

A study to analyze the pathways of social support on mental health using logistic regression model calculations

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Abstract China's economic and social development and transformation have led to changes in the mental health of the nation, in which changes in family structure brought about by social transformation have become an important factor affecting the nation's mental health. This paper utilizes the logistic regression model in the multivariate classification analysis tool to explore the causal relationship between social support and mental health. Social support is divided into three levels: life support, economic support, and emotional support, and the impact of social holding on the mental health of the elderly is empirically analyzed. Based on the logistic regression model, the least squares estimation method was used to obtain the degree of influence of social support on the mental health of the elderly. Analyzing the degree of mental health of the sample, the total score of the elderly over 80 years old is lower, and the mean and standard deviation are 3.248 and 0.574, respectively, indicating that there is a certain downward trend in the mental health of the elderly of high age. Relative to men, emotional support has a more significant effect on the depression level of female elderly, with a regression coefficient of -0.059, $P < 0.05$. Based on the findings of the study, five relevant recommendations are proposed to further enhance the mental health of the nation, such as providing good mental health services for the elderly, and actively creating a livable environment for the elderly.

Index Terms Multiple classification, logistic regression model, least squares estimation, social support, mental health

I. Introduction

Social support refers to the sympathy and resource giving from others when someone is in need [1]. And this kind of sympathy and resource giving is able to meet the needs of an individual, so as to achieve the purpose of alleviating all kinds of tensions of an individual [2], [3]. Some scholars believe that society is the connection between individuals and the social environment, and social support is the intimate connection between people, which can provide individuals with spiritual or material help when they face difficulties or threats, and is one of the mediators between psychosocial stress and psychological disorders [4]-[7]. Numerous studies have shown that people who receive higher levels of psychological or material support are physically and mentally healthier than those who receive less support [8]. The explanation of social support in terms of relationship networks and personal health has helped us to see interactions at a more micro level, and this theory has been recognized by the field of social work as very important and can be used as a theoretical perspective to guide practice work [9]-[11]. In terms of the results of the current social support-based research, it seems that these results have only continued to yield more evidence used to support the causal relationship between relational networks and psychological well-being, and less substantial analysis of the specific pathways of influence [12]-[14]. Therefore, exploring the pathways of influence of social support on mental health can provide empirical evidence for improving individual mental health as well as establishing a social support system that meets the psychological needs of the general public.

This paper explores the causal relationship between social support and mental health based on the basic principles of logistic regression. Social support is categorized into three dimensions: life support, economic support, and emotional support, and its impact on mental health is studied. A factor endowment model was established based on logistic regression, and the least squares estimation method was applied to empirically investigate the degree of influence of each level of social support on mental health. Combined with the survey content of CLHLS data, the explanatory variables, explanatory variables, control variables and mediator variables were selected, and the research on the impact of social support on mental health was launched from the four aspects of differences and correlations of sample characteristics, logistic regression results, heterogeneity test and mediation effect analysis.

II. Research methodology and theory

II. A. Impact of social support on mental health

II. A. 1) Social support

The concept of social support was first discovered in the 1970s, when psychiatry scholars first introduced social support and studied its relationship with physical and mental health, and subsequently social support has been widely used in sociology, medicine, psychology, economics and other disciplinary fields [15]. However, a consensus on the connotation of social support has not yet been formed, either between or within different disciplines. Some scholars have summarized this author more comprehensively:

First, based on the nature of the interactive relationship between individuals, social support is not limited to unilateral care and assistance, but more for the complex and multidimensional social exchange and interaction between people.

Secondly, based on the nature of social behavior generated by individuals, social support describes the process of social network members providing substantive or spiritual help to other individuals, which is an important element of the social environment affecting human progress.

Third, based on the role of social resources, social support is the behavior of social resource exchange between different members in the social network. Although scholars at home and abroad have not yet formed a complete agreement on the conceptual definition of social support, there is a common perception: first, it is emphasized that social support is not a unidirectional behavior, but rather an interactive link established between individuals in interpersonal interactions with other individuals. Second, it is emphasized that social support is a social resource that can be exchanged, accepted and reused. Based on the theme and focus of this study, social support is defined as referring to supportive resources provided by the government, social systems, and other collectives as well as interactions among members of a social network, including emotional-level care, instrumental help, information exchange support, and evaluative support.

