Childhood familial environment and adulthood depression: evidence from a Chinese population-based study

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Background: Mental disorders have become an important public health issue and evidence is lacking on the impact of childhood experience on adulthood mental health in regions of low and middle income. Using national representative data from the China Health and Retirement Longitudinal Study, we aimed to explore the impact of childhood familial environment on adulthood depression.

Methods: A total of 19 485 subjects were interviewed. The survey collected information on demographic variables, variables of childhood familial environment and potential pathway variables, including childhood health status, adulthood physical health status, adulthood social support and adulthood socio-economic status (SES). Depressive symptoms were measured by the 10-item version of the Center for Epidemiological Studies Depression Scale.

Results: Parents' physical and mental health during the subjects' childhood were significantly associated with adulthood mental health. Mothers' smoking, unfair treatment and low family SES were associated with higher depressive symptoms in adulthood. Childhood physical and mental health status, adulthood physical health and adulthood SES might be important mediators in the pathways of childhood familial environment affecting adulthood depressive symptoms.

Conclusions: This study is the first to explore the relationship of childhood familial environment and adulthood depression in China. The results indicate that parents' physical and mental health, health behaviour and treatment equity among children a important predictors for adult depression.

Keywords: adulthood depression, childhood familial environment, China

Introduction

Mental disorders now account for 183.9 million disability-adjusted life years, the fifth leading contributor to the global disease burden,[1] and have become a major public health issue all over the world. Identifying risk factors for mental disorders is critical for effective interventions. Childhood experience was a significant predictor for mental disorders in adulthood.[2–5] People who grew up with the experience of maltreatment were more likely to have poor mental health, such as depression.[6] Family disruption, such as parental divorce in childhood, could increase the risk of developing depression in adulthood.[2] Childhood physical punishment was associated with later drinking outcomes.[4]

Stressful life events prior to puberty, and particularly in the first few years of life, were a predictor for alcohol and drug dependence in adulthood.[7] Children from socio-economically disadvantaged families were more likely to suffer from substance dependence and depression when they reached adulthood.[3,8] Childhood adversities were associated with mental disorders in adulthood,[5,9] and the number of adverse experiences had a graded relationship to alcoholism and depression in adulthood.[10]

The underlying mechanism of the association between childhood experience and adulthood mental health is multifactorial and complex.[3] One possible explanation is that gene and environment interactions induce mental disorders in adulthood.[11] Another explanation is the stress sensitization model,[12] in which

the past year's stressful life events served as a trigger in the pathways from childhood experience to adulthood mental disorders,[13] and the stress sensitization effect was strong among people with multiple childhood adversities.[13] The mechanisms underlying the association between childhood experience and adulthood mental health remain inadequately understood, and gender differences might exist in its pathways.[14]

Theories of life course perspectives[15-17] and accumulated disadvantage[18-20] were also employed to explain the association between early life family environment and adulthood mental health problems. An uneven distribution of risk factors and protective factors were found due to social and economic adversity,[15,16,20] and tailored health policies are warranted to promote the well-being of the young to improve the health of the population at all ages.[21]

However, most of the existing literature was conducted in developed countries, and little was known about the relation between childhood experience and adulthood mental disorders in regions of low and middle income. In this study, using nationally representative data from the China Health and Retirement Longitudinal Study (CHARLS), we aimed to explore the association between childhood familial environment and adulthood depression in the Chinese population. We also discuss the pathways underlying this relationship. The findings provide evidence for mental health promotion and future research in the Chinese population.

Materials and methods

Data

In this study we used data from the CHARLS, a nationally representative survey conducted by the National School of Development, Peking University. The target population of the CHARLS was adults ≥45 y of age and their spouses, from both urban and rural households in China. The survey aimed to collect information on Chinese individuals and families for multidisciplinary research in economics, sociology and demography. The CHARLS used a multistage cluster sampling design with three levels of sampling frames: county/city, village/neighbourhood committee and households. A total of 150 counties/cities were selected from 30 provincial-level administrative units in mainland China (Tibet was excluded from the survey) using the probability proportional to size (PPS) method. Within each county/city, three villages/neighbourhood committees were selected with PPS. Within each village/neighbourhood committee, 80 households were randomly selected using a specialized geographic information system programme. Within each household, one adult ≥45 y of age as well as his/her spouse were randomly selected to participate in the survey. More details about the CHARLS survey and the representativeness can be found in previously published papers.[22-24]

The baseline survey was carried out in 2011/2012 and the follow-up survey was carried out in 2013/2014. We used the 2013/2014 CHARLS data in the current study. There were 19 485 observations of individuals ≥40 y of age (including the main respondents and their spouses). After excluding observations with missing information and extreme values on the key variables, our final sample included 11 857 observations. There was

no significant difference in the proportion of males between the included and excluded observations (47.3% vs 47.5%; p=0.838), while the included observations were from younger individuals than those excluded (58.6 y vs 61.7 y; p<0.01), and there were more rural residents among the included sample than in the excluded sample (79.3% vs 73.6%; p<0.01). The included sample differed to some extent from the excluded sample, but the difference was quite small. The information was collected via face-to-face interviews and reported by the participants themselves.

Outcome variable

The main outcome variable of interest was adulthood mental health, measured by the 10-question version of the Center for Epidemiological Studies Depression (CES-D) instrument developed by Andresen et al.[25] Of the 10 items in the CES-D, eight measured negative feelings and two measured positive feelings. The respondents were asked to assess their moods in the past 7 d and to choose one response from the four proposed answers: rarely or none of the time (<1 d), some or a little of the time (1–2 d), occasionally or a moderate amount of the time (3–4 d) and most or all of the time (5–7 d). The responses to the items on negative feelings were assigned an integer value of 0–3 and responses to the four items on positive feelings were coded as 3–0, which in total made up an overall CES-D score ranging from 0 to 30, with higher scores indicating more severe depressive symptoms. Subjects with a total score ≥10 were categorized as having depressive symptoms.[26-28] The 10-question version of the CES-D has been validated in the Chinese middle-aged and elderly population using the CHARLS data.[23,29]

Control variables

Demographic information of adults served as control variables, including age, gender, *hukou* and province dummy variables. *Hukou* is a legally required residential registration status in China that identifies all individuals as either urban or rural.

Independent variables

Variables of the childhood familial environment served as independent variables, including mother's and father's mental health status, mother's and father's smoking and alcohol behaviour (yes or no), mother's and father's physical health status (having major physical health problems or not), mother's and father's treatment of other children compared with the treatment of the subject (better or worse) and family socio-economic status (SES) in childhood. We measured family SES in childhood from two aspects: childhood family financial situation compared with others in the area (general, better or worse) and starvation experience (yes or no). Mother's and father's mental health status were measured from three aspects: mother's and father's continued sadness or depression, frequency of being nervous and anxious, and frequency of being upset or panicky.

