is no use of any non-publicly disclosed personal data or materials that would require individual consent for publication.

Competing interests

All authors declare no financial or non-financial conflicts of interest relevant to this work.

Author details

¹ The Reproductive Hospital of Guangxi Zhuang Autonomous Region, China

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contribution

Z.J contributed to study conception and design, analyzed and interpreted data, and drafted the core content of the manuscript. Y.H acquired and organized data, and undertook sample coding and quality control. Q.L critically revised the intellectual content of the work and optimized the methodological framework. L.D prepared figures and tables (including the PRISMA flow diagram), reviewed and approved the final manuscript, and is accountable for the accuracy and integrity of the work as well as resolving related academic issues. All authors reviewed and approved the final manuscript.

Acknowledgements

We thank the Peking University Institute of Social Science Survey for making the CFPS data publicly available and for their ongoing support of open social science research.

Availability of data and materials

All data analysed in this study are from the China Family Panel Studies (CFPS), conducted by Peking University. The de-identified datasets are publicly available through the Peking University Open Research Data Platform (<https://cfpsdata.pku.edu.cn/#/home>) upon registration and signing of a data-use agreement.

References

1. Shorey S, Chee C, Ng ED, Chan YH, Tam W, Chong YS. Prevalence and incidence of postpartum depression among healthy mothers: A systematic review and meta-analysis. *J Psychiatr Res*. 2018;104:235–48.
2. Gelaye B, Rondon MB, Araya R, Williams MA. Epidemiology of maternal depression, risk factors, and child outcomes in low-income and middle-income countries. *Lancet Psychiatry*. 2016;3(10):973–82.
3. Dadi AF, Miller ER, Mwanri L. Postnatal depression and its association with adverse infant health outcomes in low- and middle-income countries: a systematic review and meta-analysis. *BMC Pregnancy Childbirth*. 2020;20(1):416.
4. Powell WE, Book, Review. Social Causes of Psychological Distress. *Families Society: J Contemp Social Serv*. 1991;72(7):441–2.
5. Hudson CG. Socioeconomic status and mental illness: tests of the social causation and selection hypotheses. *Am J Orthopsychiatry*. 2005;75(1):3–18.
6. Wang P, Yao J, Li Y, Zhang Z, Huang X. Differences in postpartum depressive symptoms across survey waves among Chinese mothers and their association with structural resources: a repeated cross-sectional study based on CFPS data. *Front Med (Lausanne)*. 2026;13:1865725.
7. Xie Y, Lu P. The Sampling Design of the China Family Panel Studies (CFPS). *Chin J Sociol*. 2015;1(4):471–84.
8. Hsieh FY, Bloch DA, Larsen MD. A simple method of sample size calculation for linear and logistic regression. *Stat Med*. 1998;17(14):1623–34.
9. Li Z, Hicks MH. The CES-D in Chinese American women: construct validity, diagnostic validity for major depression, and cultural response bias. *Psychiatry Res*. 2010;175(3):227–32.
10. Chi X, Zhang P, Wu H, Wang J. Screening for Postpartum Depression and Associated Factors Among Women in China: A Cross-Sectional Study. *Front Psychol*. 2016;7:1668.
11. Fu B, Zhang S, Xiang L, et al. Prevalence and influencing factors of perinatal depression across different stages of pregnancy and postpartum: a cross-sectional study in China. *Front Public Health*. 2025;13:1692231.
12. Sun M, Cao F, Peng J et al. Prevalence and Risk Factors of Postpartum Depression Among Women in Low-Income Developing Rural Areas: A Cross-Sectional Study in China. *Depress Anxiety*. 2024. 2024: 8841423.
13. Boakye PN, Setordzi M, Etowa J, et al. Sociocultural and Structural Determinants of Black Maternal Mental Health. A Scoping Review. *Birth*; 2026.

