The impact of left-behind experience on adulthood depression: the role of social networks, subjective well-being, and resilience

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Research Article

Keywords: left-behind experience, depression, social networks, resilience, mental health, life course perspective

Posted Date: May 9th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-2840359/v1

Abstract

Background

Although some studies have explored the relationship between left-behind experience and depression of adulthood, there is generally a lack of analysis of the mechanisms involved and insufficient attention to heterogeneous influences.

Methods

Using the China Labor-force Dynamics Survey in 2018 (CLDS 2018), we assessed depression level by the Center for Epidemiologic Studies Depression Scale (CES-D). The OLS regression was used to exam the effect of the left-behind experience, propensity score matching analyses were used to reduce selection bias. Mediation analysis was carried out using a multiple regression analysis to exam the mechanism of social support network, subjective wellbeing (happiness and life transaction). We also divide the sample into two groups according to the level of resilience, to investigate the role of resilience in resisting depression.

Results

Results show a positive relationship between the left-behind experience and adulthood depression, and longer left-behind duration associated with higher adulthood depression. Mediation analysis show that social networks and subjective well-being mediated the relationship between left-behind and adulthood depression; heterogeneity analysis show that left-behind stage, type (both or single parents migrated) had a heterogeneity effect on adulthood depression level: those people who had experienced the left-behind earlier have higher depression; the effect size of care type showing the characteristics of “single-parent guardianship > grandparent guardianship > parents guardianship”. Groups comparison show that higher resilience group had a lower effect of left-behind on adulthood depression.

Conclusion

This study demonstrates that left-behind experience could have long-term impact on individual’s mental health. When the left-behind grew up, they have higher depression level, and we found that those people experienced left-behind also have weaker social networks, lower subjective happiness and life satisfaction, these factors caused higher depression level. And higher resilience can help individuals to resist the impact of left-behind on depression. This study expands the knowledge and understanding of the mechanism about the left-behind experience impact on adulthood mental health, and revealed the protective role of resilience.

1 Introduction

The biggest “migration wave” in human history has occurred since China’s reform and opening-up because of the regional economic and wage disparities brought on by urbanization[1, 2]. Surplus rural laborers seeking economic opportunities in large cities has generally become a survival strategy for rural families, and the splitting family structure has produced a significant number of left-behind children[3]. It is a

common strategic arrangement for migrating families for parents to move to urban areas for work and for children to be left in the care of grandparents or other relatives, which results in a great number of left-behind children[4]. The problem of left-behind children will persist in Chinese society for a long time to come, and the well-being of this vulnerable group has become an issue of great concern.

Most of the existing studies on the issue of left-behind children's well-being usually focusing on the effects of being left behind on children's educational attainment[5–7], human capital accumulation[8], health [9, 10], social cognitive[11], life satisfaction and happiness[12], and other dimensions. These studies generally conclude that left-behind children are developmentally disadvantaged on multiple dimensions compared to the general population [13], and that the mental health of left-behind children is one of the areas of research that has received the most attention. Previous researches on the mental health of left-behind children have lacked attention to the long-term effects of the left-behind experience, and while some studies have confirmed that the childhood left-behind experience can adversely affect adult mental health [6, 14], there is a general lack of dissection of the mechanisms at play.

This study is a response to the call of Linda K. George [15], we use life course theory as a theoretical tool and introduces a temporal dimension in the study of mental health of left-behind children. Based on these, the long-term effects of left-behind on individual depression in adulthood were investigated, as well as temporal effects such as stage of retention, cumulative duration of retention, and different left-behind types. Meanwhile, the mechanisms of action responsible for this long-term effect were partially explained by including social networks as mediating variables, and consistent conclusions were drawn by mitigating the endogeneity problem through propensity score matching (PSM) and replacing Logit models for robustness testing.

The following are possible contributions of this study: first, we confirm the existence of long-term effects of the left-behind experience on individual depression by using nationally representative data; second, we find that social capital, subjective well-being, and job satisfaction are mechanistic factors contributing to the long-term depressive effects of left-behind; and third, we find that psychologically resilient individuals are more resistant to the negative effects of the left-behind experience on depression in adulthood. These findings may have important implications for the design of policy interventions for left-behind children.

2 Literature review and hypotheses

2.1 Being Left behind and mental health

The mental well-being of left-behind children is a common issue and concern worldwide. Left-behind Children are more likely than their peers to experience emotional and psychological stress, including feelings of abandonment, low self-esteem, anxiety, and depression [16], and they are also less mentally resilient [17], and to make matters worse, poor mental health may further cause left-behind children to engage in self-harming behaviors[18]. Moreover, the risk of suicidal thoughts, wasting, growth retardation and drug abuse of left-behind children was also significantly higher than that of non-left-behind children[10]. A study of the impact of parental migration on left-behind children in the UK and France found that prolonged parent-child

separation not only increased children's mental health risks but also increased parent-child conflict [19]. In addition, emotional stress and physical health detriments are often tested in Philippine left-behind children whose parents work abroad. Long-term separation from their parents results in them missing their parents and feeling emotionally lonely[20]. It has been shown that left-behind children experience more negative life events and stressors, and they have higher levels of depression [21].

While it is well established that staying behind can have a negative impact on mental health, few studies have focused on how this negative impact may persist into adulthood. A few studies that have conducted exploratory research, but there are limitations in sample selection, research design and other aspects. For example, Liang & Sun limited research samples to the Yangtze River Delta and Pearl River Delta left-behind groups[6]; Li et al.'s samples were limited to students at a single university[22]; although Wang et al. used data from a national sample, there were disputes on whether the variable operationalization standard of "depression" was met, and the analysis of the mechanism of action was not in-depth enough[14]. Despite these limitations, several studies have found a long-term negative effect of left-behind on mental health. When life events involve relatively abrupt changes, there can be severe, long-lasting effects [23]. From the perspective of children, the sudden disappearance of parent(s) caused by migration is an important life event that may have long-term negative effects. Based on the above, this paper proposes hypothesis 1:

H1: Left-behind experiences during childhood lead to depression in adulthood.

Children become mature psychologically and socially as they grow older, so parents leaving left-behind children early may cause them to show more anxiety and depression [24]. The effect of left-behind on depression in adulthood may also be differentially affected by the stage of left-behind. Accordingly, hypothesis 2 is proposed:

H2: The younger the first time left-behind, the higher the level of depression in adulthood.

There is a cumulative effect over time of the long-term negative effects of left-behind experience. Li et al. found that an individual's risk of mental illness increases with the duration of left-behind, and parental absence, especially in the early childhood years, is associated with higher rates of mental illness[22]. Xu et al. used separation time as an explanatory variable and found that the longer the parent was separated from the child, the worse the child's psychological adjustment. Neuroticism, which is often a high risk factor for depression, plays a mediating role between the two[25]. This paper suggests that there is also a time dose effect of left-behind. Accordingly, hypothesis 3 is proposed:

H3: The longer children are left behind, the higher the level of depression in adulthood.