Pathway variables

Based on the findings of the existing literature, childhood health status,[30-32] adulthood health status,[28] and adulthood SES and

social support[33,34] were important predictors for mental health problems in adulthood. We explored the potential pathways from aspects of childhood health status (measured by self-reported childhood overall health status and physical health problems in childhood), adulthood physical health status (measured by physical health problems in adulthood, adulthood chronic diseases and adulthood disability), adulthood social support and adulthood SES (measured by marital status, educational attainment, working status and adulthood family expenditure level). The variable experience of physical health problems in childhood was defined as 1 if it was because of a health condition or, as a child, he/she ever missed school for ≥ 1 mo, confined to bed or home for ≥ 1 mo, hospitalized for ≥ 1 mo or hospitalized more than three times within a 12 month period before 15 y of age and was defined as 0 if he/she did not suffer any of above the situations in childhood. The variable experience of physical health problems in adulthood was defined as 1 if it was because of a health condition, adult confined to bed or home for ≥ 1 mo, hospitalized for ≥ 1 mo, hospitalized more than three times within a 12 month period before 15 y of age or left a job for ≥ 1 mo because of a health condition, and defined as 0 if he/she did not suffer any of the above situations. The variable of social support was defined as 1 if the respondent got financial support for work, positive non-financial support for work or positive support for interpersonal relationships, and 0 if the respondent did not get any kind of above support.

Empirical model and identification strategy

We used the binary choice model to analyse the association between childhood familial environment and adult depressive symptoms. The model was specified as follows:

$$D^*_i = X_i\beta + I_i\delta + P_i\phi + \mu_i \qquad (1)$$

$$\Pr(D_i = 1|X, I, P) = \Pr(D^*_i > 0|X, I, P) = G(X_i\beta + I_i\delta + P_i\phi + \mu_i), \qquad (2)$$

where D^*_i denotes a latent variable measuring depressive symptoms of individual i. The realization of D_i depends on D^*_i. We observed a D_i of 1 when D^*_i was >0, otherwise D_i equals 0. X_i denotes measures of childhood familial environment, including mother's and father's mental health, mother's and father's smoking and alcohol behaviour, mother's and father's physical health, mother's and father's treatment of other children compared with the treatment of the subject, childhood family financial situation and starvation experience. I_i represents the demographic information of the adults, including age, gender and *hukou*. We added province dummy variables (P_i) to control for the omitted location attributes. We assumed a residual term μ_i followed the logit distribution and used the logit model to estimate the above model. We reported adjusted odds ratios (ORs) in all our tables.

Based on the above model, we then successively conducted more complex models in which more covariates were added into the model in order to examine the association between other covariates and adulthood depressive symptoms, as well as how the coefficients of childhood familial environment variables would change. The final model included all indicators simultaneously. The added covariates included childhood overall health status, adulthood physical health status, social support and adulthood SES. For the strategy of identifying mediating effects, when the covariate was added into the model, the coefficients of childhood familial environment variables became smaller or less significant. Thus the covariate was proved to be an important mediator in the pathways of childhood familial environment affecting adulthood depressive symptoms. This strategy of identifying mediating effects is widely used in the literature.[23] We used Stata statistical analysis software (StataCorp, College Station, TX, USA) to conduct descriptive statistical analysis and regression analysis in this study.

Results

Sample characteristics

Table 1 reports the sample statistics of demographic characteristics. χ^2 tests were used to explore differences in categorical variables between adults with and without depressive symptoms. People with depressive symptoms accounted for 28.8% of the adults ≥ 40 y of age. A statistically significant difference was found for age between subjects with and without depressive symptoms. The prevalence rate of depressive symptoms among females was significantly higher than that in males. Compared with adults from urban areas, the prevalence rate of depressive symptoms was much higher among those from rural areas. Subjects with depressive symptoms had a higher probability of having a mother and father who continued to be sad or depress lasting ≥ 2 wk, to be nervous and anxious for most of the time and to be upset or panicky for most of the time during their childhood. No statistically significant difference was found in the proportion of having an alcoholic father and smoking mother during childhood between subjects with and without depressive symptoms. Among subjects with depression, 13.3% had a mother and 11.3% had a father who treated other children better than the individual in childhood, which was significantly higher than those without depressive symptoms (10.8% and 8.5%, respectively). The prevalence rate of depressive symptoms among subjects whose mother and father were sick in bed for a long time in their childhood was significantly higher than that among those with healthy parents (17.9% vs 11.0% and 10.8% vs 6.8%, respectively). In terms of family SES in childhood, the prevalence rates of depressive symptoms were significantly higher among people who had a worse family financial situation in childhood and those who had starvation experience in childhood.

Table 2 provides the sample statistics of potential pathway variables. The prevalence rate of depressive symptoms was much higher among subjects who had worse self-reported childhood overall health, experienced physical health problems in childhood and adulthood, had chronic diseases or were disabled in adulthood. Adults with a lower education level, unemployed or self-employed and having a lower family expenditure level had a higher prevalence of depressive symptoms.

Table 1. Sample characteristics

Variables	Sample with depressive symptoms (N=3410), n (%)	Sample without depressive symptoms (N=8447), n (%)	p-Value for χ^2 test
Age (y)			<0.01
40–55	1135 (33.3)	3152 (37.3)	
56–65	1363 (40.0)	3147(37.3)	
66–75	718 (21.1)	1588 (18.8)	
≥76	194 (5.7)	560 (6.6)	
Gender			<0.01
Male	1236 (36.3)	4381 (51.9)	
Female	2174 (63.8)	4066 (48.1)	
Hukou			<0.01
Rural	2933 (86.0)	6471 (76.6)	
Urban	477 (14.0)	1976 (23.4)	
Continued sadness or depression lasting ≥2 wk for mother			<0.01
Yes	1003 (29.4)	1254 (14.9)	
No	2407 (70.6)	7193 (85.2)	
Continued sadness or depression lasting ≥2 wk for father			<0.01
Yes	627 (18.4)	720 (8.5)	
No	2783 (81.6)	7727 (91.5)	
Experience of mother being nervous and anxious			<0.01
Good part and most of the time	771 (22.6)	1155 (13.7)	
A little and some of the time	2639 (77.4)	7292 (86.3)	
Experience of father being nervous and anxious			<0.01
Good part and most of the time	636 (18.7)	980 (11.6)	
A little and some of the time	2774 (81.4)	7467 (88.4)	
Experience of mother being upset or panicky			<0.01
Good part and most of the time	694 (20.4)	811 (9.6)	
A little and some of the time	2716 (79.7)	7636 (90.4)	
Experience of father being upset or panicky			<0.01
Good part and most of the time	523 (15.3)	611 (7.2)	
A little and some of the time	2887 (84.7)	7836 (92.8)	
Alcoholic father			0.35
Yes	250 (7.3)	578 (6.8)	
No	3160 (92.7)	7869 (93.2)	
Smoking mother			0.79
Yes	389 (11.4)	949 (11.2)	
No	3021 (88.6)	7498 (88.8)	
Smoking father			0.09
Yes	1716 (50.3)	4396 (52.0)	
No	1694 (49.7)	4051 (48.0)	

Continued

Table 1. Continued

Variables	Sample with depressive symptoms (N=3410), n (%)	Sample without depressive symptoms (N=8447), n (%)	p-Value for χ^2 test
Mother's treatment of other children compared with the treatment of the subject			<0.01
Better	454 (13.3)	911 (10.8)	
Worse	2956 (86.7)	7536 (89.2)	
Father's treatment of other children compared with the treatment of the subject			<0.01
Better	385 (11.3)	719 (8.5)	
Worse	3025 (88.7)	7728 (91.5)	
Experience of mother being sick in bed for a long time			<0.01
Yes	609 (17.9)	928 (11.0)	
No	2801 (82.1)	7519 (89.0)	
Experience of father being sick in bed for a long time			<0.01
Yes	369 (10.8)	571 (6.8)	
No	3041 (89.2)	7876 (93.2)	
Family's financial situation compared with the local in childhood			<0.01
Better	246 (7.2)	897 (10.6)	
General	1659 (48.7)	4680 (55.4)	
Worse	1505 (44.1)	2870 (34.0)	
Starvation experience in childhood			<0.01
Yes	2543 (74.6)	5545 (65.6)	
No	867 (25.4)	2902 (34.4)	

The sample of alcoholic mothers is small (81 observations), so we did not add a variable for mother's alcoholism in the model.