In this study, social support is classified into two types: formal social support and informal social support, based on the methods of categorizing social support in existing studies and the characteristics of the China Family Tracking Survey (CFPS) database. The difference between the two is mainly reflected in the subject of support, the continuity of support, and the way of support. According to the difference of the main body of the source of social support, it is divided into two categories: formal social support and informal social support. Among them, the former type is the support provided by government departments, companies and collectives, which has the characteristics of institutionalization, contract and stability. Informal social support, on the other hand, is mainly derived from the social support network constructed by social relations such as geography, blood and kinship. This network includes family members, friends, neighbors, colleagues, etc., showing obvious “emotional” and “differential pattern” characteristics. Using this classification method, we can more accurately observe the degree of influence of different social supports on the mental health of rural residents, and thus propose more targeted solutions.

II. A. 2) Mental health

Mental health is an important part of physical and mental health, and the term mental health was first coined in 1929 at the Third Conference on the Health and Protection of Children in the United States, which concluded that “mental health is a state of affairs resulting from the interaction of the individual and society”, but still did not clearly articulate a specific definition of mental health [16]. The official definition dates back to the Third International Congress on Mental Health in 1946, which first clearly defined mental health as “a state of mind in which the individual is physically, intellectually, and emotionally balanced and able to adjust his or her state of mind to the optimum.” In 2001, the World Health Organization (WHO) further stated that mental health is a state of well-being or normalcy in all aspects of the individual's psyche and in the course of his or her activities, and that it is the cornerstone of personal well-being and the efficient functioning of the organism. In this state, the individual is able to effectively realize his or her self-worth, cope with the normal stresses of life, work productively or productively, and thus make a positive contribution to the society in which he or she lives. Mental health represents a state of internal and external balance and is a key element in the harmonious coexistence of the individual and society.

II. B. Logistic regression fundamentals

Regression analysis is an important branch of mathematical statistics, which is a powerful tool for exploring the causal relationship between various types of data. Logistic regression is one of the important methods of multivariate categorical analysis, and it is a powerful tool for dealing with multivariate complex variables and unconventional mathematical variables, especially some dichotomous problems, such as “diseased” and “not diseased” problems, and “occurrence” and “non-occurrence” problems [17].

Mathematically speaking, the probability of an event occurring p may be any value on the interval $[0, 1]$, if 1 is used to indicate that the event occurs, and 0 indicates that the event does not occur, then the event is only “0” and “1”.

two states, is a discrete logical values can only be obtained by using the leap function, the ideal The ideal leap function is:

$$P(Y = 1 | x) = \begin{cases} 0, z < 0 \\ 0.5, z = \beta^T x = 0 \\ 1, z > 0 \end{cases} \quad (1)$$

In the above equation, x is a vector of explanatory variables affecting the occurrence of the event, β is a vector of regression parameters, z is a function of the explanatory variables x , and the value of the function z will determine whether the event results in an “occurrence” or a “non-occurrence”.

Conventional mathematical models of the function is generally continuously differentiable, this paper to obtain the probability of the event p may be any value on the interval $[0, 1]$, so an alternative function will be needed to continuously differentiable mathematical function model mapping to only two logical values of the set $\{0, 1\}$. The alternative function used to analyze binary classification is the logistic function (or Sigmoid function) as follows:

$$g(z) = \frac{1}{1 + \exp[-z]} \quad (2)$$

Figure 1 shows the function of the logistic regression model, the image of the logistic function is shown in Fig. 1(a), it can be seen from the diagram that the image of the logistic function is a monotonically increasing bounded “S” curve on the interval $[-\infty, +\infty]$, the function value quickly approaches 1 when the independent variable tends to positive infinity, and the function value quickly approaches 0 when the independent variable tends to negative infinity, which is exactly in line with the characteristics of the probability of event occurrence in the interval $[0, 1]$, which is very important for solving the binary classification problem.