Parent-child separation is the primary adversity faced by left-behind children. Different forms of left-behind (who is the main caregiver), may have heterogeneous effects on mental health. Previous studies have shown that the depressive effect of two-parent migration is stronger than that of father migration [21]. Inadequate care and support are important mechanisms of action, and factors such as prolonged separation, poverty, and grandparental frailty combine to exacerbate the vulnerability of left-behind children [26]. A study on children's social-emotional development also showed that only in the left-behind

groups where parents migrated together and were cared for by grandparents, the separation time between mother and child showed a significant negative association with children's social-emotional development, while the single-parent form of separation where fathers migrated and mothers cared for had no effect [27]. Since the tremendous social changes in China over the past decades have widened the generation gap between grandparents and grandchildren, the caregiving role of grandparents can hardly replace the more critical role of biological parents in the individual's life course. Hypothesis 4 is therefore proposed.

H4: Two-parent migration (grandparental care) has a greater negative impact on children's depression in adulthood than single-parent migration (single-parent care).

2.2 The power of connection: social networks and depression

Human beings are not isolated individuals, but embedded in a social network of interactions with others. Emotional support provided by social networks can help people fight depression and maintain their physical and mental health. Previous studies have shown that family relationships, peer relationships, and community relationships are conducive to depression resistance among left-behind children, turning social network support into an important mechanistic variable in understanding left-behind and mental health.

The lack of social support for left-behind children is detrimental to their spiritual well-being [28]. Lan et al. studied the role of peer support, parental support, and personal perseverance in combating depression based on the risk and resilience ecological framework, from which they found that peer support was beneficial in enhancing personal perseverance and easing depression, while family support did not show a statistical correlation with depression[29].

At school, left-behind children experience more negative life events such as academic pressure, discrimination, and decreased academic performance than other children, which can lead to depression [30]. Although peer support and peer relationships can promote children's mental health development, the "stigmatization" of left-behind children's identity affects their friendships, which may have a negative effect on the friendship networks of left-behind adolescents[31]. One study showed that left-behind children experienced more peer victimization and reported higher scores of stressful life events. According to the elaboration of the left-behind children, peers inflicted more violent and hurtful behaviors upon learning that they were left-behind children. The stigmatization of left-behind status among the peer group resulted in left-behind children being frequently targeted and subjected to more violent victimization by their peers. Peer victimization increases the negative life stress perceptions of left-behind children, and simultaneously, increases the risk of depression among left-behind children [32].

The long-term physical presence, caregiving, and emotional involvement of parents are important factors in maintaining attachment relationships within the family[33]. Therefore, left-behind children generally face attachment disruption as a result of parental migration. Studies have shown that childhood adversity can exacerbate attachment insecurity, causing physical symptoms and higher levels of health anxiety[34], and left-behind children may face more severe situations because they are directly separated from their parents in geographic space which makes it difficult to create close connections and build attachments. When

physical distance separation is unavoidable, active and effective family parent-child communication can still help left-behind children counteract the risk of depression[21]. In addition, collective community efficacy helps left-behind children resist depression[35].

Whether at school, at home, or in the community, it is ultimately the social support network that helps left-behind children to alleviate their depression. Factors such as disrupted parental support, stigmatization of left-behind identity, and inferior development of non-cognitive skills all point to a common result: left-behind children find it more difficult to establish effective social networks, thus making it difficult to effectively mobilize social networks to help them fight depression.

So, does this social capital disadvantage accumulate into adulthood and lead to depression? The life course emphasizes the role of trajectories and expands on this to develop theories of cumulative disadvantage and cumulative advantage. Some studies with a life course perspective suggest that the quality of early partnerships has an impact on depression later in an individual's life course; that loneliness in childhood has a strong positive association with depression in adulthood; and that frequent partner interactions can have a sustained positive effect on mental health[36]. generally, those who are better connected with local communities also have a better health status[37], Left-behind children are at a social interaction disadvantage during childhood, which is detrimental to capital accumulation, and this disadvantage is highly likely to continue into adulthood leading to depression. Accordingly, hypothesis 5 of this study is proposed.

H5: Left-behind experiences negatively affect individual's social network, which in turn leads to higher levels of depression in adulthood.

2.3 Subjective well-being and depression

Subjective well-being refers to people's experience and feelings about their development and situation, which is usually expressed in terms of happiness, life satisfaction and happiness in existing studies. The left-behind group has lower happiness, life satisfaction, economic satisfaction, and other dimensions in life, which may also be the mechanism factor leading to depression of this group. Therefore, the following three hypotheses are therefore proposed.

H6: The group with left-behind experience has lower life happiness, which indirectly leads to higher levels of depression when they become adults.

H7: The group with left-behind experience has lower life satisfaction, which indirectly leads to higher levels of depression when they become adults.

2.4 The role of individual mental resilience

Contemporary sociology emphasizes not only the influence of structures, but also the role of individual actions. Social network support is a function of the external environment, but for left-behind children

themselves, what factors can resist depression? Previous studies have shown that mental resilience can help left-behind children resist depression[28], however, the experience of being left behind often leads to poorer mental resilience of children[17]. This paper therefore proposes hypothesis 8.

H8: The effect size of left-behind experience on adulthood depression will be lower in high resilience group.

3 Materials and Methods

3.1 Data and sample

The 2018 China Labor-force Dynamic Survey (CLDS) data collected by the Social Science Survey Center of Sun Yat-sen University were used. The CLDS is based on a random stratified sampling method with retrospective surveys in the outflow areas of the labor force, and the survey population is the entire labor force aged 15–64 years old in the sample household, which has a good national representation in terms of sample. What is valuable is that it not only investigates whether there is a left-behind experience, but also divides the period of left-behind experience into four life stages: preschool, elementary school, middle school, and high school stages, as well as dividing the guardians living together into both parents, fathers, mothers, etc. This therefore allows us to examine not only the effects of staying behind, but also the differential effects of stage, duration, and form of left-behind, which helps us to understand the association between left-behind and depression in adulthood from multiple perspectives.

This data set had asked the participants who was born after 1980 about the left-behind experience. Since this paper examines the impact of childhood left-behind experiences on individuals in adulthood, it is limited to the sample over 18 years old. After drop the observations with missing variables, the final 3807 observations were entered into the empirical analysis.

3.2 Model setting

This paper aims to explore the impact of left-behind experience on the individual's mental health. And to clarify the role of social network, happiness, satisfaction of life in mediating the impact of left-behind experience on depression. To this end, the empirical model is established as follows:

3.2.1 Baseline regression

The outcome equation describing adulthood depression level can be expressed as:

$$Depression_i = \alpha_0 + \beta_0 LeftBehind_i + \gamma_0 Control_i + \epsilon_i \quad (1)$$

Where $LeftBehind_i$ represents different left-behind experience for individual i; $Control_i$ is a set of observable control variables, including respondent's age, gender, couple status, education, working status, salary, party status, and hukou.