Association between adulthood depressive symptoms and childhood familial environment

We used the logit model to estimate the effect of childhood familial environment on adulthood depressive symptoms. All standard errors were clustered at the household level. The ORs are reported in Table 3, with the addition of variables on childhood familial environment (mother's and father's mental health status, mother's and father's physical health status, mother's and father's alcohol consumption and smoking behaviour, mother's and father's treatment of other children compared with the treatment of the subject [better or worse] and family SES in childhood) separately based on demographic characteristics (age, gender and hukou of the subject) and all the measures were added in column 6. We also included province dummies in all the models to control for the unobserved heterogeneity among geographic regions (such as regional economic and cultural factors). We found that coefficients of the age variable among the groups 56–65 y and 66–75 y were significant at the 10% level but not significant among people ≥76 y, indicating that age had a converse U-shaped association with depressive symptoms among subjects ≥40 y of age. A significant difference on depressive symptoms was found between genders. Male subjects were less likely to suffer depressive symptoms than females. People with rural hukou were more likely to have depressive symptoms than those with urban hukou. All coefficients of the age, gender and hukou variables (except for those ≥76 y of age) remained significant at the 1% level after controlling for variables of childhood familial environment.

Coefficients of the mother's and father's mental health variables in column 1 showed that subjects whose mother and father had continued sadness or depression lasting for ≥2 wk were more likely to suffer depressive symptoms, with the effect from the mother stronger than the effect from the father (OR 1.5, p<0.001 and OR 1.3, p<0.001, respectively). After controlling for other measures of childhood familial environment in column 6, the effect of mother's and father's sadness or depression on the subject's mental health was still significant (OR 1.4, p<0.001 and OR 1.2, p<0.05, respectively). Subjects whose mothers were frequently nervous, and upset or panicky were more likely to

Table 2. Potential path variables

Variables	Sample with depressive symptoms (N=3410), n (%)	Sample without depressive symptoms (N=8447), n (%)	p-Value for χ^2 test
Self-reported childhood overall health status			<0.01
Better	1015 (29.8)	3334 (39.5)	
General	1790 (52.5)	4288 (50.8)	
Worse	605 (17.7)	825 (9.8)	
Experience of physical health problems in childhood			<0.01
Yes	415 (12.2)	613 (7.3)	
No	2995 (87.8)	7834 (92.7)	
Experience of physical health problems in adulthood			<0.01
Yes	1258 (36.9)	2049 (24.3)	
No	2152 (63.1)	6398 (75.7)	
Adulthood chronic disease			<0.01
Yes	2297 (67.4)	4427 (52.4)	
No	1113 (32.6)	4020 (47.6)	
Adulthood disability			<0.01
Yes	655 (19.2)	1167 (13.8)	
No	2755 (80.8)	7280 (86.2)	
Adulthood social support			<0.10
Yes	827 (24.3)	2178 (25.8)	
No	2583 (75.8)	6269 (74.2)	
Marital status			**0.63**
Married	2895 (84.9)	7639 (90.4)	
Unmarried	515 (15.1)	808 (9.6)	
Educational attainment			<0.01
Primary school and below	2551 (74.8)	5095 (60.3)	
Middle school	592 (17.4)	2105 (24.9)	
High school and above	267 (7.8)	1247 (14.8)	
Working status			<0.01
Unemployed	814 (24.8)	1495 (18.3)	
Agricultural employed	125 (3.8)	817 (10.0)	
Non-agricultural employed	2043 (62.2)	4574 (55.8)	
Family non-medical expenditure level			<0.01
Low	1016 (29.8)	2208 (26.1)	
Middle	1317 (38.6)	2994 (35.4)	
High	1077 (31.6)	3245 (38.4)	

The variable experience of physical health problems in childhood was defined as 1 if, as a child, he/she ever missed school for ≥1 mo, was confined to bed or home for ≥1 mo, was hospitalized for ≥1 mo or was hospitalized more than three times within a 12 mo period before 15 y of age because of a health condition, and defined as 0 if he/she did not suffer any of the above situations. The variable experience of physical health problems in adulthood was defined as 1 if the individual was confined to bed or home for ≥1 mo, hospitalized for ≥1 mo, hospitalized more than three times within a 12 mo period before 15 y of age or left a job for ≥1 mo because of a health condition, and defined as 0 if he/she did not suffer any of the above situations.

have depressive symptoms, while the effect of the father was not significant. The above results indicated that the mother's mental health might play a relatively greater role in the development of an individual's mental health than the father's mental health.

In Table 3 column 2 we added variables of mother's and father's alcohol and smoking behaviours. No significant associ-ation was found between father's alcohol behaviour and depres-sive symptoms of the subjects. The father's smoking behaviour did not increase the subject's possibility of depressive symptoms in adulthood (OR 0.917, p<0.1). However, the mother's smok-ing behaviour was significantly associated with higher depres-sive symptoms for the subject (OR 1.2, p<0.05), and it was still

Table 3. Logistic regression models of the association between childhood experience and adult depressive symptoms (N=11 857)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Continued sadness or depression lasting ≥2 wk for mother: yes	1.518*** (0.103)					1.401*** (0.096)
Continued sadness or depression lasting ≥2 wk for father: yes	1.281*** (0.106)					1.235** (0.103)
Experience of mother being nervous and anxious: good part or most of the time	1.241*** (0.101)					1.202** (0.099)
Experience of father being nervous and anxious: good part or most of the time	0.919 (0.084)					0.907 (0.083)
Experience of mother being upset or panicky: good part or most of the time	1.459*** (0.134)					1.376*** (0.128)
Experience of father being upset or panicky: good part or most of the time	1.096 (0.118)					1.098 (0.119)
Alcoholic father: yes		1.119 (0.095)				1.078 (0.092)
Smoking mother: yes		1.155** (0.081)				1.146* (0.082)
Smoking father: yes		0.923* (0.041)				0.917* (0.042)
Mother's treatment of other children compared with the treatment of the subject: better			1.208** (0.101)			1.172* (0.099)
Father's treatment of other children compared with the treatment of the subject: better			1.248** (0.113)			1.186* (0.109)
Experience of mother being sick in bed for a long time: yes				1.548*** (0.092)		1.304*** (0.080)
Experience of father being sick in bed for a long time: yes				1.419*** (0.105)		1.215** (0.093)
Family's financial situation compared to the local in childhood (General as reference)						
Better					0.834** (0.067)	0.810** (0.066)
Worse					1.381*** (0.062)	1.206*** (0.056)
Starvation experience in childhood: yes					1.306*** (0.067)	1.192*** (0.062)
Age (y) (40–55 y as reference group)						
56–65	1.247*** (0.064)	1.293*** (0.066)	1.299*** (0.066)	1.299*** (0.067)	1.204*** (0.064)	1.191*** (0.064)
66–75	1.330*** (0.082)	1.354*** (0.083)	1.373*** (0.084)	1.358*** (0.083)	1.292*** (0.080)	1.291*** (0.082)
≥76	1.072 (0.104)	1.088 (0.104)	1.105 (0.106)	1.106 (0.106)	1.091 (0.104)	1.069 (0.105)
Male	0.521*** (0.021)	0.520*** (0.021)	0.521*** (0.021)	0.522*** (0.021)	0.502*** (0.020)	0.511*** (0.021)
Rural *hukou*	1.658*** (0.102)	1.763*** (0.107)	1.804*** (0.111)	1.728*** (0.106)	1.656*** (0.102)	1.601*** (0.100)

Coefficients reported as OR (robust standard error). *p<0.1, **p<0.05, ***p<0.01. We controlled province dummies in the model.

significant at the 10% level after controlling for other measures of childhood familial environment. This indicated that the mother's smoking behaviour might play a more important role than the father's in adulthood depression, while in Western countries both of the parents' smoking behaviours were associated with more mental health problems of their children.[35]

In Table 3 column 3 we added the mother's and father's treatment of other children compared with the treatment of the subject (better or worse). We found that subjects who thought other children were treated better were more likely to suffer depressive symptoms in adulthood (OR 1.2), and it was still significant at the 10% level (Table 3 column 6) when all the other measures were added into the model. This indicated that parents' equality of treatment among children was important for children's mental health.