14. Goulding AN, Rosenblum KL, Miller AL et al. Associations between maternal depressive symptoms and child feeding practices in a cross-sectional study of low-income mothers and their young children. *Int J Behav Nutr Phys Activity*. 2014. 11(1).
15. He L, Mai Z, Guan X et al. The Moderating Role of Social Capital Between Parenting Stress and Mental Health and Well-Being Among Working Mothers in China. *Healthc (Basel)*. 2025. 13(2).
16. Liu S, Yan Y, Gao X, et al. Risk factors for postpartum depression among Chinese women: path model analysis. *BMC Pregnancy Childbirth*. 2017;17(1):133.
17. Han R, Ding X, Yang M, et al. The association between subjective socioeconomic status and depressive symptoms in women of reproductive age: the chain mediating effects of marital satisfaction and well-being. *Front Psychol*. 2025;16:1715488.
18. Jolliffe IT, Cadima J. Principal component analysis: a review and recent developments. *Philos Trans A Math Phys Eng Sci*. 2016. 374(2065): 20150202.
19. Pearson K. LIII. *<i>On lines and planes of closest fit to systems of points in space</i>*. Lond Edinb Dublin Philosophical Magazine J Sci. 1901;2(11):559–72.
20. Bai Y, Li Q, Cheng KK et al. Prevalence of Postpartum Depression Based on Diagnostic Interviews: A Systematic Review and Meta-Analysis. *Depress Anxiety*. 2023. 2023: 8403222.
21. Ding R, Yuan D, Zhu X, Du Y, Guo C. China's universal two-child policy and depressive symptoms among women at childbearing age: a difference-in-difference analysis based on the China Family Panel Study. *Epidemiol Psychiatr Sci*. 2026;35:e18.
22. Hahn-Holbrook J, Cornwell-Hinrichs T, Anaya I. Economic and Health Predictors of National Postpartum Depression Prevalence: A Systematic Review, Meta-analysis, and Meta-Regression of 291 Studies from 56 Countries. *Front Psychiatry*. 2017;8:248.
23. Dennis CL, Letourneau N. Global and relationship-specific perceptions of support and the development of postpartum depressive symptomatology. *Soc Psychiatry Psychiatr Epidemiol*. 2007;42(5):389–95.
24. Carlson DS, Grzywacz JG, Ferguson M, Hunter EM, Clinch CR, Arcury TA. Health and turnover of working mothers after childbirth via the work–family interface: An analysis across time. *J Appl Psychol*. 2011;96(5):1045–54.
25. Guan Z, Wang Y, Hu X, et al. Postpartum depression and family function in Chinese women within 1 year after childbirth: A cross-sectional study. *Res Nurs Health*. 2021;44(4):633–42.
26. Zhao L, Zhang M, Zhang Z, Guo H. Effects of occupational factors on depression in Chinese veterans: a fsQCA study based on 2022 CFPS data. *Front Psychol*. 2026;17:1853613.
27. Wainaina CW, Igonya E, Wekesah FM, Sidze EM. Women's economic empowerment and maternal mental health: A qualitative study in Rural Kenya. *Eur PSYCHIATRY*. 2024;67(S1):S810–1.
28. Phillips MR, Zhang J, Shi Q, et al. Prevalence, treatment, and associated disability of mental disorders in four provinces in China during 2001–05: an epidemiological survey. *Lancet*. 2009;373(9680):2041–53.
29. Bambra C, Riordan R, Ford J, Matthews F. The COVID-19 pandemic and health inequalities. *J Epidemiol Community Health*. 2020;74(11):964–8.
30. Dui H. COVID-19, income and gender wage gap: Evidence from the China family panel studies (CFPS) 2014 to 2020. *Front Public Health*. 2022;10:1066625.

31. Goyal D, Gay C, Lee KA. How much does low socioeconomic status increase the risk of prenatal and postpartum depressive symptoms in first-time mothers. *Womens Health Issues*. 2010;20(2):96–104.