3.2.2 Mechanism of social networks

We construct the model 4 and model 5 to exam the role of social network. In the model 2, the social network variable be taken as dependent variables to test whether left-behind experience exerts a significant impact on the social network in the adulthood. In the model 3, social network be included into the baseline model to determine whether social network have a significant impact on adulthood depression. Constructed models as follows:

$$SocialNetwork_i = \alpha_1 + \beta_1 LeftBehind_i + \gamma_1 Control + \epsilon_i$$

2

$$Depression_i = \alpha_2 + \beta_2 LeftBehind_i + \delta_1 SocialNetwork_i + \gamma_2 Control_i + \epsilon_i$$

3

Where $SocialNetwork_i$ is the mediating variable, represents social network of individual i; $Control_i$ is a set of observable control variables.

3.2.3 Mechanism of happiness

We construct the model 4 and model 5 to exam the role of happiness. In the model 4, the happiness variable be taken as dependent variables to test whether individual's happiness exerts a significant impact on the social network in the adulthood. In the model 5, happiness be included into the baseline model to determine whether happiness have a significant impact on adulthood depression. Constructed models as follows:

$$Happiness_i = \alpha_3 + \beta_3 LeftBehind_i + \gamma_3 Control + \epsilon_i$$

4

$$Depression_i = \alpha_4 + \beta_4 LeftBehind_i + \delta_2 Happiness_i + \gamma_4 Control_i + \epsilon_i$$

5

Where $Happiness_i$ is the mediating variable, represents happiness level of individual i; $Control_i$ is a set of observable control variables.

3.2.4 Mechanism of life satisfaction

We construct the model 6 and model 7 to exam the role of life transaction. In the model 6, the life transaction variable be taken as dependent variable to test whether individual's left-behind experience exerts a significant impact on the happiness in the adulthood. In the model 5, happiness be included into the baseline model to determine whether happiness have a significant impact on adulthood depression. Constructed models as follows:

$$LifeSati_i = \alpha_5 + \beta_5 LeftBehind_i + \gamma_5 Control + \epsilon_i$$

6

$$Depression_i = \alpha_6 + \beta_6 LeftBehind_i + \delta_3 LifeSati_i + \gamma_6 Control_i + \epsilon_i$$

7

Where $LifeSati_i$ is the mediating variable, represents life satisfaction of individual i; $Control_i$ is a set of observable control variables.

3.3 Measures

3.3.1 Dependent variable: level of depression

This paper is concerned with the level of depression among those left-behind. CLDS survey measures the depression level of interviewees using the CESD-20 scale, which uses 20 questions to measure the frequency of the corresponding condition in the past week. Each question can be divided into four grades based on the responses: none/mostly none (less than 1 day), rarely (1–2 days), often (3–4 days), and almost always. The CLDS data set assigns a score of 1–4 to the responses to 20 questions, and the responses to the 20 questions are summed and leveled to obtain a depression level indicator with a range of 0–60 points. The higher the score, the higher the degree of depression.

3.3.2 Independent variable: left-behind Experience

Three operationalizations of left-behind experience were conducted according to the research objectives: a. constructing dummy variables based on whether or not they experienced left-behind in childhood to observe whether the group that experienced left-behind had higher levels of depression in adulthood; b. examining the heterogeneous effects of left-behind in different periods of childhood on depression in adulthood using the initial left-behind stage; c. observing the time-dose effect of left-behind on depression in adulthood using the length of left-behind.

3.3.3 Controlled variables

This study controls for demographic characteristics and other variables, including age, gender, presence of a partner, years of education, party membership, household type, work status, and logarithmic annual income.

3.3.4 Mechanism variables

In this study, the number of “friends/acquaintances who are close in the local area and can be supported and helped by them” was used as a measure of social networks. Among them, the indicators of “telling one’s heart”, “discussing important issues”, “borrowing 5,000 RMB” respectively represented three different types of social networks: emotional support network, decision support network and economic support network. Since the answer of each question varied from 0-800, and the total number of the three questions became even more 0-2400, which may produce bias in the estimation of the model, logarithmic transformations were performed to normalize the data distribution. In this study, the effects of overall social network, and three different social network types on depression were all empirically studied.

We measure individuals' life satisfaction and happiness as indicators of subjective well-being by the answers of two questions: "In general, do you think your life is happy?" and "In general, are you satisfied with your life?" Participants scored questions on a 5-point Likert scale ranging from 0 to 4, with a higher score indicating the better happiness and better life transaction.

The descriptive statistics of all variables are shown in Table 1. In the endogeneity exploration section, there were missing values for the predictor variables used in the propensity value analysis, but no further sample cleaning was performed based on these variables in order to retain the sample size as much as possible in the baseline regression, mechanism analysis section. As the purpose of this paper is to compare the effects of single parent guardianship and paternal guardianship, the types of left-behind (guardianship) at each stage only include parental care, single parent care and paternal care, while other caregivers (such as other relatives and friends, brothers, and sisters, etc.) are not included in the comparison range, so there is a certain missing value.

Table 1
Descriptive statistics

Variable name	Measures	Mean	SD	N
Dependent variable				
depression	1–30, higher score means higher depression level	6.979	8.211	3807
Core independent variable				
left behind	Have left-behind experience = 1, without = 0	.195	0.397	3807
left time	Left behind time: the sum of all the stage be left behind. never be left behind = 0, left behind during: preschool = 6, primary school = 6, junior high school = 3	1.836	4.364	3807
left stages				
left pre school	Be left behind during preschool = 1, never be left behind = 0	.119	0.324	3476
left primary	Be left behind during primary school = 1, never be left behind = 0	.035	0.183	3173
left junior	Be left behind during junior high school = 1, never be left behind = 0	.067	0.251	3284
Mediating variable				
social net	The logarithm of number of friends in the local that can provide help	2.015	1.020	3807
emo support	The logarithm of number of friends in the local that can tell your heart	1.235	0.793	3807
deci support	The logarithm of number of friends in the local that can discuss important issues with	1.192	0.773	3807
eco support	The logarithm of number of friends in the local that can lend money	1.101	0.862	3807
hapiness	score of happiness, range from 1–5, higher scores indicating higher levels of happiness	3.867	0.863	3807
life transaction	score of life satisfaction, range from 1–5, higher scores indicating higher levels of life satisfaction	3.742	0.898	3807
Controlled variables				
age	Unit: year	28.708	5.582	3807
male	Male = 1, female = 0	.453	0.498	3807

Variable name	Measures	Mean	SD	N
Dependent variable				
couple	Married or cohabitation = 1, unmarried, divorced, or widowed = 0	.678	0.467	3807
edu	Educated years: primary school/private school = 6, middle school = 9, high school (ordinary high school, vocational high school, technical school, technical secondary school) = 12, junior college = 15, undergraduate degree = 16, master or above = 19	11.432	3.908	3807
hukou nong	Agricultural hukou = 1, non-agricultural hukou = 0	.689	0.463	3807
CPC	Member of the Communist Party of China = 1, otherwise = 0	.076	0.265	3807
work status	Currently working = 1, not working = 0	.721	0.448	3807
ln salary	Salary in the last year (log transformed)	5.761	5.278	3807

4 Results

4.1 Baseline results

4.1.1 Left-behind experience and depression in adulthood

Table 2shows the effect of left-behind experience on individual's depression in adulthood. Model 1 shows the effect of left-behind experience on the level of depression in adulthood when no variables are controlled. The group that experienced being left behind had significantly higher levels of depression in adulthood than the control group that never experienced being left behind. After the control variables were included, there is still a highly significant positive correlation between the left-behind experience and depression in adulthood. The empirical results confirm hypothesis 1 that being left behind during childhood has a long-term negative impact on individuals, leading to higher levels of depression in adulthood than in the non-left behind group.