Table 3 column 4 shows that parents' physical health status in the childhood of subjects was significantly associated with the subject's mental health in adulthood. People who experienced in their childhood that their mother/father was sick in bed for a long time were more likely to suffer adulthood depressive symptoms than those whose mother/father was healthy (OR 1.5, p<0.001 and OR 1.4, p<0.001, respectively).

In Table 3 column 5 we added measures of childhood family SES to the model. This showed that subjects having a better family financial situation during childhood were less likely to suffer depressive symptoms (OR 0.8, p<0.05) and those having a worse financial situation during childhood were more likely to have depressive symptoms in adulthood (OR 1.4, p<0.001). People who experienced starvation in childhood were 1.3 times more likely to suffer depressive symptoms in adulthood, and this was still significant at the 1% level (Table 3 column 6). This indicated that childhood family SES was an important risk factor for mental problems in adulthood.

Association between adulthood depressive symptoms and health status in childhood and physical health, social support and SES in adulthood

We explored the association between adulthood depressive symptoms and childhood health status (including self-reported overall health status and experience of physical health problems in childhood), physical health status in adulthood, social support in adulthood and adulthood SES. We also examined how the coefficients of variables of childhood familial environment changed when we added these variables in the model. In Table 4 we added the above variables gradually. For comparison, Table 4 column 1 was the same as Table 3 column 6. We found in Table 4 column 2 that adults with worse health status in childhood (worse self-reported overall health and experience of physical health problems in childhood) were more likely to suffer depressive symptoms in adulthood than those with better childhood health status.

In Table 4 column 3, experience of physical health problems in adulthood, having chronic disease and being disabled also increased the likelihood of adulthood depressive symptoms. The coefficient magnitudes of mother's and father's sadness or depression, treatment of other children compared with the treatment of the subject, experience of the mother and father being sick in bed for a long time and family SES variables declined

but were still significant after variables of childhood overall health and adulthood health were added into the model. This indicated that parents' mental health, physical health and family SES in childhood may influence the subject's adulthood depressive symptoms partially by affecting the subject's childhood and adulthood health status.

In Table 4 column 4 we added variables of adulthood SES, including marital status, educational attainment, working status, family economic status and social support of the subjects. Married adults were less likely to suffer depressive symptoms than single adults. Adults having a high education level were less likely to suffer depressive symptoms. Unemployed adults and farmers had a higher probability of depressive symptoms than employed adults and non-agricultural workers. Adulthood family economic status was highly associated with adulthood mental health. Subjects with a higher level of family non-medical expenditures were 0.9 times (p<0.01) more likely to have depressive symptoms. The coefficient of the social support variable was not significant at the 10% level. The results indicated that lower adulthood SES was significantly associated with adulthood depressive symptoms. There was some decrease in the coefficients of mother's and father's sadness or depression. The coefficient of mother's smoking and father's treatment of other children was no longer significant when comparing the estimates in Table 4 column 4 to column 3. This indicated that adulthood SES may played an important role in mediating the effect of the childhood familial environment on adulthood depressive symptoms.

The above results show that being unmarried, having a lower education level, being unemployed or farming and having a lower family economic level were associated with a higher likelihood of adulthood depressive symptoms. Furthermore, the coefficients of the variables of mother's and father's sadness or depression, treatment of other children compared with the treatment of the subject, experience of the mother and father being sick in bed for a long time and family SES in childhood declined after variables of childhood health and adulthood physical health were added into the model. Meanwhile, mother's smoking and father's treatment of other children were no longer statistically significant, and the significance and magnitude of the father's sadness or depression measure decreased after controlling for adulthood SES. These findings imply that physical and mental health status in childhood, physical health in adulthood and adulthood SES might be important mediators in the pathways of childhood familial environment affecting adulthood depressive symptoms, although these relationships were not necessarily causal.

Subgroup study

We conducted subgroup regressions in male and female subjects to explore whether the determinants of depressive symptoms vary by gender. The results are presented in Table 5. Mother's sadness or depression was associated with a higher risk of depressive symptoms in both male and female subjects, while other mental health variables were not significant for male subjects but were significant for females. This indicated that the effect of parents' mental health on adulthood mental health was much stronger among females than among males.

No significant association between father's alcohol behaviour and adult children's mental health was found among both

Table 4. Regressions for depressive symptoms with physical health status in childhood and adulthood, adulthood social support and adulthood SES (N=11 857)

Variables	(1)	(2)	(3)	(4)
Married				0.652***
				(0.047)
Educational attainment (primary school and below as reference group)				
Middle school				0.826***
				(0.050)
High school and above				0.765***
				(0.066)
Working status (unemployed as reference group)				
Agricultural employed				0.971
				(0.056)
Non-agricultural employed				0.757***
				(0.053)
Family non-medical expenditure level (middle as reference group)				
Low				0.955
				(0.056)
High				0.857***
				(0.047)
Adulthood social support: yes				1.022
				(0.054)
Chronic disease: yes			1.571***	1.561***
			(0.074)	(0.073)
Disability: yes			1.137**	1.090
			(0.067)	(0.065)
Experience physical health problem in adulthood: yes			1.508***	1.487***
			(0.073)	(0.073)
Experience physical health problem in childhood: yes		1.314***	1.226***	1.242***
		(0.099)	(0.094)	(0.095)
Self-reported childhood overall health status (general as reference group)				
Worse		1.454***	1.393***	1.399***
		(0.097)	(0.094)	(0.095)
Better		0.787***	0.805***	0.810***
		(0.038)	(0.039)	(0.040)
Continued sadness or depression lasting ≥2 wk for mother: yes	1.401***	1.369***	1.362***	1.363***
	(0.096)	(0.096)	(0.096)	(0.096)
Continued sadness or depression lasting ≥2 wk for father: yes	1.235**	1.220**	1.192**	1.177*
	(0.103)	(0.103)	(0.102)	(0.101)
Experience of mother being nervous and anxious: good part or most of the time	1.202**	1.203**	1.169*	1.169*
	(0.099)	(0.100)	(0.098)	(0.099)
Experience of father being nervous and anxious: good part or most of the time	0.907	0.909	0.914	0.912
	(0.083)	(0.084)	(0.085)	(0.086)
Experience of mother being upset or panicky: good part or most of the time	1.376***	1.337***	1.319***	1.308***
	(0.128)	(0.125)	(0.125)	(0.124)
Experience of father being upset or panicky: good part or most of the time	1.098	1.099	1.122	1.107
	(0.119)	(0.120)	(0.124)	(0.122)
Alcoholic father: yes	1.078	1.072	1.057	1.050
	(0.092)	(0.092)	(0.092)	(0.092)
Smoking mother: yes	1.146*	1.156**	1.141*	1.121
	(0.082)	(0.083)	(0.083)	(0.082)
Smoking father: yes	0.917*	0.914**	0.906**	0.910**
	(0.042)	(0.042)	(0.042)	(0.042)