For a bi-distributed problem where the independent variable obeys a binomial distribution (“0” or “1”), the probabilities of $y = 1$ and $y = 0$ are, respectively:

$$P(y = 1) = p \quad (3)$$

$$P(y = 0) = 1 - p \quad (4)$$

p is the probability that y will occur, and $1 - p$ is the probability that y will not occur, and the ratio of the two is the odds (odds), which refers to the ratio of the probability of an event occurring to the probability that it will not occur. The log odds are then:

$$\ln(odds) = \ln \frac{p}{1 - p} \quad (5)$$

From equations (1) and (2), $z > 0$, $g(z) > 0.5$, $P(Y = 1 | x) = 1$, when the event occurs, and $p < 1 - p$ when the event does not occur, i.e., $p < 0.5$, $P(Y = 1 | x) = 0$, $g(z) < 0.5$, $z < 0$, $g(z)$ can be used to describe the probability of the event occurring p . Thus:

$$\ln(odds) = \ln \frac{p}{1 - p} = z = \beta^T x \quad (6)$$

Log odds function image in Figure 1(b), the event probability p in the interval $[0, 1]$, the log odds $\ln(odds)$ can take any real number, the requirements of the function z to take the value of any number in the real range. In equation (6), the function z is a linear function of the explanatory variables, so the function z can take values to any number in the real number range, which can also be seen in Figure 1(a).

The logistic regression model has been established, and the next task to be accomplished is to use mathematical methods to solve for the vector of regression parameters β in the function z .

In the actual modeling and analysis process, the vector x usually contains multiple explanatory variables $x_1, x_2, \dots, x_n$, so the parameter vector β has multiple parameters to be regressed on $\beta_0, \beta_1, \beta_2, \dots, \beta_n$, and the function z is expressed as follows:

$$z = \beta^T x = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n \quad (7)$$

In the above equation: z is a function of the explanatory variables $x_1, x_2, \dots, x_n$ as a function of $\beta_0, \beta_1, \beta_2, \dots, \beta_n$ are the regression parameters to be solved. Each database used for event analysis is a sample of data, and the

overall database is not available, so the sample data is needed to estimate the overall parameters. In statistics, the maximum likelihood method is an efficient way to solve for multiple regression parameters, which can be obtained by solving a system of equations, and will not be repeated here.

After obtaining the regression parameters, a function of the probability of occurrence of the event can be obtained in the form of the following equation:

$$\pi(x) = \frac{1}{1 + \exp[-(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n)]} \quad (8)$$

In the above equation $\pi(x)$ is the probability of event occurrence, $x_1, x_2, \dots, x_n$ are explanatory variables, $\beta_0, \beta_1, \beta_2, \dots, \beta_n$ are the regression parameters.

The content of this section is a basic introduction to the principles of logistic regression theory, which is the basis for the research conducted in the subsequent chapters, and is also the theoretical support for this paper's subsequent research on the expansion of logistic regression theory in social support and mental health discrimination, so the basic principles of logistic regression theory are clarified in advance in this chapter.

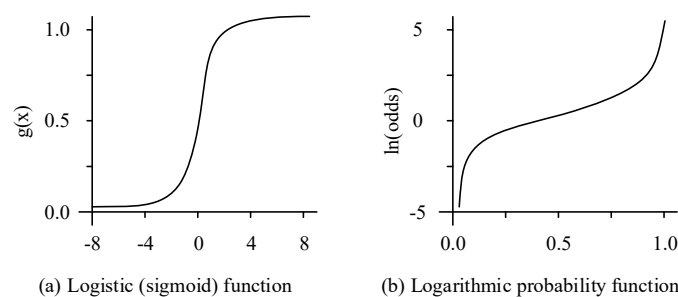


Figure 1: Functions of the logistic regression model

III. Study design

III. A. Impact of life support on mental health

Taking the elderly as an example, according to the special needs of the elderly, this study divides the social support into three levels: life support, economic support, and emotional support, and empirically analyzes the impact of social support on the psychological health of the elderly.