Table 2
effect of left-behind on adulthood depression

	(1)	(2)
	depression	depression
left_behind	1.703***	1.677***
	(0.334)	(0.337)
age		0.009
		(0.031)
male		-0.848***
		(0.276)
couple		-0.974***
		(0.361)
work_status		0.881**
		(0.420)
ln_salary		-0.067*
		(0.036)
edu		-0.226***
		(0.042)
CPC		0.739
		(0.529)
hukou_nong		-0.392
		(0.321)
_cons	6.646***	9.989***
	(0.148)	(1.108)
N	3807	3807
R^2	0.007	0.020
Standard errors in parentheses		
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$		

4.1.2 Dose effect: length of left-behind and depression

Table 3shows the effect of length of left-behind on depression. In order to retain a sufficient sample size to ensure the robustness of the empirical results, the left-behind time of the sample that never experienced left-behind was recorded as 0 and included in the model for analysis. The results show a significant positive relationship between the duration of childhood left-behind and the level of depression in adulthood. On the one hand, this result demonstrates the long-term negative impact of the experience of being left behind once again; on the other hand, it also indicates that there is a time-dose relationship between being left behind and depression in adulthood, i.e., the longer the experience of being left behind, the stronger the effect on depression in adulthood, and left-behind will cause the “cumulative disadvantage effect” of depression.

Table 3
Effect of the length of left-behind on adulthood depression

	(1)
	depression
left_time	0.152***
	(0.031)
age	0.007
	(0.031)
male	-0.842***
	(0.276)
couple	-0.964***
	(0.361)
work_status	0.944**
	(0.420)
ln_salary	-0.072**
	(0.036)
edu	-0.228***
	(0.042)
CPC	0.746
	(0.529)
hukou_nong	-0.374
	(0.321)
_cons	10.063***
	(1.106)
N	3807
R^2	0.020
Standard errors in parentheses	
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$	

4.2 Mechanism analysis

4.2.1 The role of social networks

Social networks may be an important mechanism for understanding the long-term effects of left-behind experiences on depression. Table 4shows the results of the test for mediating effects of social networks. Model 1 is the baseline model, model 2 is the effect of left-behind experience on social network in adulthood, and model 3 is the result of combining social network and left-behind experience into the baseline model. As can be seen from Model 2, childhood left-behind experience is detrimental to the development of individuals' social networks in adulthood, which is manifested by the fact that the group who has experienced left-behind is significantly inferior to the group who has not experienced left-behind in terms of social networks. In Model 3, the effect of social network on depression in adulthood is significantly negative, indicating that social network can help resist depression. Meanwhile, the estimated coefficient of left-behind begins to decrease in Model 3 compared to Model 1, suggesting that part of the effect of left-behind on depression in adulthood is mediated through social network disadvantage.

Table 4
the mediating effect of social networks

	(1)	(2)	(3)
	depression	social_net	depression
left_behind	1.677***	-0.120***	1.626***
	(0.337)	(0.041)	(0.337)
social_net			-0.426***
			(0.133)
age	0.009	0.002	0.010
	(0.031)	(0.004)	(0.031)
male	-0.848***	0.182***	-0.771***
	(0.276)	(0.034)	(0.277)
couple	-0.974***	0.094**	-0.933***
	(0.361)	(0.044)	(0.361)
work_status	0.881**	0.342***	1.027**
	(0.420)	(0.051)	(0.422)
ln_salary	-0.067*	-0.011**	-0.072**
	(0.036)	(0.004)	(0.036)
edu	-0.226***	0.040***	-0.209***
	(0.042)	(0.005)	(0.042)
CPC	0.739	0.169***	0.812
	(0.529)	(0.065)	(0.529)
hukou_nong	-0.392	0.052	-0.369
	(0.321)	(0.039)	(0.321)
_cons	9.989***	1.154***	10.481***
	(1.108)	(0.135)	(1.118)
N	3807	3807	3807

Standard errors in parentheses

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

	(1)	(2)	(3)
R^2	0.020	0.053	0.023
Standard errors in parentheses			
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$			

Table 5shows the mediating role of the three different social network types in detail. Two of the social network types, emotional support, and decision support, play a mediating role, while the results from Model 5 show that the individual left-behind experience has no significant negative impact on the economically supportive social network. The left-behind group has a disadvantage in developing emotionally supportive and decision-supportive social networks, while have no significant disadvantages in the economic support network. The reason may be that economic support networks are more likely to be kinship networks consisting of blood ties rather than “karma” and “interest” networks built up by individuals’ dynamic development. Therefore, there is no significant difference in the strengths and weaknesses between the left-behind and non-left-behind groups in this regard. Emotional support and decision support networks require individuals to actively build them. However, left-behind children are at a disadvantage in terms of non-cognitive development, which may lead to setbacks in building the two social networks and indirectly lose the protective factor of social networks in the process of resisting depression. The three social networks are the ideal types summarized for the sake of understanding. In practice the three social networks of individuals may overlap with each other, which can also be found in Model 2, Model 4, and Model 6. All social network types functions to help individuals resist depression: the estimated coefficient of retention has decreased compared to the baseline model. This also confirms the hypothesis of this study that the left-behind experience may lead individuals to develop unfavorable social networks, thus leading them to higher levels of depression.

Table 5
the mediating effect of 3 types of social network

	(1)	(2)	(3)	(4)	(5)	(6)
	emo_support	depression	deci_support	depression	eco_support	depression
left_behind	-0.116***	1.623***	-0.065**	1.637***	-0.063*	1.641***
	(0.032)	(0.337)	(0.031)	(0.337)	(0.034)	(0.337)
emo_support		-0.468***				
		(0.168)				
deci_support				-0.605***		
				(0.174)		
eco_support						-0.566***
						(0.159)
age	0.000	0.009	-0.000	0.009	0.011***	0.015
	(0.003)	(0.031)	(0.003)	(0.031)	(0.003)	(0.031)
male	0.102***	-0.800***	0.133***	-0.768***	0.161***	-0.757***
	(0.027)	(0.276)	(0.026)	(0.277)	(0.028)	(0.277)
couple	0.039	-0.955***	0.015	-0.965***	0.153***	-0.887**
	(0.035)	(0.361)	(0.034)	(0.360)	(0.037)	(0.361)
work_status	0.215***	0.982**	0.210***	1.008**	0.265***	1.031**
	(0.040)	(0.421)	(0.039)	(0.421)	(0.043)	(0.421)
ln_salary	-0.011***	-0.072**	-0.009**	-0.073**	-0.000	-0.068*
	(0.003)	(0.036)	(0.003)	(0.036)	(0.004)	(0.036)
edu	0.021***	-0.217***	0.028***	-0.209***	0.031***	-0.209***
	(0.004)	(0.042)	(0.004)	(0.042)	(0.004)	(0.042)
CPC	0.093*	0.783	0.083*	0.789	0.245***	0.878*
	(0.051)	(0.529)	(0.049)	(0.529)	(0.054)	(0.530)