Figures

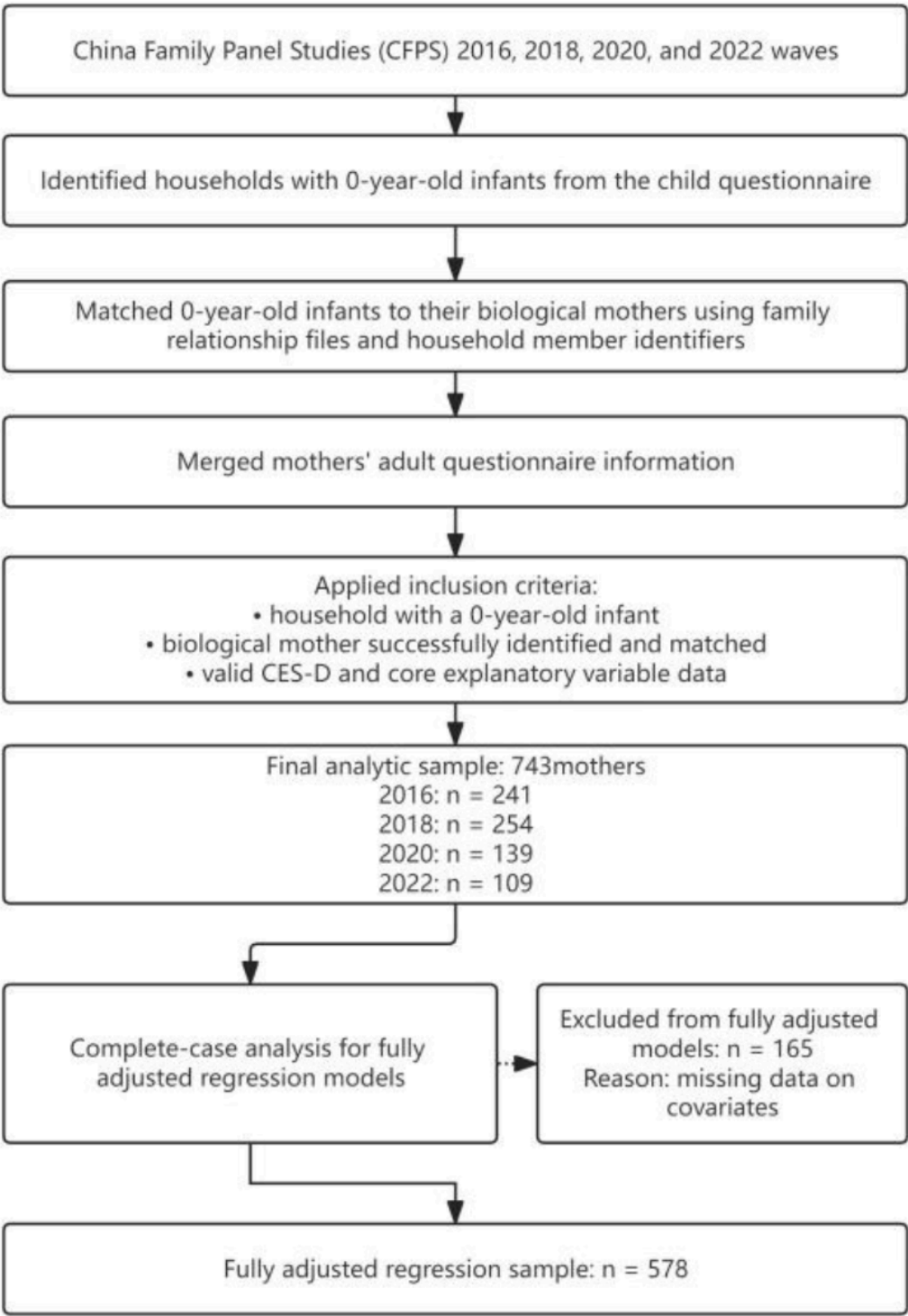


Figure 1

Flowchart of sample selection and analytical sample derivation. "Postpartum mothers" are defined as women living in households with a 0-year-old child; because the CFPS records only child age and not the exact date of delivery, the precise postpartum month could not be ascertained.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementaryFileS1.docx](#)
- [SupplementaryTableS1.docx](#)
- [SupplementaryTableS2.docx](#)
- [SupplementaryTableS3.docx](#)
- [SupplementaryTableS4.docx](#)
- [SupplementaryTableS5.docx](#)