Continued

Table 4. Continued

Variables	(1)	(2)	(3)	(4)
Mother's treatment of other children compared with the treatment of the subject: better	1.172*	1.164*	1.155*	1.160*
	(0.099)	(0.098)	(0.098)	(0.099)
Father's treatment of other children compared with the treatment of the subject: better	1.186*	1.177*	1.163	1.162
	(0.109)	(0.108)	(0.108)	(0.108)
Experience of mother being sick in bed for a long time: yes	1.304***	1.258***	1.205***	1.195***
	(0.080)	(0.078)	(0.076)	(0.076)
Experience of father being sick in bed for a long time: yes	1.215**	1.176**	1.112	1.101
	(0.093)	(0.091)	(0.087)	(0.087)
Family's financial situation compared with the local in childhood (general as reference):				
Better	0.810**	0.823**	0.826**	0.843**
	(0.066)	(0.068)	(0.069)	(0.071)
Worse	1.206***	1.164***	1.153***	1.140***
	(0.056)	(0.055)	(0.055)	(0.055)
Starvation experience in childhood: yes	1.192***	1.174***	1.143**	1.141**
	(0.062)	(0.061)	(0.060)	(0.060)

Other control variables include age, gender, *hukou* and province dummies. Coefficients reported as OR (robust standard error). *p<0.1, **p<0.05, ***p<0.01.

male and female subjects. Mother's smoking behaviour was significantly associated with female adult children's depressive symptoms, but not for males, and father's smoking behaviour was associated with a lower risk of depressive symptoms in males, suggesting that mother's and father's alcohol and smoking behaviour have different impacts on male and female subjects. This indicated that females' mental health was more likely to be affected by the mother, while males' was more likely to be affected by the father.

Male subjects were more likely to suffer depressive symptoms if their father treated other children better than themselves in childhood, while the coefficient of mother's treatment of other children was not significant. This might be because fathers are more likely to be the head of the household in China, and distribute family resources among the children. If the father treated other children better than the subject, this meant that the subject would get fewer family resources than his/her siblings, which would affect his/her mental health development. Hence parents' equal treatment of children was important for children's mental health development, especially for males.

Mother's physical health status was highly associated with depressive symptoms for both male and female subjects. However, father's worse physical health was associated with depressive symptoms among female subjects but not males. This could be correlated with the Chinese traditional culture that the father is the main wealth contributor of the family and sons are preferred in Chinese families. Female children are less likely to get a family's resources than male children (e.g. less education and less caring from parents), and would be asked to help increase financial resources when the family's financial situation became worse because of the father's bad physical health, which would increase the risk of developing depressive symptoms in adulthood in females.

Robust tests

In addition to the benchmark model, we also conducted sensitivity tests to check the robustness of our findings. First, we used the 80th percentile point of the CES-D total score (score of 13) as the threshold value of having depressive symptoms or not (the 0th, 20th, 40th, 60th, 80th and 100th percentiles of distribution for CES-D scores were 0, 3, 6, 8, 13 and 30), which was the original classification standard developed by Radloff.[36,37] Meanwhile, we also used a continuous variable of CES-D scores as a dependent variable. The regression results are reported in Table 6, which are similar to the results of the benchmark model, and they validated our main findings in the above sections. Regressions using sample weights were also conducted and the results were similar to those in Tables 3 and 4 (Appendices 1-3).

Discussion

This study revealed a prevalence rate of 28.8% for depressive symptoms among Chinese middle-aged and elderly people, and childhood familial environment was significantly associated with adulthood depressive symptoms, which was consistent with findings from the existing literature.[4–6] Both the physical and mental health status of parents during the subject's childhood were significantly associated with the subject's mental health in adulthood. People with parents with poor physical/mental health status were more likely to have depressive symptoms in adulthood, with the mother's physical health status having a stronger effect than the father's. For health behaviours of parents, only mothers' smoking was associated with a higher likelihood of depressive symptoms for the subjects in adulthood. Children who felt they were treated worse than their siblings by their parents were also more likely to be depressed in adulthood than those who felt they had been treated fairly. Low family SES in childhood

Table 5. Subgroup regression

Variables	Male adults (n=5617)				Female adults (n=6215)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Married				0.610*** (0.071)				0.645*** (0.059)
Educational attainment (primary school and below as reference group)								
Middle school				0.825* (0.072)				0.838** (0.071)
High school and above				0.821* (0.095)				0.711*** (0.093)
Working status (unemployed as reference group)								
Agricultural				0.809** (0.077)				1.062 (0.076)
Non-agricultural				0.613*** (0.065)				0.907 (0.086)
Family non-medical expenditure level (middle as reference group)								
Lower				0.940 (0.081)				0.977 (0.072)
Higher				0.816** (0.068)				0.888* (0.061)
Adulthood social support				1.102 (0.084)				0.951 (0.070)
Chronic disease: yes			1.495*** (0.110)	1.488*** (0.110)			1.617*** (0.098)	1.615*** (0.099)
Disability: yes			1.216** (0.107)	1.142 (0.102)			1.091 (0.089)	1.063 (0.087)
Experience of physical health problem in adulthood			1.543*** (0.113)	1.483*** (0.110)			1.478*** (0.095)	1.476*** (0.096)
Experience of physical health problem in childhood		1.285** (0.140)	1.197 (0.131)	1.225** (0.135)		1.352*** (0.143)	1.256** (0.136)	1.256** (0.137)
Self-reported childhood overall health status (general as reference group)								
Worse		1.341*** (0.143)	1.294** (0.139)	1.298** (0.140)		1.534*** (0.134)	1.463*** (0.129)	1.476*** (0.131)
Better		0.842* (0.063)	0.869* (0.066)	0.871* (0.067)		0.747*** (0.047)	0.759*** (0.048)	0.762*** (0.049)
Continued sadness or depression lasting ≥2 wk for mother: yes	1.421*** (0.159)	1.395*** (0.157)	1.373*** (0.156)	1.391*** (0.157)	1.359*** (0.120)	1.321*** (0.119)	1.326*** (0.121)	1.317*** (0.121)
Continued sadness or depression lasting ≥2 wk for father: yes	1.149 (0.150)	1.139 (0.150)	1.107 (0.147)	1.093 (0.146)	1.342*** (0.149)	1.318*** (0.148)	1.293** (0.148)	1.281** (0.147)
Experience of mother being nervous and anxious: good part or most of the time	1.123 (0.152)	1.115 (0.151)	1.066 (0.146)	1.055 (0.146)	1.280** (0.134)	1.292** (0.138)	1.270** (0.137)	1.287** (0.139)
Experience of father being nervous and anxious: good part or most of the time	1.017 (0.149)	1.027 (0.151)	1.049 (0.156)	1.034 (0.155)	0.810* (0.096)	0.805* (0.097)	0.802* (0.097)	0.802* (0.098)
Experience of mother being upset or panicky: good part or most of the time	1.223 (0.196)	1.160 (0.187)	1.146 (0.188)	1.159 (0.189)	1.485*** (0.173)	1.476*** (0.174)	1.447*** (0.171)	1.425*** (0.169)
Experience of father being upset or panicky: good part or most of the time	1.318 (0.237)	1.343 (0.241)	1.384* (0.253)	1.361* (0.246)	0.971 (0.131)	0.957 (0.131)	0.970 (0.134)	0.952 (0.133)
Alcoholic father: Yes	1.115 (0.136)	1.107 (0.135)	1.080 (0.133)	1.075 (0.134)	1.022 (0.124)	1.018 (0.125)	1.015 (0.126)	1.011 (0.126)
Smoking mother: yes	1.025 (0.114)	1.036 (0.115)	1.034 (0.116)	1.019 (0.115)	1.250** (0.116)	1.260** (0.118)	1.237** (0.117)	1.213** (0.115)
Smoking father: yes	0.887* (0.062)	0.893 (0.063)	0.884* (0.063)	0.879* (0.063)	0.936 (0.055)	0.925 (0.055)	0.918 (0.055)	0.924 (0.056)
Mother's treatment of other children compared with the treatment of the subject: better	1.119 (0.153)	1.119 (0.153)	1.125 (0.156)	1.134 (0.158)	1.194 (0.129)	1.175 (0.128)	1.154 (0.126)	1.153 (0.126)
Father's treatment of other children compared with the treatment of the subject: better	1.320* (0.194)	1.312* (0.192)	1.298* (0.192)	1.285* (0.192)	1.123 (0.132)	1.114 (0.132)	1.101 (0.131)	1.106 (0.132)
Experience of mother being sick in bed for a long time: yes	1.241** (0.125)	1.216* (0.123)	1.191* (0.121)	1.190* (0.121)	1.337*** (0.108)	1.272** (0.104)	1.199** (0.100)	1.184** (0.099)
Experience of father being sick in bed for a long time: yes	1.085 (0.131)	1.029 (0.126)	0.969 (0.121)	0.958 (0.120)	1.351*** (0.137)	1.335** (0.138)	1.268** (0.133)	1.260** (0.133)
Family's financial situation compared to the local in childhood (general as reference):								
Better	0.832 (0.117)	0.841 (0.119)	0.847 (0.120)	0.875 (0.126)	0.795** (0.080)	0.814** (0.082)	0.818** (0.083)	0.834* (0.086)
Worse	1.255*** (0.090)	1.206** (0.088)	1.195** (0.088)	1.186** (0.088)	1.177*** (0.073)	1.146** (0.072)	1.133* (0.072)	1.120* (0.072)
Starvation experience in childhood: yes	1.204** (0.100)	1.187** (0.098)	1.157* (0.097)	1.165* (0.098)	1.196** (0.078)	1.174** (0.078)	1.143* (0.076)	1.139* (0.077)

