

Article

The Impact of Family Factors on Children's Mental Health during Home Quarantine: An Empirical Study in Northwest China

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Abstract: (1) Aims: This paper aims to analyze the factors affecting children's mental health during home quarantine from the perspective of family composition in a specific Chinese context where historically, families are small in size. (2) Methods: Here, 10,210 online questionnaires from 3 junior high schools in Xi'an and Hanzhong from 23 to 27 February 2020, were collected to explore the impact of family factors on children's mental health in Northwest China during home quarantine based on the ecosystem theory, by using OLS, logit regression models, and the Shapley value decomposition method. (3) Results: The mental health of northwestern Chinese children changed significantly after home quarantine. We also found that during home quarantine, some factors, such as a high-income family, lack of siblings, living with parents, mothers with middle- or high-level occupations, frequent parent-child communication, and better parent-child relationships, were positively related to children's mental health. (4) Conclusions: Different from previous studies, this paper found that the psychological condition of children in Northwest China tended to be improved during the epidemic. In addition, family factors, especially the parent-child interaction, played an important role in the mental health of children during the epidemic.

Keywords: child psychiatry; parent-child interaction; COVID-19; health policy



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1. Introduction

Quarantine, as an acknowledged effective method against COVID-19, keeps people at a certain social distance from others in daily interactions [1]. However, long-term isolation-like confinement causes negative psychological consequences, such as health anxiety, financial worry, and loneliness, and even generating posttraumatic symptoms [2–4]. During home quarantine, children's study, social activities, and daily schedules were changed, for which the emergence of psychological problems should be extensively highlighted, especially for children [5]. The WHO defines mental health as a state of well-being [6]. Focusing on children's mental health, scholars have developed several measuring tools, such as the Achenbach behavior scale [7] and Youth's self-report [8]. Stressful events, internal and external family environments, and individual characteristics all significantly affect children's mental health [9–11]. Widely applied in children's mental health research worldwide, the validity of the ecosystem theory has been sufficiently verified [12]. According to the ecosystem theory, individuals are situated in a series of environmental systems that interact with each other [13]. In these systems, the environment affects the development of individuals in a variety of ways, directly or indirectly [14]. The family, which directly affects children's growth, has always been the focus of ecosystem theory [15,16]. Some family factors were found to significantly affect children's mental health during home quarantine [17,18]. However, previous studies failed to reveal the changes in children's mental health in poor areas, uncover the impact of family factors on children's mental health based on the ecosystem theory, and did not estimate the impact of the family as

a critical factor influencing children's mental health. Family characteristics may have an important impact on children's mental health during home quarantine. For instance, children from low-income families have to face the challenge of insufficient immunization resources; non-only children may have to compete with their siblings for family care resources during family reunions; left-behind children whose parents leave home have to face the brunt of the epidemic alone; children with parents reporting lower educational and professional classes may not receive scientific guidance when facing a crisis; children who communicate less with their parents and have poor parent–child relationships are more likely to experience bad emotions. All these phenomena and problems have attracted the attention of the public and academics.

China was the first country to initiate a home quarantine during the COVID-19 epidemic, providing abundant samples for studying children's mental health during this special situation. Based on the data collected in Northwest China in February 2020, the current paper aimed to (1) reveal changes in children's mental health in remote developing areas during home quarantine based on descriptive statistics, (2) explore the impact of family factors based on the ecosystem theory by using regression models, and (3) identify the critical family factors affecting children's mental health during quarantine by using the Shapley value decomposition method.

2. Theoretical Analysis and Hypothesis

Researchers have explored the factors that trigger children's psychological problems from multi-theory perspectives. The life-course theory holds that the existence of key nodes in life will have a significant impact on individual development [19]. Empirical studies have found behavioral problems and low self-efficacy occurred among children in the United States and Greece during and after recessions [20,21]. Ecosystem theory holds that individuals grow in a series of environmental systems that interact with each other and influence individual development [13]. Families, classmates, peers, and school teachers were found to have effects on children's mental health, and family had the greatest effect on children's mental health [22]. In addition, the attachment theory and resource dilution theory are widely used in studying a specific dimension of the family factors on children's mental health. Based on the survey data collected during the home quarantine, empirical studies found that psychological problems, including fear, anxiety, depression, and somatization, became more serious among children [23]. Furthermore, family economic pressure, parenting style, and sibling relationships affect children's mental health during this special time [24]. However, most of the existing studies, only considering the effects of a certain factor in the family system on children's mental health, have not incorporated all family factors into an econometric model. In addition, empirical studies on children's mental health during the home quarantine in Western China, especially in a poor agricultural county, were rare. The family system, a proximal environment system that is a cradle for children growing up, is also the base for children interacting with the external environment. Research on children's development based on the ecosystem theory should place the family system in an important position [18,25]. The family system was divided into three dimensions, namely, the family environment, as well as parent and child subsystems by scholars [13]. This classification has been repeatedly applied and modified in previous studies. At present, the family system has been extended to a four-dimensional analytical framework, including the family environment, parent, child, and parent–child interaction subsystems [26]. During home quarantine, parent–child time increases dramatically, and the educational functioning of the family is strengthened, which may drive the family to become the most important microsystem influencing children's mental health.