Standard errors in parentheses

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

	(1)	(2)	(3)	(4)	(5)	(6)
hukou_nong	0.010	-0.387	0.032	-0.372	0.074**	-0.349
	(0.031)	(0.321)	(0.030)	(0.321)	(0.033)	(0.321)
_cons	0.840***	10.382***	0.683***	10.402***	0.000	9.989***
	(0.107)	(1.117)	(0.103)	(1.113)	(0.113)	(1.107)
N	3807	3807	3807	3807	3807	3807
R^2	0.028	0.022	0.039	0.023	0.080	0.024
Standard errors in parentheses						
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$						

4.2.2 Life happiness, life satisfaction and economic satisfaction

Table 6demonstrates the mediating mechanisms of life happiness and life satisfaction. The left-behind experience indirectly contributes to the level of depression in adulthood through two factors. Those individuals had experienced being left behind has lower happiness and life transaction, which caused higher depression level. The mediated, or indirect effect, can be calculated by the estimated coefficients, happiness mediates 10.09% of the effect, while life satisfaction mediates 22.38% of the effect.

Table 6
the mediating effect of subjective well-being

	(1)	(2)	(3)	(4)
	hapiness	depression	life_transaction	depression
left_behind	-0.072**	1.504***	-0.147***	1.294***
	(0.035)	(0.327)	(0.037)	(0.324)
hapiness		-2.386***		
		(0.151)		
life_transaction				-2.593***
				(0.143)
eco_transaction				
age	-0.016***	-0.029	-0.014***	-0.027
	(0.003)	(0.030)	(0.003)	(0.030)
male	-0.047	-0.959***	-0.035	-0.938***
	(0.029)	(0.267)	(0.030)	(0.265)
couple	0.241***	-0.399	0.216***	-0.413
	(0.038)	(0.351)	(0.039)	(0.348)
work_status	-0.129***	0.574	-0.075*	0.686*
	(0.044)	(0.407)	(0.046)	(0.403)
ln_salary	0.005	-0.056	-0.000	-0.068*
	(0.004)	(0.035)	(0.004)	(0.035)
edu	0.027***	-0.163***	0.028***	-0.154***
	(0.004)	(0.041)	(0.005)	(0.041)
CPC	0.166***	1.136**	0.189***	1.231**
	(0.055)	(0.513)	(0.057)	(0.509)
hukou_nong	-0.020	-0.440	-0.034	-0.480
	(0.033)	(0.311)	(0.035)	(0.309)

Standard errors in parentheses

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

	(1)	(2)	(3)	(4)
_cons	3.955***	19.424***	3.779***	19.789***
	(0.115)	(1.229)	(0.120)	(1.194)
N	3807	3807	3807	3807
R^2	0.037	0.081	0.035	0.098
Standard errors in parentheses				
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$				

4.3 Heterogeneity analysis

4.3.1 Heterogeneity of left-behind stage

Table 7demonstrates the heterogeneity effects of experiencing initial left-behind at different stages. To ensure the comparability of the estimated coefficients, the group in the full sample that never experienced retention is taken as a control group, so that the control group in the three models is the same sample group, facilitating direct comparison of the estimated coefficients across the three models. Model 1 is the effect of experiencing retention on depression in adulthood at preschool age, model 2 is the effect of experiencing initial retention on depression at the elementary school level, and model 3 is the effect of experiencing retention on depression in adulthood at the middle school level. The control group at each stage is the group that does not experience being left behind at the corresponding stage. It can be found that being left behind in preschool and elementary school is positively related to depression in adulthood, while this effect does not reach statistical significance at the middle school stage (but the estimated coefficient is still positive). Comparing the three models, it can be found that there is a heterogeneous effect of different stages of initial left-behind on depression in adulthood: experiencing being left behind at the preschool stage has the largest effect on depression in adulthood, followed by initial left-behind at the elementary school stage, with a concomitant decrease in statistical significance. In contrast, middle school left-behind has the weakest effect and no longer shows statistical significance (p = 0.167). The results of the comparison of the three models suggest that there is a critical window of left-behind.

Table 7
Heterogeneity effects of left-behind stage on adulthood depression

	(1)	(2)	(3)
	depression	depression	depression
left_pre_schol	2.265***		
	(0.434)		
left_primary		1.529**	
		(0.774)	
left_junior			0.681
			(0.557)
age	0.020	0.029	0.017
	(0.033)	(0.033)	(0.033)
male	-0.910***	-0.555*	-0.680**
	(0.289)	(0.295)	(0.290)
couple	-1.161***	-0.954**	-0.927**
	(0.378)	(0.385)	(0.379)
work_status	0.867*	0.788*	0.735*
	(0.445)	(0.453)	(0.443)
ln_salary	-0.072*	-0.092**	-0.086**
	(0.039)	(0.039)	(0.038)
edu	-0.220***	-0.217***	-0.226***
	(0.044)	(0.046)	(0.045)
CPC	0.931*	0.687	0.684
	(0.551)	(0.555)	(0.551)
hukou_nong	-0.425	-0.606*	-0.579*
	(0.335)	(0.341)	(0.338)

Standard errors in parentheses

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

	(1)	(2)	(3)
_cons	9.816***	9.522***	9.988***
	(1.166)	(1.193)	(1.171)
N	3476	3173	3284
R^2	0.021	0.015	0.015
Standard errors in parentheses			
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$			

4.3.2 Heterogeneity of left-behind type

Table 8demonstrates the effects of single-parent care and grandparent care on depression in adulthood under different stages. The estimated coefficients are comparable among the six models because the control group is all full-stage two-parent caregiving (never experienced left-behind) group. It can be found that no matter in preschool, elementary school or middle high school, both of two left-behind form have a significant effect on depression in adulthood. Compare within each life stage, single parent migration always has stronger impact on adulthood depression. Moreover, the estimated coefficient of single parent care decreases gradually with the extension of the stage of retention, which confirming H2 again.