Other control variables include age, gender, *hukou* and province dummies. Coefficients reported as OR (robust standard error). *p<0.1, **p<0.05, ***p<0.01.

Table 6. Robust check

Variables	Depressive symptoms (CES-D≥13) (n=11 812)				CES-D scores (n=11 857)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Married				0.617*** (0.051)				−1.221*** (0.189)
Educational attainment (Primary school and below as reference group)								
Middle school				0.834** (0.061)				−0.528*** (0.128)
High school and above				0.785** (0.087)				−0.712*** (0.168)
Working status (Unemployed as reference group)								
Agricultural				0.840*** (0.056)				−0.209 (0.146)
Non-agricultural				0.655*** (0.057)				−0.926*** (0.154)
Family non-medical expenditure level (Middle as reference group)								
Lower				1.073 (0.074)				0.084 (0.145)
Higher				0.876** (0.058)				−0.387*** (0.124)
Young adult support and mentoring				0.991 (0.062)				−0.066 (0.117)
Chronic disease: yes			1.586*** (0.091)	1.570*** (0.091)			1.246*** (0.105)	1.216*** (0.105)
Disability: yes			1.218*** (0.083)	1.150*** (0.080)			0.575*** (0.157)	0.425*** (0.157)
Health problem in adulthood			1.627*** (0.092)	1.580*** (0.090)			1.190*** (0.125)	1.120*** (0.124)
Health problem in childhood		1.361*** (0.116)	1.247* (0.108)	1.269*** (0.111)		0.741*** (0.206)	0.536*** (0.203)	0.578*** (0.202)
Self-reported childhood overall health status (general as reference group)								
Worse		1.311*** (0.099)	1.246*** (0.095)	1.243*** (0.095)		0.749*** (0.184)	0.595*** (0.181)	0.599*** (0.179)
Better		0.744*** (0.043)	0.764*** (0.045)	0.769*** (0.045)		−0.705*** (0.108)	−0.621*** (0.107)	−0.592*** (0.106)
Continued sadness or depression lasting ≥2 wk for mother: yes	1.601*** (0.123)	1.566*** (0.122)	1.563*** (0.123)	1.573*** (0.124)	1.027*** (0.190)	0.965*** (0.190)	0.915*** (0.188)	0.921*** (0.187)
Continued sadness or depression lasting ≥2 wk for father: yes	1.212* (0.111)	1.191* (0.110)	1.160 (0.108)	1.145 (0.107)	0.850*** (0.235)	0.803*** (0.234)	0.730*** (0.231)	0.693*** (0.230)
Mother's treatment of other children compared with the treatment of the subject: better	1.115 (0.107)	1.119 (0.107)	1.089 (0.105)	1.098 (0.106)	0.315 (0.225)	0.315 (0.224)	0.234 (0.222)	0.237 (0.221)
Father's treatment of other children compared with the treatment of the subject: better	0.964 (0.102)	0.965 (0.103)	0.971 (0.103)	0.969 (0.104)	0.058 (0.249)	0.058 (0.248)	0.073 (0.245)	0.070 (0.245)
Experience of mother being sick in bed for a long time: yes	1.436*** (0.147)	1.396*** (0.142)	1.369*** (0.142)	1.358*** (0.141)	1.093*** (0.272)	1.009*** (0.273)	0.950*** (0.268)	0.921*** (0.267)
Experience of father being sick in bed for a long time: yes	1.092 (0.129)	1.092 (0.130)	1.117 (0.135)	1.098 (0.133)	0.129 (0.321)	0.135 (0.321)	0.185 (0.316)	0.134 (0.315)
Alcoholic father: yes	1.054 (0.108)	1.049 (0.109)	1.032 (0.107)	1.028 (0.108)	0.061 (0.201)	0.052 (0.200)	0.010 (0.197)	0.004 (0.195)
Smoking mother: yes	1.066 (0.090)	1.076 (0.091)	1.054 (0.091)	1.033 (0.090)	0.224 (0.168)	0.233 (0.166)	0.188 (0.165)	0.128 (0.165)
Smoking father: yes	0.905* (0.049)	0.899** (0.049)	0.891** (0.049)	0.895** (0.049)	−0.173 (0.108)	−0.176* (0.107)	−0.201* (0.105)	−0.179* (0.105)
Mother's treatment of other children compared with the treatment of the subject: better	1.200* (0.119)	1.194* (0.118)	1.180* (0.118)	1.188* (0.120)	0.344 (0.225)	0.327 (0.224)	0.300 (0.220)	0.321 (0.219)
Father's treatment of other children compared with the treatment of the subject: better	1.255* (0.135)	1.247* (0.133)	1.227* (0.133)	1.225* (0.134)	0.597** (0.251)	0.578** (0.250)	0.537** (0.245)	0.537* (0.243)
Mother was sick in bed for a long time	1.327*** (0.093)	1.276*** (0.091)	1.213*** (0.087)	1.201** (0.087)	0.864*** (0.172)	0.771*** (0.171)	0.637*** (0.169)	0.610*** (0.168)
Father was sick in bed for a long time	1.196* (0.103)	1.161* (0.101)	1.089 (0.096)	1.080 (0.096)	0.841*** (0.211)	0.763*** (0.212)	0.594*** (0.210)	0.566*** (0.209)
Family's financial situation compared with the local in childhood (general as reference):								
Better	0.818** (0.083)	0.838* (0.086)	0.847 (0.088)	0.866 (0.091)	−0.573*** (0.171)	−0.505*** (0.171)	−0.502*** (0.168)	−0.415** (0.168)
Worse	1.242*** (0.068)	1.206*** (0.067)	1.194*** (0.066)	1.180*** (0.066)	0.568*** (0.115)	0.497*** (0.115)	0.455*** (0.114)	0.410*** (0.114)
Starvation experience in childhood: yes	1.100 (0.069)	1.082 (0.068)	1.048 (0.066)	1.050 (0.067)	0.386*** (0.117)	0.349*** (0.116)	0.262** (0.115)	0.246** (0.115)
R^2	–	–	–	–	0.124	0.132	0.155	0.165