Researchers of family studies hold that the family is the most important system affecting individual growth, in which the family environment, parental characteristics, and parent–child relationships are the key components of the family system [26]. Based on the ecosystem theory, this paper analyzed the impact of family factors on children's mental health in poor areas during home quarantine, estimating the impact of three key

components of the mesosystem, namely, the family environment, parental characteristics, and parent–child interaction, and taking individual characteristics (e.g., gender, age, etc.) in the microsystem, factors in the medium system (e.g., community), and household registration system in the macro system as control variables.

2.1. Family Environment and Children’s Mental Health during Home Quarantine

The family environment, including the income and structure of the family, barely changes within a short period [27]. Previous studies have found that the family environment is closely related to children’s mental health, and it plays an important role in child protection when negative life events occur [28].

Marginalized groups, especially individuals from low-income families, are more likely to confront great challenges and inequities due to limited resources and fear during pandemic times [29]. Three factors may affect the mental health of children from low-income families during home quarantine. The first factor is a digital gap. While many schools have abruptly adopted remote learning to continue schooling, students from lower-income households experience a “digital gap” due to a lack of reliable access to the internet and other digital resources (e.g., computers) at home, potentially affecting their learning [30]. Online learning tends to intensify educational inequities and also induces academic anxiety among children from poor families. The second factor is the food crisis. Some poor families have to limit the sizes or reduce the number of meals during the pandemic [31]. Even brief periods of food insecurity can cause long-term developmental, psychological, physical, and emotional harm [32]. The third factor is the risk of abuse. Economic stress in vulnerable households increases the risks of domestic violence and child abuse or neglect [33]. An online survey of more than 20,000 families in Hong Kong confirms that children from low-income families experienced a higher risk of psychological problems during home quarantine [34]. With the poor infrastructure, limited social resources, and conservative culture in Northwest China, children from low-income families may have less access to online learning, suffer food shortages, and have a greater risk of domestic violence during home quarantine, all of which negatively affect their mental health. Thus, the following hypothesis was proposed:

Hypothesis 1.1. *Children from low-income families were expected to report worse mental health and a higher risk of mental health deterioration during home quarantine compared with children from rich families.*

In terms of family structure, the only child and parent–child separation are more frequently discussed [35,36]. Since the execution of the one-child policy had lasted for over 3 decades, the massive only-child group has been forged, which has brought challenges to parent–child relations and children’s mental health, etc. Moreover, rural–urban migration for working in cities results in widespread phenomena of left-behind children and parent–child separation. The home quarantine in 2020 coincided with the Chinese Lunar New Year Holiday, which is a time for family reunions. According to the resource dilution theory, with increasing sibship size, finite parental resources are spread more thinly across siblings so that fewer resources can be invested in each child, which negatively affects children’s mental health outcomes [37,38]. Some empirical studies have explored differences in psychological characteristics between the only-child group and the non-only-child group during home quarantine. Using an online survey of more than 10,000 middle school students, Cao et al. revealed that children with siblings appeared more psychiatrically vulnerable to the exposure risk of home quarantine [39]. Given the extension of parent–child time during home quarantine, the interaction between children and parents can help the only child to rid themselves of loneliness. Therefore, in most northwestern families with limited resources, the psychological characteristics of the only child during home quarantine may be better than those with siblings. According to the attachment theory, parental absence is not conducive to children’s psychological development [40]. A study

revealed that the psychological health of children significantly worsened if they did not live with their parents [41]. As Northwest China is the labor outflow area, some parents choose not to return home to earn high overtime pay during the Spring Festival. In that case, their children have to rely on other relatives or self-care, and their moods cannot be effectively relieved by parents immediately when an epidemic occurs, which largely leads to a series of psychological problems. Thus, the following hypotheses were proposed:

Hypothesis 1.2. *The only child group was expected to report better mental health conditions and a lower risk of mental health deterioration during home quarantine compared to children with siblings.*

Hypothesis 1.3. *Children living with their parents were expected to report better mental health conditions and lower risks of mental health deterioration during home quarantine compared with children not living with their parents.*

2.2. Parents' Characteristics and Children's Mental Health during Home Quarantine

Although home quarantining increases social distance, it brings family members much closer. External support may be disrupted, social support systems may fade away due to social distancing measures, and many parents have to take care of their children with restricted caregiver resources (e.g., grandparents, daycare settings) [42]. In this context, parents' personal traits may have a great influence on their children. It was found in previous studies that well-educated parents with abundant social resources tended to protect their children from negative events [43]. During home quarantine, children with well-educated parents may have advantages in mental health due to abundant family resources. Thus, the following hypotheses were proposed:

Hypothesis 2.1. *Children with well-educated fathers were expected to report better mental health conditions and lower risks of mental health deterioration during home quarantine than children with less-educated fathers.*

Hypothesis 2.2. *Children with well-educated mothers were expected to report better mental health conditions and lower risks of mental health deterioration during home quarantine than children with less-educated mothers.*

Parental occupation is an important indicator. A low-level occupation indicates a low income and fewer resources (e.g., social capital, housing condition, spare time), resulting in "less capacity for supportive, consistent, and involved parenting" [44]. Parents with a high-level occupation usually choose different methods of parenting, which may be the reason for the lower prevalence of mental health problems among children from richer families [45]. A series of empirical studies have also shown that children whose parents have middle- or high-level occupations are less likely to report psychological problems. Parents with low-level occupations have fewer family resources and parenting choices, which are not conducive to their children's mental health. Thus, the following hypotheses were proposed:

Hypothesis 2.3. *Children with fathers reporting middle- or high-level occupations were expected to experience better mental health conditions and lower risks of mental health deterioration during home quarantine compared to children with fathers reporting low-level occupations.*

Hypothesis 2.4. *Children with mothers reporting middle- or high-level occupations were expected to experience better mental health conditions and lower risks of mental health deterioration during home quarantine compared to children with mothers reporting low-level occupations.*

2.3. Parent–Child Interaction and Children’s Mental Health during Home Quarantine

Previous studies demonstrated that in negative life events, such as hurricanes, earthquakes, migrations, and terrorist attacks, parent–child communication and relationship were closely related to children’s mental health [46,47].