The most important place to provide life support services for the elderly is still the family, and the main body to provide care services is mainly the spouse, children or other family members. For the mild elderly, although their activities are limited, they are able to take care of themselves by dressing or eating, while the severe elderly need to be taken care of by specialized personnel for a long period of time. In terms of urban-rural differences, urban communities are able to provide the most basic personal care services, but most elderly people in rural areas can only rely on their spouses and children. As they age, the elderly become more dependent on their families and society, and their need for family and social care increases. Therefore, the degree of access to and quality of life support services will have a greater impact on the mental health of the elderly.

III. B. The impact of financial support on mental health

The special consumption needs and income levels of the elderly determine, to a certain extent, their needs for financial support. The consumption needs of the elderly are somewhat different from those of the general elderly population; as the elderly age, their health deteriorates and their ability to move around becomes more and more limited, so they have to increase their medical consumption expenditures in order to alleviate the deterioration of their health. The elderly have basically lost their ability to earn income, and their basic livelihood depends mainly on their children's financial support and social security. The impact of economic support on the mental health of the elderly is reflected in two aspects: first, adequate economic support ensures that the elderly maintain a certain standard of living and meet their daily consumption expenditures, and second, adequate economic support ensures that the elderly have the ability to consume medical care, which reduces the pain and suffering of the sick and enhances their satisfaction of life.

III. C. Impact of emotional support on mental health

In terms of emotional needs, as important members of social relationships, the elderly need to derive emotional comfort from their daily interpersonal relationships. As their health deteriorates with age, their emotional needs are

more pressing than those of the general elderly population. At the same time, the limitations in daily activities also determine that the scope of activities of the elderly will become smaller and mainly confined to the family and the community. Prolonged closure of social relationships will result in the development of negative emotions, which will further increase their need for emotional support. Emotional comfort is an important condition for the elderly to maintain their mental health, and good emotional comfort will help the elderly to recognize themselves again and realize their own value.

IV. Model variables and variable selection

IV. A. Modeling

Combining the social characteristics of the elderly, the logistic regression method is used as the basis to establish the factor endowment model, and the least squares estimation method is used to empirically study the degree of influence of each level of social support on the mental health of the elderly [18]. The regression model can be expressed as:

$$MH = \beta_0 + \beta_1 SZ + \beta_2 JZ + \beta_3 QZ + \beta_4 YZ \cdots \beta_i X_i + \varepsilon \quad (9)$$

where MH is the dependent variable, i.e., the mental health level of the elderly, and SZ, JZ, QZ, YZ are the life support, financial support, and emotional support received by the elderly, respectively. X_i is the control variable, the intercept β_0 is the average value of the dependent variable MH when both the independent variable and the control variable are 0. The regression coefficients $\beta, \beta_2, \beta_3, \dots, \beta_i$ indicate that, respectively, after controlling for the other variables, the average change in the dependent variable for each unit change in the independent variable.

The effects of the 3 levels of social support on the mental health of the elderly, some of which are direct and some of which are also manifested as indirect effects under specific circumstances, are examined comprehensively in this study to examine the types of social support received by the elderly with disabilities, and to analyze the extent to which the potential mediating variables can explain the correlation between factors and the mental health of the elderly with disabilities by using the mediating effects model, and to explore the social support's mental health by exploring the pathways and magnitude of the effects of social support on the mental health of the elderly with disabilities. The main models are as follows:

$$Y = cX + e_1 \quad (10)$$

$$M = aX + e_2 \quad (11)$$

$$Y = c'X + bM + e_3 \quad (12)$$

The coefficient c in Eq. (10) is the total effect of the independent variable X on the dependent variable Y , the coefficient a in Eq. (11) is the effect of the independent variable X on the mediator variable M , the coefficient b in Eq. (12) is the effect of the mediator variable M on the dependent variable Y after controlling for the effect of the independent variable X , the coefficient c' is the direct effect of the independent variable X on the dependent variable Y after controlling for the effect of the mediating variable M , and ab is the mediating effect.