Other control variables include age, gender, *hukou* and province dummies. Coefficients reported as OR (robust standard error). *$p<0.1$, **$p<0.05$, ***$p<0.01$.

was associated with an increased likelihood of having depressive symptoms in adulthood, especially for those who experienced starvation. The findings were similar to results from the literature in developed counties.[2–5]

This study looked at the potential mechanisms underlying the link between childhood familial environment and adulthood depression. Several mediators were identified based on the results. Health status in childhood was significantly associated with adulthood depression. The results were similar to the existing literature.[38] The explanation was that childhood health (including physical and mental health) could affect an individual's ability to work and earn as an adult as well as intergenerational and within-generation social mobility, which would impact on the individual's work history, marriage stability and personality traits.[38] Another important mediator was adulthood socio-economic status. Childhood family SES could impact the individual's education attainment and physical health status, which affects their adult occupation and income[39] and leads to mental health problems in adulthood.[39,40] Physical health status in adulthood was also significantly associated with adult depression, as physical illness is an important risk factor for depression by causing pain, disability and economic burden.[41–43]

This study has several limitations. First, it used cross-sectional survey data, which undermined its power to explore casual relationships between childhood familial environment and adulthood mental health. Second, instead of using standard scales of childhood adverse experience, questions on childhood experiences were asked to the participants of the CHARLS survey. Third, the information was collected by self-reports based on the recall of the participant, thus the results could be affected by recall bias. Also, people with depression might view past experiences differently than those without depression, so the estimates of the relationship between childhood experiences and adulthood depression might be biased. Fourth, the potential pathway variables were selected based on the existing literature, thus the results should be interpreted with caution.

Nevertheless, this study is the first to explore the relationship between childhood familial environment and adulthood depression among the Chinese population, and we also tried to analyse the underlying mechanisms of the link between childhood familial environment and adulthood depression. Childhood adversities were found to be significantly associated with adulthood depression, and the physical and mental health status in childhood, physical health in adulthood and adulthood SES served as mediator variables in this relationship. The results were similar to the findings of studies conducted in Western countries.

The onset of mental diseases may occur in childhood, but the impact can last for a lifetime. In China, 8 in 1000 adults suffer from disability caused by mental disorders, corresponding to >8 million people.[44] Among Chinese elderly people, the lifetime prevalence rate of mental disorders is 24.20%.[45] Early prevention programmes for mental disorders during childhood are necessary, and our findings provide strong evidence that the promotion of healthy psychosocial experiences for children could be beneficial. Our results also indicate that a lower socio-economic status is significantly associated with higher depressive symptoms, which implies that more effort should be focused on disadvantaged populations and populations from underdeveloped regions. Increasing primary healthcare resources, providing free medical examinations and implementing favourable social security policies for targeted populations could help promote early diagnosis and treatment of mental disorders and thus improve the population's mental health status.

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Appendix Table 1. Logistic regression models of the association between childhood experience and adult depressive symptoms using sample weight (n=11 857)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Continued sadness or depression lasting ≥2 wk for mother: yes	1.473*** (0.123)					1.358*** (0.114)
						Continued

Appendix Table 1. Continued

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Continued sadness or depression lasting ≥2 wk for father: yes	1.320*** (0.127)					1.243** (0.121)
Experience of mother being nervous and anxious: good part or most of the time	1.291*** (0.121)					1.265** (0.121)
Experience of father being nervous and anxious: good part or most of the time	0.843 (0.093)					0.823* (0.091)
Experience of mother being upset or panicky: good part or most of the time	1.511*** (0.153)					1.419*** (0.144)
Experience of father being upset or panicky: good part or most of the time	1.075 (0.128)					1.081 (0.130)
Alcoholic father: yes		1.210* (0.118)				1.153 (0.115)
Smoking mother: yes		1.156* (0.091)				1.137 (0.090)
Smoking father: yes		0.877** (0.051)				0.876** (0.050)
Mother's treatment of other children compared with the treatment of the subject: better			1.255** (0.123)			1.200* (0.113)
Father's treatment of other children compared with the treatment of the subject: better			1.157 (0.136)			1.131 (0.126)
Experience of mother being sick in bed for a long time: yes				1.688*** (0.139)		1.447*** (0.140)
Experience of father being sick in bed for a long time: yes				1.545*** (0.178)		1.364** (0.181)
Family's financial situation compared to the local in childhood (General as reference)						
Better					0.845* (0.083)	0.830* (0.081)
Worse					1.392*** (0.073)	1.218*** (0.066)
Starvation experience in childhood: yes					1.206** (0.096)	1.101 (0.084)
Age (y) (40–55 y as reference group)						
56–65	1.374*** (0.094)	1.416*** (0.094)	1.422*** (0.095)	1.419*** (0.091)	1.355*** (0.105)	1.336*** (0.100)
66–75	1.462*** (0.106)	1.468*** (0.105)	1.487*** (0.107)	1.481*** (0.107)	1.422*** (0.107)	1.431*** (0.107)
≥76	1.142 (0.123)	1.147 (0.122)	1.175 (0.125)	1.183 (0.127)	1.165 (0.124)	1.141 (0.124)
Male	0.548*** (0.030)	0.543*** (0.029)	0.543*** (0.028)	0.540*** (0.027)	0.523*** (0.029)	0.538*** (0.029)
Rural *hukou*	1.869*** (0.140)	1.980*** (0.148)	2.040*** (0.155)	1.920*** (0.142)	1.861*** (0.139)	1.800*** (0.133)

Coefficients reported as OR (robust standard error). *p<0.1, **p<0.05, ***p<0.01. We controlled province dummies in the model.