Based on a survey data of 2993 migrant children in Beijing, Tang et al. found that parent–child communication acts as a protecting factor for children’s mental health during home quarantine. Good parent–child relationships are expected to effectively alleviate the effects of negative events on the mental health of children [48]. Gil-Rivas et al. [49] found a direct correlation between parent–child conflict and psychological problems of children under the shadow of terrorist attacks. The same result has been demonstrated in the Chile earthquake [49]. Furthermore, a strong correlation between family relations and fear of COVID-19 was noted [50]. An online survey of more than 5000 Chinese children was conducted by Liu et al., and they found that a poor parent–child relationship results in depression and anxiety in children during home quarantine [51]. Effective parent–child communication and a high-quality relationship play active roles in children’s mental health during home quarantine. Thus, the following hypotheses are proposed:

Hypothesis 3.1. *Children with more frequent parent–child communications were expected to report better mental health conditions and lower risks of mental health deterioration during home quarantine than children with less frequent parent–child communications.*

Hypothesis 3.2. *Children with solid parent–child relationships were expected to report better mental health conditions and lower risks of mental health deterioration during home quarantine than children with poor parent–child relationships.*

In this study, the classical ecosystem theory was applied to structure the core framework, which instructed the selection of influencing factors and ensured the integrity of the research model. The hypotheses were put forward based on the previous studies and indicated the selection of core independent variables, aiming to test the applicability of the conventional hypotheses in a poor agricultural county located in Northwest China. Subsequently, this study explored the dynamic of children’s mental health status around home quarantine. Classic regression models were applied to analyze the survey data, which ensured the reliability of the results. This study aims to verify the applicability of the ecosystem theory in exploring the determinants of children’s mental health in Western China during home quarantine and to identify the critical family factors so as to provide evidence for policy-making.

3. Methods

3.1. Data

The data used in this study came from a survey on children during home quarantine, which was conducted in 2020 by the New Urbanization and Sustainable Development Research Group of Xi’an Jiaotong University in Shaanxi Province, a representative province in Northwest China. Northwest China was not the region with the most serious epidemic but suffers from slow economic growth and poor infrastructure. Due to the lack of internet access, many children from northwest rural families face difficulties in continuing learning at home. Moreover, Shaanxi Province, as the gateway to the vast western regions of China, is the only northwestern province adjacent to Hubei, where the first case of COVID-19 was reported. The epidemic in Shaanxi Province was the most serious among the five provinces in Northwest China due to the frequent economic and population exchanges with Hubei, for which children and their families were heavily affected by COVID-19.

The survey was conducted from 23 to 27 February 2020, one month after the nationwide lockdown started (From 23 to 29 January 2020, 31 provinces on the Chinese mainland successively implemented home quarantine). During that period, children’s living and learning environment changed dramatically because of COVID-19. Although the northwest

is the main area of rural labor outflow, the proportion of children who do not live with their parents during home isolation in this study was extremely low because the lockdown coincided with the Chinese New Year in 2020, when most parents were returning home for a family reunion.

An online survey was applied instead of a traditional on-site survey. Meanwhile, in order to facilitate the distribution and collection of the online questionnaire, we carried out a special investigation on middle school students by cooperating with the head teachers of classes in the selected middle schools, and WeChat groups were utilized for teacher–parent communication. The survey included children’s family background, daily life, and learning situation.

Multi-stage random sampling was used to select schools, and then cluster sampling was used to select students. First of all, to reflect the impact of social and economic development on educational resources, we selected two cities in Shaanxi Province to represent the developed urban society (Xi’an) and underdeveloped urban society (Hanzhong), respectively. As the capital city of Shaanxi Province, the economic aggregate of Xi’an ranks first in the province, and the educational resources in the compulsory stage are the most abundant and of high quality. In contrast, the economic aggregate of Hanzhong ranks far behind Xi’an in the province, and the educational resources in the compulsory stage are relatively deficient. Second, two urban key schools (G and J Middle School) in the Xi’an and one ordinary rural school (N Middle School) in Hanzhong were randomly selected to represent the overall situation of middle schools in Northwest China to some extent. Finally, all students in the selected schools were questioned by using cluster sampling. The survey was conducted by well-trained class teachers and experienced instructors. Instructors sent the online questionnaires to the head teachers of classes in the selected middle schools. Then, the head teachers were required to forward the links to the teacher–parent WeChat groups of their classes, explain the important matters that should be paid attention to, and remind the parents to guide the children to complete their answers within 5–8 min on a voluntary basis for both sides. The survey covered 10,645 students in the three junior high schools. In the end, 10,210 online questionnaires were collected, and a sample of 10,085 individuals was used in our analysis. Accordingly, the response rate was 95.91%, and the efficiency of the sample was 95.74%. In addition, we also invited middle school students nationwide to answer the same online questionnaire and collected 468 responses. Because the sample size was relatively small and the data were collected by convenience sampling, these samples were only used for describing differences in the psychological characteristics of northwestern children and individuals from other areas during home quarantine.