IV. B. Variable selection

IV. B. 1) Explained variables

The explanatory variable for this study was the mental health status of the elderly, which was divided into two aspects in conjunction with the survey content of the CLHLS data: first, the positive emotions of the elderly, and second, the negative emotions of the elderly.

IV. B. 2) Explanatory variables

The core explanatory variable in this study is the social support variable, which is categorized into three dimensions: financial support, life care support, and emotional support.

IV. B. 3) Control variables

Personal characteristics mainly include gender, age, years of education, and marital status.

IV. B. 4) Intermediate variables

Both the quantity and quality of social support affect the mental health of the elderly, but the elderly's perception of the quality of social support is directly reflected in their satisfaction with the daily care they receive. Therefore, in this study, caregiving satisfaction was used as a mediating variable.

V. Analysis of empirical results

V. A. Basic Sample Characteristics

V. A. 1) Differences

Table 1 shows the results of the comparison of the current status of social support and mental health of the elderly and the differences between ages. In terms of the total social support score, the lowest score was found in those over 80 years of age ($M = 3.278$, $SD = 0.523$), indicating that the sense of social support of the elderly gradually declined with the increase of age, and the difference between ages was significant ($F = 3.048$, $P < 0.05$). Among the dimensions, financial support, assessment support, and companionship support differed significantly between grades, with lower scores for information support for seniors aged 70-80 ($M = 3.209$, $SD = 0.536$) versus 80+ ($M = 3.145$, $SD = 0.532$), and lower scores for information support for seniors aged 70-80 ($M = 3.148$, $SD = 0.621$) versus 80+ ($M = 3.178$, $SD = 0.516$) students had similarly low assessment support scores. In terms of mental health, the total score was lower for those over 80 years of age ($M = 3.248$, $SD = 0.574$), and the adaptability ($M = 3.298$, $SD = 0.798$) scores showed a similar trend, suggesting that there is a definite downward trend in the mental health of those of advanced age. The overall analysis showed that with increasing age, the elderly face more challenges in the dimensions of social support and mental health, which require close attention and active intervention.

Table 1: The status quo and age difference between social support and mental health of elderly

Item/dimension	50-60				60-70				F
	Min	Max	M	SD	Min	Max	M	SD	
Emotional support	2	5	3.548	0.615	2	5	3.456	0.515	1.455
Economic support	1	5	3.548	0.579	1	5	3.498	0.624	3.148**
Life support	1	5	3.248	0.616	1	5	3.248	0.709	1.348
Evaluation support	2	5	3.536	0.623	1	5	3.487	0.543	3.048**
Company support	1	5	3.888	0.549	2	5	3.749	0.551	4.847***
Social support score	1	5	3.563	0.656	1	5	3.498	0.586	3.048**
Adaptive ability	1	5	3.415	0.563	2	5	3.348	0.583	2.936**
Emotional management	2	5	3.298	0.593	1	5	3.236	0.563	1.348
Positive cognition	2	5	3.448	0.624	1	5	3.248	0.487	3.248**
Mental health score	1	5	3.345	0.579	1	5	3.264	0.553	3.514**
Item/dimension	70-80				Over 80				F
	Min	Max	M	SD	Min	Max	M	SD	
Emotional support	1	5	3.448	0.648	1	5	3.496	0.549	1.455
Economic support	1	5	3.209	0.536	1	5	3.145	0.532	3.148**
Life support	2	5	3.348	0.612	1	5	3.395	0.485	1.348
Evaluation support	1	5	3.148	0.621	1	5	3.178	0.516	3.048**
Company support	2	5	3.487	0.547	1	5	3.395	0.584	4.847***
Social support score	1	5	3.316	0.569	1	5	3.278	0.523	3.048**
Adaptive ability	1	5	3.308	0.612	1	5	3.298	0.798	2.936**
Emotional management	1	5	3.214	0.569	1	5	3.248	0.636	1.348
Positive cognition	2	5	3.165	0.574	1	5	3.236	0.487	3.248**
Mental health score	1	5	3.248	0.566	1	5	3.248	0.574	3.514**

Note:**and*** represent the significance levels of 0.05 and 0.01 respectively.