Table 8
Heterogeneous effect of left-behind type on adulthood depression

	Preschool		Primary School		Junior High	
	(1)	(2)	(3)	(4)	(5)	(6)
single_parent	3.091***		2.991***		1.835***	
	(0.746)		(0.682)		(0.639)	
granparent		1.740***		1.474***		1.738***
		(0.544)		(0.552)		(0.623)
age	0.032	0.024	0.035	0.026	0.028	0.029
	(0.034)	(0.033)	(0.034)	(0.033)	(0.033)	(0.033)
male	-0.807***	-0.670**	-0.736**	-0.688**	-0.781***	-0.647**
	(0.299)	(0.291)	(0.299)	(0.289)	(0.296)	(0.293)
couple	-1.217***	-1.069***	-1.119***	-1.113***	-1.062***	-1.150***
	(0.391)	(0.380)	(0.390)	(0.378)	(0.386)	(0.383)
work_status	0.776*	0.701	0.933**	0.737*	0.971**	0.815*
	(0.460)	(0.449)	(0.460)	(0.445)	(0.457)	(0.451)
ln_salary	-0.076*	-0.077**	-0.091**	-0.079**	-0.097**	-0.082**
	(0.040)	(0.039)	(0.040)	(0.038)	(0.039)	(0.039)
edu	-0.236***	-0.209***	-0.234***	-0.212***	-0.215***	-0.223***
	(0.046)	(0.045)	(0.046)	(0.045)	(0.046)	(0.046)
CPC	0.773	0.949*	0.697	1.040*	0.609	0.885
	(0.559)	(0.554)	(0.557)	(0.551)	(0.552)	(0.561)
hukou_nong	-0.543	-0.509	-0.573*	-0.516	-0.525	-0.520
	(0.346)	(0.336)	(0.345)	(0.334)	(0.342)	(0.339)
_cons	9.801***	9.590***	9.595***	9.595***	9.541***	9.616***
	(1.208)	(1.178)	(1.206)	(1.172)	(1.196)	(1.185)
N	3185	3306	3211	3291	3232	3240

Standard errors in parentheses

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

	Preschool		Primary School		Junior High	
R^2	0.020	0.015	0.021	0.015	0.017	0.016
Standard errors in parentheses						
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$						

4.3.3 Heterogeneity of resilience

Contemporary sociology emphasizes not only the role of structure, but also the power of individual action. Therefore, while stressing the protective role of social networks, attention should also be paid to the role of individual mental resilience.

Table 9 shows the results of the grouped regressions based on mental resilience. The sample is ranked according to mental resilience from low to high and then divided into two groups, model 1 in Table 9shows the left-behind experience effect on adulthood depression in the low resilience group, while model 2 shows the effect in the high resilience group.The comparison reveals that the effect of left-behind experience on individual depression in adulthood is lower in the group with higher mental resilience, and that mental resilience could mitigate and resist the effects of depression caused by left-behind.

Table 9
Heterogeneity effect of resilience on adulthood depression

	(1)	(2)
	Low resilience group	High resilience group
left_behind	1.928***	1.453***
	(0.489)	(0.466)
age	0.015	0.004
	(0.045)	(0.044)
male	-0.756*	-0.973**
	(0.402)	(0.380)
couple	-1.058**	-0.845*
	(0.513)	(0.510)
work_status	1.161*	0.616
	(0.607)	(0.581)
ln_salary	-0.082	-0.054
	(0.053)	(0.050)
edu	-0.234***	-0.209***
	(0.060)	(0.060)
CPC	1.320*	0.252
	(0.797)	(0.705)
hukou_nong	-0.232	-0.531
	(0.470)	(0.440)
_cons	9.783***	10.006***
	(1.595)	(1.546)
N	1904	1903
R^2	0.023	0.019
Standard errors in parentheses		
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$		

4.4 Endogeneity issue and robustness checks

4.4.1 Propensity score matching

Due to the lack of randomization, the study design may have been influenced by selection bias, to address this issue, case matching was performed using the propensity score generated by a logistic regression model based on cohort, birth hukou, father's party membership, father's educated years when participant were 14 years old, only child status. Figure 1 shows the distributions of propensity scores.

Table 10 shows the regression results using propensity scores as weights. The estimated parameters of left-behind experience remain significantly negative, suggesting that left-behind experience does increase individuals' levels of depression in adulthood. Initial left-behind in preschool is significantly positively associated with depression levels in adulthood, and the effect of initial left-behind in elementary and middle school on depression in adulthood is no longer statistically significant. After propensity score matching, the critical window for the effect of preschool-phase left-behind on depression in adulthood is highlighted even more, while the effect gradually diminishes as the duration of initial left-behind is delayed.

Table 10
multiple regression results after propensity score matching

	(1)	(2)	(3)	(4)
	depression	depression	depression	depression
left_behind	1.260***			
	(0.395)			
left_pre_school		1.951***		
		(0.560)		
left_primary			1.426	
			(0.921)	
left_junior				0.674
				(0.636)
age	-0.038	0.017	0.574***	-0.042
	(0.037)	(0.043)	(0.043)	(0.041)
male	-2.482***	-3.597***	-0.845**	-2.066***
	(0.331)	(0.378)	(0.405)	(0.376)
couple	-1.956***	-3.542***	-2.275***	-2.158***
	(0.448)	(0.546)	(0.518)	(0.484)
work_status	1.671***	1.084**	2.365***	2.164***
	(0.479)	(0.550)	(0.487)	(0.528)
ln_salary	0.048	0.186***	0.135***	-0.005
	(0.040)	(0.050)	(0.040)	(0.043)
edu	-0.248***	-0.374***	0.260***	-0.479***
	(0.048)	(0.051)	(0.057)	(0.056)
CPC	0.570	3.758***	-5.736***	-1.874**
	(0.682)	(0.851)	(0.766)	(0.779)

Standard errors in parentheses

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

	(1)	(2)	(3)	(4)
hukou_nong	0.651	1.543***	4.319***	-0.146
	(0.408)	(0.482)	(0.478)	(0.462)
_cons	10.982***	11.465***	-15.601***	14.062***
	(1.289)	(1.485)	(1.799)	(1.525)
N	2760	2374	1561	1890
R^2	0.042	0.082	0.204	0.075
Standard errors in parentheses				
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$				

4.4.2 Model replacement

In order to preserve the information measured as much as possible, the original scores are retained for the operationalization of the depression variable during the empirical process. In practical application, both 16-point and 20-point of CESD-20 scale scores are the evaluation criteria for depression. In the robustness test, two criteria are used to re-operationalize the explained variable -- depression, and Logit regression was used as a robustness test. The results are shown in Table 11: when a score of 16 was used as the criterion for depression, the left-behind experience increased the probability of adulthood depression significantly; when a score of 20 was used as a criterion for depression, statistical significance disappeared. However, this is not enough to overturn the conclusions of this study because the 20-point criterion for depression is stricter, and the estimated coefficient of Model 2 is still positive, even though does not reach statistical significance (p = 0.205).

Table 11
robustness test using Logit regression

	(1)	(2)
	depress16	depress20
left_behind	0.250**	0.158
	(0.104)	(0.125)
age	-0.006	0.008
	(0.010)	(0.012)
male	-0.239***	-0.169
	(0.090)	(0.107)
couple	-0.327***	-0.400***
	(0.115)	(0.135)
work_status	0.059	-0.149
	(0.134)	(0.159)
ln_salary	0.005	0.014
	(0.012)	(0.014)
edu	-0.067***	-0.068***
	(0.013)	(0.015)
CPC	0.124	0.429**
	(0.176)	(0.196)
hukou_nong	-0.216**	-0.007
	(0.104)	(0.125)
_cons	-0.277	-1.169***
	(0.351)	(0.414)
N	3807	3807
R^2		
Standard errors in parentheses		

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.0$.