3.2. Statistical Analysis

In the present study, the STATA program (version:15.0; manufacture: StataCorp; location: College Station, TX, USA) was used to analyze the data in this study. The paired-sample t-test was used to determine whether the home quarantine significantly influenced children’s mental health compared with ordinary times. The Chi-square test was used to compare psychological differences among children from different regions. OLS regression and logistic regression were used to analyze the mental health conditions and changes of children during home quarantine. In addition, in order to analyze the relative contribution and difference of family factors affecting children’s mental health, this study used the Shapley value decomposition method proposed by Shorrocks and Anthony (2013) on the basis of cooperative game theory and measured the relative difference of the influence of various independent variables on dependent variables [52]. The following are variables included in the regression models.

3.3. Variables

- Dependent Variables

The dependent variables include the psychological characteristics of children during home quarantine, including children’s mental health conditions and changes. Based on

the context of home quarantine in China, we adopted Youth's self-report [8]. In the questionnaire, we asked whether participants felt joyless/depression/inferiority/nervousness/scatterbrained/anxiety/worry/Internet addiction before and since the home quarantine. The options included three categories: never (=0); sometimes (=1); often (=2). Each question was reverse-assigned, and scores were summed up to obtain the total mental health scores before and during home quarantine. The first dependent variable was the total score of mental health during home quarantine. High scores indicated a healthy psychological condition. Additionally, the second dependent variable was the change of mental health status during home quarantine, which was calculated by the total mental score since home quarantine minus that before home quarantine. Individuals with a score of less than 0 were assigned a 1, indicating psychological deterioration, while individuals with a score greater than or equal to 0 were assigned 0, indicating no psychological deterioration. In addition, with the reliability analysis, the alpha coefficients for these items exceeded 0.80, which was high enough to satisfy the analytical needs.

- Independent Variables

Family environments were the economic level and structure of the family [27]. The question "How about your family's financial situation compared with your classmates?" was applied to assess the family's economic level. If the respondent answered "low" or "very low", it was recorded as bad (1); if not, it was recorded as not bad (0). The family structure was mainly presented in two aspects: if the respondent was an only child and if the respondent lived with parents [53]. The question "Are you the only child?" was used to determine if the respondent was the only child. If the respondent had no siblings, it was recorded as yes (1); if not, it was recorded as no (0). In addition, the question "Has your father/mother been living at home since home quarantine?" was used to determine if the respondent lived with their parents. If both parents of the respondent were at home, it was recorded as yes (1); if not, it is recorded as no (0).

This part examined the characteristics of parents by their educational level and occupational level. If the respondent's father/mother had a college degree, a high degree of education was recorded (1); if not, a low degree was recorded (0). Based on previous research [54], farmers or the unemployed were classified as low-level occupations (0); teachers, engineers, doctors, lawyers, workers, self-employed individuals, government staff, and senior management in companies were recorded as middle- or high-level occupations (1). According to previous studies [46,47], the question "How often do you communicate with your father/mother since home quarantine?" was used to evaluate parent-child communication. Five response options ranging from 1 representing "never" to 5 representing "very high frequency" were adopted; the parent-child relationship was measured by asking the question "How often do you quarrel with your father/mother since home quarantine?" was adopted to measure the parent-child relationship. Five response options were used, ranging from 1 representing "very high frequency" to 5 representing "never".

- Control variables

The external environment has important effects on children's mental health. Thus, variables of the external environment, as well as individual characteristics, were controlled. The external environment included the following items:

(1) The institutional factor is the household registration type of children. The household registration system is a population management system in China that divides Chinese citizens into agricultural and non-agricultural categories. Rural residents cannot obtain the same urban-type social security and public services as urban residents due to the restriction of the hukou category [54]. (2) The community factor is the community type in which children were residing. Consistent with previous studies [55], communities were divided into urban and rural ones to explore the impact of urban and rural differences on the community environment. The individual characteristics included gender and age.

Table 1 reports the definitions and descriptions of the variables required for empirical research.

Table 1. Descriptive statistics for variables ($N = 10,085$).

Variables	Description	Range	Mean (SD)
Dependent Variables			
Mental Health Conditions	The total score of participants' mental health during home quarantine	0–16	13.286 (3.239)
Mental Health Changes	Did not become worse = 0; Became worse = 1	0–1	0.165 (0.371)
Independent Variables			
Family Environments			
Family Economic	Not bad = 0; Bad = 1	0–1	0.118 (0.323)
Only Child	No = 0; Yes = 1	0–1	0.583 (0.493)
Both Parents at Home	No = 0; Yes = 1	0–1	0.939 (0.238)
Parental Characteristics			
Father's Education	Low-Level = 0; High-Level = 1	0–1	0.512 (0.500)
Mother's Education	Low-Level = 0; High-Level = 1	0–1	0.445 (0.497)
Father's Occupation	Low-Level = 0; Middle- or High-Level = 1	0–1	0.811 (0.392)
Mother's Occupation	Low-Level = 0; Middle- or High-Level = 1	0–1	0.705 (0.456)
Parent–Child Interaction			
Parent–Child Communication	Participants rated how often they communicated with their parents	0–5	3.550 (0.858)
Parent–Child Relationship	Participants' ratings of their relationship with their parents	0–5	4.064 (0.845)
Control Variables			
Age	The age of participants	13–19	15.224 (1.564)
Sex	Male = 0; Female = 1	0–1	0.487 (0.500)
Hukou Type	Non-agricultural Hukou = 0; Agricultural Hukou = 1	0–1	0.746 (0.435)
Community Type	Rural Community = 0; Urban Community = 1	0–1	0.794 (0.405)