Appendix Table 2. Regressions for depressive symptoms with physical health status in childhood and adulthood, adulthood social support and adulthood SES using sample weight (n=11 632)

Variables	(1)	(2)	(3)	(4)
Married				0.595***
				(0.067)
Educational attainment (Primary school and below as reference group)				
Middle school				0.853*
				(0.072)
High school and above				0.784**
				(0.083)
Working status (Unemployed as reference group)				
Agricultural employed				1.013
				(0.076)
Non-agricultural employed				0.783**
				(0.077)
Family non-medical expenditure level (Middle as reference group)				
Lower				0.911
				(0.059)
Higher				0.844**
				(0.057)
Adulthood social support: yes				1.035
				(0.071)
Chronic disease: yes			1.597***	1.580***
			(0.091)	(0.088)
Disability: yes			1.173**	1.128*
			(0.077)	(0.075)
Experience of physical health problem in adulthood: yes			1.474***	1.468***
			(0.086)	(0.086)
Experience of physical health problem in childhood: yes		1.271***	1.190**	1.207**
		(0.109)	(0.103)	(0.104)
Self-reported childhood overall health status (General as reference group)				
Worse		1.391***	1.320***	1.336***
		(0.113)	(0.112)	(0.111)
Better		0.831***	0.845***	0.846***
		(0.052)	(0.054)	(0.051)
Continued sadness or depression lasting ≥2 wk for mother: yes	1.358***	1.316***	1.297***	1.299***
	(0.114)	(0.115)	(0.118)	(0.116)
Continued sadness or depression lasting ≥2 wk for father: yes	1.243**	1.234**	1.229**	1.212*
	(0.121)	(0.122)	(0.123)	(0.119)
Experience of mother being nervous and anxious: good part or most of the time	1.265**	1.251**	1.249**	1.255**
	(0.121)	(0.121)	(0.122)	(0.124)
Experience of father being nervous and anxious: good part or most of the time	0.823*	0.836	0.821*	0.814*
	(0.091)	(0.091)	(0.094)	(0.095)
Experience of mother being upset or panicky: good part or most of the time	1.419***	1.401***	1.372***	1.349***
	(0.144)	(0.144)	(0.141)	(0.139)
Experience of father being upset or panicky: good part or most of the time	1.081	1.077	1.105	1.103
	(0.130)	(0.130)	(0.135)	(0.135)
Alcoholic father: yes	1.153	1.152	1.128	1.116
	(0.115)	(0.116)	(0.113)	(0.112)
Smoking mother: yes	1.137	1.143*	1.138	1.104
	(0.090)	(0.091)	(0.092)	(0.090)

Appendix Table 2. Contiued

Variables	(1)	(2)	(3)	(4)
Smoking father: yes	0.876**	0.874**	0.863**	0.874**
	(0.050)	(0.050)	(0.051)	(0.049)
Mother's treatment of other children compared with the treatment of the subject: better	1.200*	1.185*	1.182*	1.187*
	(0.113)	(0.110)	(0.113)	(0.115)
Father's treatment of other children compared with the treatment of the subject: better	1.131	1.135	1.109	1.108
	(0.126)	(0.123)	(0.128)	(0.131)
Experience of mother being sick in bed for a long time: yes	1.447***	1.410***	1.354***	1.326***
	(0.140)	(0.143)	(0.140)	(0.125)
Experience of father being sick in bed for a long time: Yes	1.364**	1.338**	1.269*	1.248*
	(0.181)	(0.186)	(0.178)	(0.159)
Family's financial situation compared with the local in childhood (General as reference):				
Better	0.830*	0.825*	0.818*	0.838*
	(0.081)	(0.083)	(0.085)	(0.086)
Worse	1.218***	1.181***	1.168***	1.156***
	(0.066)	(0.065)	(0.065)	(0.063)
Starvation experience in childhood: yes	1.101	1.083	1.055	1.056
	(0.084)	(0.085)	(0.083)	(0.077)

Other control variables include age, gender, *hukou* and province dummies. Coefficients reported as OR (robust standard error). *p<0.1, **p<0.05, ***p<0.01.

Appendix Table 3. Regressions for depressive symptoms with physical health status in childhood and adulthood, adulthood social support and adulthood SES using sample weight (n=11 857)

Variables	(1)	(2)	(3)	(4)
Married				0.652***
				(0.047)
Educational attainment (Primary school and below as reference group)				
Middle school				0.826***
				(0.050)
High school and above				0.765***
				(0.066)
Working status (Unemployed as reference group)				
Agricultural employed				0.971
				(0.056)
Non-agricultural employed				0.757***
				(0.053)
Family non-medical expenditure level (Middle as reference group)				
Lower				0.955
				(0.056)
Higher				0.857***
				(0.047)
Adulthood social support: yes				1.022
				(0.054)

Continued

Appendix Table 3. Continued

Variables	(1)	(2)	(3)	(4)
Chronic disease: yes			1.571***	1.561***
			(0.074)	(0.073)
Disability: yes			1.137**	1.090
			(0.067)	(0.065)
Experience of physical health problem in adulthood: yes			1.508***	1.487***
			(0.073)	(0.073)
Experience of physical health problem in childhood: yes		1.314***	1.226***	1.242***
		(0.099)	(0.094)	(0.095)
Self-reported childhood overall health status (General as reference group)				
Worse		1.454***	1.393***	1.399***
		(0.097)	(0.094)	(0.095)
Better		0.787***	0.805***	0.810***
		(0.038)	(0.039)	(0.040)
Continued sadness or depression lasting ≥2 wk for mother: yes	1.401***	1.369***	1.362***	1.363***
	(0.096)	(0.096)	(0.096)	(0.096)
Continued sadness or depression lasting ≥2 wk for father: yes	1.235**	1.220**	1.192**	1.177*
	(0.103)	(0.103)	(0.102)	(0.101)
Experience of mother being nervous and anxious: good part or most of the time	1.202**	1.203**	1.169*	1.169*
	(0.099)	(0.100)	(0.098)	(0.099)
Experience of father being nervous and anxious: good part or most of the time	0.907	0.909	0.914	0.912
	(0.083)	(0.084)	(0.085)	(0.086)
Experience of mother being upset or panicky: good part or most of the time	1.376***	1.337***	1.319***	1.308***
	(0.128)	(0.125)	(0.125)	(0.124)
Experience of father being upset or panicky: good part or most of the time	1.098	1.099	1.122	1.107
	(0.119)	(0.120)	(0.124)	(0.122)
Alcoholic father: yes	1.078	1.072	1.057	1.050
	(0.092)	(0.092)	(0.092)	(0.092)
Smoking mother: yes	1.146*	1.156**	1.141*	1.121
	(0.082)	(0.083)	(0.083)	(0.082)
Smoking father: yes	0.917*	0.914**	0.906**	0.910**
	(0.042)	(0.042)	(0.042)	(0.042)
Mother's treatment of other children compared with the treatment of the subject: better	1.172*	1.164*	1.155*	1.160*
	(0.099)	(0.098)	(0.098)	(0.099)
Father's treatment of other children compared with the treatment of the subject: better	1.186*	1.177*	1.163	1.162
	(0.109)	(0.108)	(0.108)	(0.108)
Experience of mother being sick in bed for a long time: yes	1.304***	1.258***	1.205***	1.195***
	(0.080)	(0.078)	(0.076)	(0.076)
Experience of father being sick in bed for a long time: yes	1.215**	1.176**	1.112	1.101
	(0.093)	(0.091)	(0.087)	(0.087)
Family's financial situation compared with the local in childhood (General as reference):				
Better	0.810**	0.823**	0.826**	0.843**
	(0.066)	(0.068)	(0.069)	(0.071)
Worse	1.206***	1.164***	1.153***	1.140***
	(0.056)	(0.055)	(0.055)	(0.055)
Starvation experience in childhood: yes	1.192***	1.174***	1.143**	1.141**
	(0.062)	(0.061)	(0.060)	(0.060)

Other control variables include age, gender, *hukou* and province dummies. Coefficients reported as OR (robust standard error). *p<0.1, **p<0.05, ***p<0.01.