5 Conclusion and discussion

From a life-course perspective, this paper uses data of the 2018 China Labor Force Dynamics Survey to reveal the long-term impact of left-behind as an important event in an individual's life course from the perspective of depression. The main findings are as follows:

First, the left-behind experience in childhood has a long-term impact on adulthood's depression—those who have been left-behind in childhood have higher levels of depression level in adulthood. Second, there is a dose response of left-behind, which is reflected in the higher depression level in adulthood for those individuals who have experienced longer left-behind. Third, there is a stage effect for the impact of left-behind on depression in adulthood, only the first experience of left-behind occurred during preschool and elementary school has an impact on individuals' depression levels in adulthood, while when individuals first experience left-behind in middle school, their depression levels in adulthood are not significantly different from the general group. Fourth, the depression effect differs by guardianship type, showing the characteristics of "single-parent guardianship > grandparent guardianship > parents guardianship". Fifth, the study validated the robust relationship between guardianship and depression in adulthood by alleviating endogenous problems through propensity score matching.

Enhanced economic conditions through migration to work can improve the physical health of the children behind the children, but cannot buy mental health. As adolescence is a critical period for individual development, premature parent-child separation can bring irreparable damage to children's growth, and this paper confirms the long-term persistence of such damage. Therefore, families should weigh the pros and cons of working across regions and go out as late and as short as possible if the situation permits, to reduce the negative impact of parent-child separation on children's mental health development. Meanwhile, for the government and policy makers, the fundamental solution should be to reduce the migration of workers due to the regional development gap, and reduce involuntary migration due to the lack of development opportunities by promoting balanced urban-rural and regional development. In addition, the government should also improve the level of public services such as housing and education in the place of migration to reduce the reunion cost of migrating families. In a word, compared with non-left-behind, "moving with" is the second-best option for children's development.

Declarations

Ethics approval and consent to participate

This study was a secondary analysis of the identified CLDS public data. The Ethics Committee of the Department of Sociology and social work in Sun Yat-Sen University granted the current study exemption from review. All participants provided written informed consent. All methods were performed in accordance with the relevant guidelines and regulations.

Availability of data and materials

Data analyzed in this manuscript were obtained from the CLDS project. The raw data may not be shared by third parties due to ethics requirements but can be obtained via contacting the Center for Social Survey at Sun Yat-sen University [cssdata@mail.sysu.edu.cn].

Competing interests

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Funding

This research was funded by the Late-stage Funding Project of National Social Science Fund of China, grant number: 22FSHA003; Innovative Team and Outstanding Talent Program of Colleges and Universities in Guangxi, grant number: JDZD202203.

Authors' contributions

Jinguan Huang has designed empirical models and analysis strategies, participated in data cleaning, empirical results interpretation, and writhed the first manuscript. Wanqing Wei reviewed and revised the manuscript. Aiqin Wu modified, translated, and polish the manuscript. All authors contributed to the study conception and design and read and approved the final manuscript.

Acknowledgements

We would like to thank the Center for Social Science Survey at Sun Yat-sen University for allowing us to use the CLDS data for our analysis.

References

1. Fong E, Shibuya K. Migration Patterns in East and Southeast Asia: Causes and Consequences. Annual Review of Sociology. 2020;46:511–31.
2. Zhang W-W. Transforming China. London: Palgrave Macmillan London; 2000.
3. Ge Y, Song L, Clancy RF, Qin Y. Studies on Left-Behind Children in China: Reviewing Paradigm Shifts. New Directions for Child and Adolescent Development. 2019;2019:115–35.
4. Biao X. How far are the left-behind left behind? A preliminary study in rural China. Popul Space Place. 2007;13:179–91.
5. Hu BY, Wu H, Winsler A, Fan X, Song Z. Parent migration and rural preschool children's early academic and social skill trajectories in China: Are left-behind' children really left behind? Early Childhood Res Q.

2020;51:317–28.
6. Liang Z, Sun F. The lasting impact of parental migration on children's education and health outcomes: The case of China. DemRes. 2020;43:217–44.
7. Yang G, Bansak C. Does wealth matter? An assessment of China's rural-urban migration on the education of left-behind children. China Econ Rev. 2020;59:101365.
8. Zheng X, Fang Z, Wang Y, Fang X. When left-behind children become adults and parents: The long-term human capital consequences of parental absence in China. China Economic Review. 2022;74:101821.
9. Fan X. Unpacking the Association between Family Functionality and Psychological Distress among Chinese Left-Behind Children: The Mediating Role of Social Support and Internet Addiction. IJERPH. 2022;19:13327.
10. Fellmeth G, Rose-Clarke K, Zhao C, Busert LK, Zheng Y, Massazza A, et al. Health impacts of parental migration on left-behind children and adolescents: a systematic review and meta-analysis. The Lancet. 2018;392:2567–82.
11. Ding K, Li C, Jia H, Zhang M, Yu D. Is left-behind a real reason for children's social cognition deficit? An fNIRS study on the effect of social interaction on left-behind preschooler's prefrontal activation. PLoS One. 2021;16:e0254010.
12. Su S, Li X, Lin D, Zhu M. Future Orientation, Social Support, and Psychological Adjustment among Left-behind Children in Rural China: A Longitudinal Study. Front Psychol. 2017;8:1309.
13. Waddoups AB, Yoshikawa H, Strouf K. Developmental Effects of Parent–Child Separation. Annual Review of Developmental Psychology. 2019;1:387–410.
14. Wang Y, Yang S, Wang F, Liu Z. Long-term effects of left-behind experience on adult depression: Social trust as mediating factor. Frontiers in Public Health. 2022;10.
15. George LK. Taking Time Seriously: A Call to Action in Mental Health Research. J Health Soc Behav. 2014;55:251–64.
16. Valtolina GG, Colombo C. Psychological Well-Being, Family Relations, and Developmental Issues of Children Left Behind. Psychological Reports. 2012;111:905–28.
17. Zhou C, Lv Q, Yang N, Wang F. Left-Behind Children, Parent-Child Communication and Psychological Resilience: A Structural Equation Modeling Analysis. International Journal of Environmental Research and Public Health. 2021;18:5123.
18. Zhou T-J, Yuan M-Y, Ren H-Y, Xie G-D, Wang G-F, Su P-Y. Childhood Separation From Parents and Self-Harm in Adolescence: A Cross-Sectional Study in Mainland China. Front Psychol. 2022;12:645552.
19. Eremenko T, Bennett R. Linking the family context of migration during childhood to the well-being of young adults: Evidence from the UK and France: Linking migration during childhood to the wellbeing of young adults. Popul Space Place. 2018;24:e2164.
20. Smeekens C, Stroebe MS, Abakoumkin G. The impact of migratory separation from parents on the health of adolescents in the Philippines. Social Science & Medicine. 2012;75:2250–7.
21. Yu Guang, Zhengzhi Feng, Guoyu Yang, Yaling Yang, Lifei Wang, Qin Dai, et al. Depressive symptoms and negative life events: What psycho-social factors protect or harm left-behind children in China? BMC