4. Results

4.1. Children's Mental Health during Home Quarantine

Table 2 shows the total score of children's mental health. In this part, the paired-samples t-test was used to compare whether there were significant differences in mental health scores among children in various periods. The results show that the mental health scores of children in all regions during the home quarantine were statistically significantly higher than before.

Table 2. The total score of children's mental health by period.

	n	Before Home Quarantine		During Home Quarantine		t	p-Value
		Mean	SD	Mean	SD		
All northwestern children	10,085	13.075	3.110	13.318	3.221	−15.119	$p < 0.001$
Children in other places	468	12.286	3.578	12.598	3.541	−3.325	$p < 0.001$
Northwestern Urban Children	8385	13.201	3.041	13.451	3.133	−13.736	$p < 0.001$
Northwestern Rural Children	2168	12.590	3.319	12.804	3.404	−6.324	$p < 0.001$

Table 3 illustrates the percentage of psychological deterioration by region. In this part, the Chi-square test was used to test whether there was a significant correlation between psychological deterioration and region. The results show that there was a statistically significant correlation between the area and children's psychological deterioration since the percentage of children's psychological deterioration in other parts of China was statistically higher than that in Northwest China during home quarantine. However, there was no significant difference in mental health between urban and rural children.

Table 3. The percentage of psychological deterioration by region (%).

	All Northwestern Children		Children in Other Places		χ^2	<i>p</i> -Value
	n	%	n	%		
Yes	1666	16.520	96	20.513	5.128	<i>p</i> = 0.024
No	8419	83.480	372	79.487		
	Northwestern Urban Children		Northwestern Rural Children		χ^2	<i>p</i> -Value
	n	%	n	%		
Yes	1339	16.729	327	15.714	1.235	<i>p</i> = 0.267
No	8004	83.271	2081	84.286		

4.2. Effects of Family Factors

In order to reveal how the family influences children's mental health and prepares for subsequent Shapley decomposition, this section shows the regression analysis to test the hypothesis. As "mental health condition" was treated as a continuous variable and "mental health change" was treated as a binary variable, OLS regression and logit regression were utilized, respectively. In the process of regression analysis, the Variance Inflation Factor (VIF) diagnostic test was performed to detect multicollinearity. After the diagnosis, the average VIF value was 1.76, and the maximum VIF value was 3.34. There was no multicollinearity problem. The two regression results are shown in Tables 4 and 5.

Table 4. Coefficients from the OLS regression of children's mental health.

Variables	Mental Health Conditions				
	B	RobustSE	t	<i>p</i>	95% CI
Family Environments					
Family Economics: (Not Bad) Bad	−0.528	0.114	−4.629	<0.001 ***	[−0.752~−0.305]
Only Child: (No) Yes	0.134	0.065	2.064	0.039 *	[0.007~0.261]
Both Parents at Home: (No) Yes	0.254	0.145	1.752	0.080 +	[−0.030~0.539]
Parental Characteristics					
Father's Education: (Low) High	0.004	0.080	0.044	0.965	[−0.154~0.161]
Mother's Education: (Low) High	−0.128	0.078	−1.642	0.101	[−0.280~0.025]
Father's Occupation: (Low-Level) Middle- or High-Level	−0.168	0.154	−1.096	0.273	[−0.469~0.133]
Mother's Occupation: (Low-Level) Middle- or High-Level	0.161	0.093	1.722	0.085 +	[−0.022~0.344]
Parent–Child Interaction					
Parent–Child Communication	0.651	0.040	16.140	<0.001 ***	[0.572~0.731]
Parent–Child Relationship	1.041	0.043	24.263	<0.001 ***	[0.957~1.125]
Control Variables					
Age	−0.196	0.021	−9.505	<0.001 ***	[−0.236~−0.155]
Sex: (Male) Female	−0.085	0.059	−1.441	0.150	[−0.202~0.031]
Hukou Type: (Non-agricultural) Agricultural	−0.045	0.114	−0.397	0.692	[−0.269~0.179]
Community Type: (Rural) Urban	0.017	0.141	0.124	0.902	[−0.259~0.293]
_cons			9.638 (22.881)		
R ²			0.159		
F			112.48 ***		
N			10,085		

Note: + *p* < 0.1, * *p* < 0.05, *** *p* < 0.001.

Table 5. Coefficients from the logistic regression of changes in children’s mental health.

Variables	Mental Health Changes				
	B	SE	Z	p	OR (95% CI)
Family Environments					
Family Economic: (Not Bad) Bad	0.145	0.091	1.593	0.111	1.156 [0.967~1.381]
Only Child: (No) Yes	−0.027	0.060	−0.453	0.65	0.973 [−0.144~1.094]
Both Parents at Home: (No) Yes	−0.035	0.111	−0.313	0.755	0.966 [0.771~1.201]
Parental Characteristics					
Father’s Education: (Low) High	−0.100	0.075	−1.330	0.183	0.905 [0.780~1.049]
Mother’s Education: (Low) High	0.116	0.075	1.550	0.121	1.123 [0.970~1.299]
Father’s Occupation: (Low-Level) Middle- or High-Level	−0.047	0.126	−0.374	0.709	0.954 [0.744~1.222]
Mother’s Occupation: (Low-Level) Middle- or High-Level	0.087	0.086	1.015	0.310	1.091 [0.922~1.291]
Parent–Child Interaction					
Parent–Child Communication	−0.212	0.035	−6.109	<0.001 ***	0.809 [0.756~0.866]
Parent–Child Relationship	−0.300	0.032	−9.301	<0.001 ***	0.741 [0.696~0.789]
Control Variables					
Age	0.042	0.018	2.298	0.022 *	1.043 [1.006~1.081]
Sex: (Male) Female	−0.026	0.054	−0.473	0.637	0.975 [0.876~1.084]
Hukou Type: (Non-agricultural) Agricultural	0.066	0.101	0.656	0.512	1.068 [0.877~1.302]
Community Type: (Rural) Urban	0.199	0.12	1.651	0.099 +	1.220 [0.964~1.545]
_cons			−0.524		
LL			−4421.974		
N			10,085		

Note: + $p < 0.1$, * $p < 0.05$, *** $p < 0.001$.

- Home Environment

The family’s economic situation during the home quarantine had a significant impact on children’s mental health. Children with low-income families reported worse mental health conditions during home quarantine; hereby, **hypothesis 1.1 was partially supported**. The mental health of only children during home quarantine was significantly better than individuals with siblings; hereby, **hypothesis 1.2 was partially supported**. Moreover, children who lived with their parents reported significantly better mental health during home quarantine; therefore, **hypothesis 1.3 was partially supported**.

- Parental Characteristics

The effects of parental education on children’s mental health during the home quarantine were not consistent with the expectations. As for the father’s education, it did not significantly influence children’s mental health conditions or changes. **Hypothesis 2.1 was not supported**. This might be caused by the fact that well-educated fathers usually have higher expectations for their children, which may induce a negative effect on children’s

psychology. The mother's education did not significantly affect the children's mental health; thus, **hypothesis 2.2 was not supported**.

The effects of parental occupation on children's mental health during the home quarantine were inconsistent with the expectations. There was no significant difference in mental health between children with a father of middle or high occupational class and children with fathers of a low occupational level during home quarantine; hereby, **hypothesis 2.3 was not supported**. Furthermore, in the multiple linear regression model, the influence of the father's occupational class on children's mental health was negative. This finding may be related to the higher possibilities for fathers in the middle and high occupational level to work from home or outside the home during a public crisis. Children with mothers of a middle or high occupational level reported better psychological states than children with mothers of low occupational level during home quarantine; hereby, **hypothesis 2.4 was partially supported**.

- Parent–Child Interaction

The frequency that children communicated with their parents during the home quarantine was positively related to their mental health. **Hypothesis 3.1 was completely supported**. Similarly, the parent–child relationship positively predicted children's mental health conditions and low risks of psychological deterioration during home quarantine. **Hypothesis 3.2 was completely supported**.

Age was also a significant factor affecting children's mental health during the home quarantine. Older children tended to report poor mental health conditions and a greater risk of mental deterioration. However, the impacts of gender and the type of hukou were not significant. More importantly, compared with the mental health condition of children in rural communities, the mental health of children in rural communities reported a higher risk of deterioration.

4.3. Relative Contribution of Family Factors

The regression analyses above reveal the impact of family on children's mental health during the home quarantine. To further analyze the key factors among them, it is necessary to quantify the relative contributions of family factors. Table 6 lists the relative contributions of family factors to children's mental health calculated by the Shapley value decomposition method. Based on the family ecological system, the relative contributions of family factors, including the home environment (family economic condition, family structure), parents' characteristics (parents' education and occupation level), and parent–child interaction (parent–child communication, parent–child relationship) on children's mental health during home quarantine are revealed in Table 6.

Table 6. The relative contributions of factors concerning family.

Variables	Mental Health Conditions	Mental Health Changes
Family Environments		
Family Economics	3.39	1.92
Only Child	0.53	0.05
Both Parents at Home	0.77	0.33
Parental Characteristics		
Father's Education	0.49	0.49
Mother's Education	0.36	0.99
Father's Occupation	1.20	0.45
Mother's Occupation	1.20	1.22
Parent–Child Interaction		
Parent–Child Communication	34.30	34.64
Parent–Child Relationship	57.76	59.89

As shown in Table 6, parent–child interaction showed the highest relative contribution to the condition and changes of children's mental health during the home quarantine,

which was the key component to improving northwestern children's mental health. In the composition of parent–child interaction, the relative effect of the parent–child relationship was greater than parent–child communication. This result suggested that parents should pay attention to the parent–child relationship during crisis events and actively improve the relationship with their children to enhance their children's psychological welfare.