Psychiatry. 2017;17:1–16.
22. Li X, Coid JW, Tang W, Lv Q, Zhang Y, Yu H, et al. Sustained effects of left-behind experience during childhood on mental health in Chinese university undergraduates. Eur Child Adolesc Psychiatry. 2021;30:1949–57.
23. George LK. Life Course Perspective. In: Gu D, Dupre ME, editors. Encyclopedia of Gerontology and Population Aging. Cham: Springer International Publishing; 2020. p. 1–9.
24. Liu Z, Li X, Ge X. Left Too Early: The Effects of Age at Separation From Parents on Chinese Rural Children's Symptoms of Anxiety and Depression. Am J Public Health. 2009;99:2049–54.
25. Xu W, Yan N, Chen G, Zhang X, Feng T. Parent–child separation: the relationship between separation and psychological adjustment among Chinese rural children. Qual Life Res. 2018;27:913–21.
26. Zhao C, Wang F, Zhou X, Jiang M, Hesketh T. Impact of parental migration on psychosocial well-being of children left behind: a qualitative study in rural China. Int J Equity Health. 2018;17:80.
27. Shi H, Wang Y, Li M, Tan C, Zhao C, Huang X, et al. Impact of parent-child separation on children's social-emotional development: a cross-sectional study of left-behind children in poor rural areas of China. BMC Public Health. 2021;21:823.
28. Fan X, Lu M. Testing the effect of perceived social support on left-behind children's mental well-being in mainland China: The mediation role of resilience. Children and Youth Services Review. 2020;109:104695.
29. Lan X, Wang W, Radin R. Depressive Symptoms in Emerging Adults with Early Left-Behind Experiences in Rural China. Journal of Loss and Trauma. 2019;24:339–55.
30. Li K, Guang Y, Ren L, Zhan X, Tan X, Luo X, et al. Network analysis of the relationship between negative life events and depressive symptoms in the left-behind children. BMC Psychiatry. 2021;21:429.
31. Li Y, Cheng C, Deane G, Liang Z. Parental migration and Chinese adolescents' friendship networks in school. Chinese Sociological Review. 2020;52:389–410.
32. Zhang X, Hong H, Hou W, Liu X. A prospective study of peer victimization and depressive symptoms among left-behind children in rural China: the mediating effect of stressful life events. Child Adolesc Psychiatry Ment Health. 2022;16:1–11.
33. Cassidy J. The nature of the child's ties. In: Handbook of attachment: Theory, research, and clinical applications, 2nd ed. New York, NY, US: The Guilford Press; 2008. p. 3–22.
34. Le TL, Geist R, Bearss E, Maunder RG. Childhood adversity and attachment anxiety predict adult symptom severity and health anxiety. Child Abuse & Neglect. 2021;120:105216.
35. Wang D, Jiang Q, Yang Z, Choi J-K. The longitudinal influences of adverse childhood experiences and positive childhood experiences at family, school, and neighborhood on adolescent depression and anxiety. Journal of Affective Disorders. 2021;292:542–51.
36. Jiang J, Wang P. Does early peer relationship last long? The enduring influence of early peer relationship on depression in middle and later life. Journal of Affective Disorders. 2020;273:86–94.
37. Zhou M, Guo W. Local, trans-local, and fellow townspeople ties: differential effects of social relations on physical health among China's rural-to-urban migrants. Journal of Ethnic and Migration Studies.

2023;49:272–93.

Figures

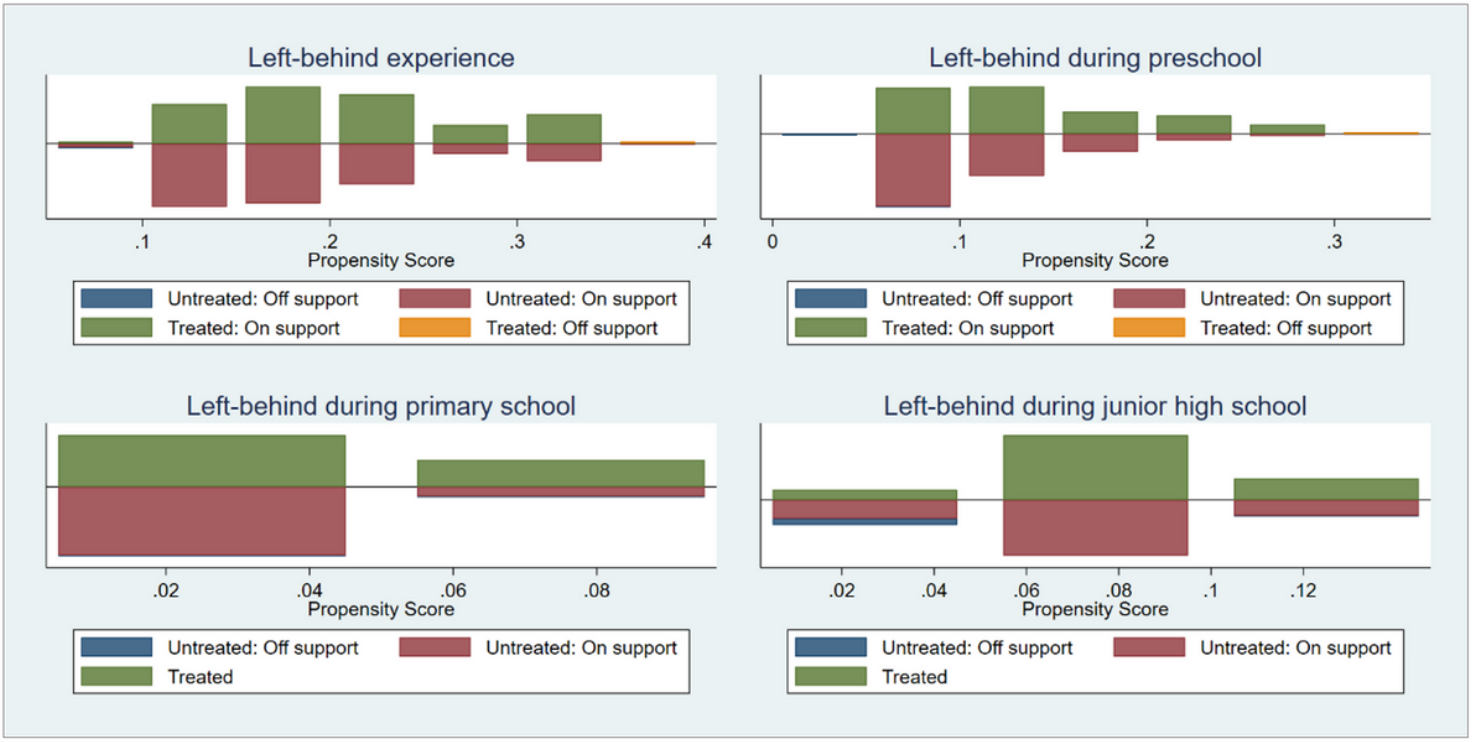

Figure 1

distributions of propensity scores