5. Discussion

5.1. Characteristics of Children's Mental Health during Home Quarantine

This paper reveals the change in children's mental health in Northwest China before and during home quarantine, with a brief comparative analysis with children from other regions in China. Some unexpected findings of this paper have not been observed in the previous studies. Most studies revealed an increase in psychological problems among children during home quarantine. In the UK, an empirical study comparing the mental health scores of 168 children between ages 7.5 and 6.5 years before and after the UK lockdown found a significant increase in depressive symptoms among children [56]. In Grace, the survey data on the mental health of high school students during lockdowns revealed a significant increase in both positive rates of depression screening and anxiety among them [57]. However, these findings were all from developed countries. This paper found that the mental health score of children in Northwest China was significantly higher during home quarantine than before. This was generally caused by the fact that most of their out-migrated parents return home from cities during the Spring Festival. Moreover, the playtime significantly increased due to the large-scale closure of schools. Although some northwestern children suffered psychological deterioration during home quarantine, they reported lower proportions compared with children of other regions.

5.2. Effects of the Family Factors

During home quarantine, family factors greatly affect children's mental health. Table 7 reports the results of the hypotheses.

Table 7. Results of the hypotheses.

Variables	Mental Health Conditions	Mental Health Changes	Whether the Hypothesis Is Supported
Family Environments			
Hypothesis 1.1: Family Economics	✓	×	Partially
Hypothesis 1.2: Only Child	✓	×	Partially
Hypothesis 1.3: Both Parents at Home	✓	×	Partially
Parental Characteristics			
Hypothesis 2.1: Father's Education	×	×	No
Hypothesis 2.2: Mother's Education	×	×	No
Hypothesis 2.3: Father's Occupation	×	×	No
Hypothesis 2.4: Mother's Occupation	✓	×	Partially
Parent–Child Interaction			
Hypothesis 3.1: Parent–Child Communication	✓	✓	Completely
Hypothesis 3.2: Parent–Child Relationship	✓	✓	Completely

- **Impact of Family Environment**

A study from the United Kingdom showed that children from families with financial problems such as rent arrears and loans during the home quarantine were twice as likely to suffer psychological problems as children from better-off families [58]. Similarly, studies from Italy suggested that children from low-income families were at higher psychological risk during home confinement [59]. However, the above studies only considered the impact of family economic level on children's mental health during home isolation and did not systematically include other family factors in the analysis. After controlling for parental characteristics, parent–child interaction, and other confounding factors, this paper also

demonstrated that the family's economic level was positively related to children's mental health. Accordingly, support from the government, communities, and schools is needed to help children from economically disadvantaged families with distance learning, financial aid, and psychological counseling when necessary during a public crisis.

The influence of siblings on children's mental health is a unique topic in China. One research paper by Cao et al. [39] showed that non-only children were more likely to have anxiety and depression symptoms than only children when impacted by COVID-19 in China. Consistent with this result, we also found that the psychological well-being during home isolation was better for only children than for non-only children. This finding indicated that the positive impact of the only child was common in China regardless of the massive regional gap in socio-economic development. It is worth noting that, in Northwest China, where family resources are relatively scarce, the effect of sibling competition on children's mental health is likely to be more obvious. For families with more children in poor areas, parents need social support in a public crisis to secure equity among siblings in the allocation of time and financial resources.

Rural to urban migration is a unique way of urbanization in China. According to the seventh census, by 2020, around 260 million rural migrants will be living in cities for work without urban hukou [60], which is a certificate for accessing urban social security. Therefore, most rural migrant workers have to leave their children in their hometowns and return home during holidays and busy farming seasons. The number of left-behind children was 6.97 million in 2018 [61], and the northwest is the main area where rural migrant workers are sent, which creates a high risk of mental health issues for children caused by parent-child separation in Northwest China. Studies of migration suggest that the psychological risk of children increases when their parents move abroad. A study of left-behind children under COVID-19 also found that depression and anxiety symptoms for left-behind children were more severe and their academic adjustment was poorer [62]. Consistent with previous studies, this paper indicated that children living with both parents during the home quarantine were in a better mental health condition, and the psychological problem of children who did not live with their parents during a public crisis was challenging in Northwest China.

- Impact of Parental Characteristics

A study from Iran that examined 185 children and their parents demonstrated the positive impact of parental education on children's mental health during home quarantine [63], yet this paper's results did not support this. One possible explanation is the two opposite effects on children's mental health: on the one hand, well-educated parents have superior educational resources, which is beneficial to the psychological development of children [63]; on the other hand, in the context of exam-oriented education in China, well-educated parents tend to have higher academic expectations for their children, which may exert greater academic pressure on their children and harm their children's psychological welfare [64].

Few studies have evaluated the influence of fathers' occupational levels on children's mental health during home quarantine. It is worth noting that high professional levels of fathers increase the possibility that they go to work during the crisis, and their time accompanying children reduces, which may negatively affect children's mental health. A study from Korea suggested that low occupational levels of fathers were closely associated with high rates of suicidal ideation [65]. However, this study only revealed the relationship between fathers' occupation and children's mental health under normal conditions, and few empirical studies focused on the relevant topics in a specific public crisis. Contrary to the previous outcomes, we found that during home quarantine, the mental health of children who had fathers with middle or high occupational levels was worse than children whose fathers with low occupational levels. This was related to the fact that the majority of people working outside were men with middle or high professional levels during a public crisis.

Researchers have paid more attention to the relationship between maternal occupational levels and children's mental health. Existing literature suggests that high maternal occupational levels lead to scientific parenting styles and the mental health status of children [66]. This paper revealed that compared with children with mothers of low occupational levels, children with mothers of middle or high occupational levels reported a better psychological status in a public crisis. In addition, we also found that due to different social divisions of labor, mothers' high occupational levels did not necessarily induce a high possibility of working outside.

- **Impact of Parent–Child Interaction**

Numerous studies have found that children have a psychological advantage when parents maintain frequent communication with them during home isolation [67]. Consistent with this finding, our regression results revealed that children with frequent parent–child communication experienced improved psychological status during home isolation along with a decreased risk. Therefore, improving parent–child communication is an effective way to maintain a good condition of children's mental health in a public crisis. Cooper et al. [68] found that adolescents who reported being close to their parents reported fewer symptoms. Similarly, we found that close parent–child relationships forged during home isolation improved the child's mental health and lowered the risk of deterioration. Based on the ecosystem theory, previous studies mainly focused on the effects of various family factors on children's mental health [26]. This paper further explored the relative importance of various family factors during home quarantine by using the Shapley value decomposition method. Compared with other family factors, the parent–child relationship plays the most important role in children's mental health. When the external environment changes dramatically, the parent–child relationship becomes the most important protective factor for children's mental health.

5.3. *Effects of Other Factors*

In terms of children's characteristics, in accordance with the results of Qin et al., psychological conditions and risks of psychological deterioration increased with age during home quarantine [69]. However, the results on children's gender did not agree with the results of Mckune et al. [70]. This paper revealed that gender was not significantly related to children's psychological conditions during home quarantine, probably because gender differentially influences problems. For example, boys have more frequent Internet access, which leads to problematic game addiction and a low stress index [71,72]. In terms of the external environment, a previous study from China found that children living in rural areas had significantly worse mental health than those living in cities [73]. However, this paper found that children living in poor rural areas reported a lower risk of psychological deterioration, which may be related to the more restrictive measures imposed on urban residents during this period.

5.4. *Contributions*

There are many empirical studies on children's mental health based on ecosystem theory in ordinary circumstances [13], but not on the duration of the home quarantine. This study found that both the mesosystem (school factors, community factors) and the microsystem (individual factors) of individual growth had significant impacts on the psychological state and changes of children in Western China during home quarantine, which proved the validity of ecosystem theory in analyzing the psychological problems of children from Western China during special situations. Meanwhile, the crucial family factors affecting children's mental health during the home quarantine in Western China were revealed in this study. Consistent with previous studies, high-income families [58], a lack of siblings [39], living with parents [62], mothers with middle- or high-level occupations [67], frequent parent–child communication [67], and better parent–child relationships [68] were positively related to children's mental health when using regression models. However, existing studies have failed to discuss the relative effects of these factors. Based on Shapely

decomposition, parent–child communication and relationship were identified as the most critical family factors affecting the mental health of children in Western China during home quarantine. The results highlighted the important role of parent–child interaction in crisis and important topics for relevant policy interventions.

5.5. Limitations

The present study was limited in several ways. (1) This study was limited by the length of the questionnaire; only a few typical items reflecting children’s psychological problems were selected to reveal the characteristics of children’s mental health during the home quarantine. (2) More detailed environmental factors—such as peer relations in the class, educational resources of the school, and public services in the community—might affect children’s mental health but were not considered in this paper, and thus give us a direction for further studies. (3) Our findings were obtained merely based on data collected in an agricultural county located in a developing northwest area at the time of China’s home quarantine in 2020, which might not be extended to other developed regions in China and other countries.

6. Conclusions

Based on an online survey of children during the home quarantine conducted by Xi’an Jiaotong University in February 2020, this paper revealed the characteristics of northwestern children’s mental health and the impact of family factors. Additionally, we found that the psychological condition of children in Western China tended to be improved during the epidemic. In addition, family factors, especially parent–child interaction, played an important role in the mental health of children during the epidemic. The detailed conclusions are as follows:

Compared with ordinary times, the mental health of northwestern Chinese children during home quarantine became significantly better. A large proportion of children suffered psychological deterioration during home isolation, but the rate was more significant in central and eastern areas than in northwestern areas.

A series of hypotheses about the relationship between family factors and children’s mental health status was significantly and positively impacted. First, the family’s economic status significantly and positively impacted the mental health of children in Northwest China during home isolation. Second, compared with non-only children, the psychological state of only children during the epidemic was significantly better, and children with both parents at home experienced significantly better mental health conditions than individuals with one parent away. Third, contrary to our expectations, parents’ education levels did not significantly influence children’s mental health, which might be correlated with the high competitive pressure during compulsory education in China. Fourth, children with fathers of middle and high occupational levels reported worse psychological states than children with fathers of low occupational levels. However, the psychological well-being of children with mothers of middle and high occupational levels was significantly better than for those with mothers of low occupational levels. Fifth, the original hypotheses of the parent–child relationship and parent–child communication were supported well in that they significantly and positively impact children’s mental health. In addition, among the control variables, the age of children and the type of community they live in significantly impacted the mental health of children in poor areas during special periods.

According to the results of Shapley value decomposition, we suggest special attention should be paid to parent–child interaction, including parent–child communication and the parent–child relationship, as they are the key to improving children’s mental health during a public crisis.

Based on the results of this study, more targeted supportive social policies for left-behind children and poorer families should be made and implemented to promote children’s psychological welfare when a public crisis appears.

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Informed Consent Statement: All participants provided online consent prior to beginning the survey and received a small honorarium through Wechat to compensate for their time.

Data Availability Statement: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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