V. A. 2) Relevance

Table 2 shows the correlation between social support and mental health of the elderly, and the total score of social support was positively correlated with emotional support ($r=0.324$, $P < 0.05$), economic support ($r=0.377$, $P < 0.05$), living support ($r = 0.524$, $P < 0.01$), assessment support ($r=0.325$, $P < 0.05$) and companionship support ($r = 0.385$, $P < 0.05$). There was also a positive correlation between the total score of mental health and adaptability ($r=0.397$, $P < 0.05$), emotion management ($r=0.326$, $P < 0.05$) and positive cognition ($r=0.352$, $P < 0.05$), indicating that good adaptability, emotion regulation and positive cognitive attitude were helpful to the improvement of mental health of the elderly. There was a significant positive correlation between the total score of social support and the total score of mental health ($r=0.483$, $P < 0.05$), which further emphasized the importance of good social support in improving the mental health of the elderly, and highlighted the key role of the support system in promoting mental health, that is, a good sense of social support can help improve the mental health of the elderly.

Table 2: Analysis of social support and mental health of elderly people

/	1	2	3	4	5	6	7	8	9	10
1.Emotional support	-									
2.Economic support	0.278	-								
3.Life support	0.254	0.422**	-							
4.Evaluation support	0.315	0.317	0.196	-						
5.Company support	0.423***	0.408	0.243	0.318	-					
6.Social support score	0.324**	0.377***	0.524***	0.325**	0.385**	-				
7.Adaptive ability	0.354**	0.375	0.236	0.312	0.249	0.318**	-			
8.Emotional management	0.347**	0.353**	0.198	0.353	0.425**	0.421**	0.318	-		
9.Positive cognition	0.408***	0.218	0.318**	0.324**	0.352**	0.205	0.362**	0.342**	-	
10.Mental health score	0.395**	0.318**	0.304	0.249	0.487***	0.483**	0.397**	0.326**	0.352**	-

Note:**and*** represent the significance levels of 0.05 and 0.01 respectively.

V. B. Logistic regression analysis

Table 3 shows the results of the logistic regression, since the higher the score on the dependent variable, the worse the level of mental health, so if the coefficient of the independent variable is negative, it means that there is a promotion of mental health. In contrast to model (1) without controlling covariates, model (2) with covariates added found unchanged results, with emotional support (regression coefficients and standard errors of -0.073 and 0.036, respectively, $P<0.05$), life support ($P<0.001$) and mental health of the elderly presenting a significant positive correlation, and a non-significant association between financial support and mental health of the elderly, with emotional support ($P<0.05$), financial support ($P<0.001$), life support ($P<0.001$) and mental health of the elderly showed significant positive correlation.

Table 3: Logistic regression

Variable	Mental health (1)	Mental health (2)	Variable	Mental health (1)	Mental health (2)
Emotional support	-0.153*** (0.023)	-0.073* (0.036)	Medical insurance		-0.348 (0.394)
Economic support	-0.034*** (0.008)	-0.024*** (0.058)	Endowment insurance		0.025 (0.248)
Life support	-0.248*** (0.046)	-0.154*** (0.044)	Surf the Internet		-0.842*** (0.215)
Gender		-1.348*** (0.248)	Sleep length		-0.748*** (0.045)
Age		-0.026 (0.018)	Smoking		0.274 (0.269)
Domicile		-0.958*** (0.265)	Drinking		-0.648*** (0.158)
Marital status		-1.526*** (0.348)	Chronic disease		0.856*** (0.055)
Education level		-0.384*** (0.095)	Revenue		-0.054*** (0.058)
Live alone		-0.348 (0.448)	F	32.486	104.199
			Adjust R2	0.019	0.266

Note: * $P<0.05$, ** $P<0.01$, *** $P<0.001$. The values in parentheses are standard errors. The same applies to the following table.

V. C. Heterogeneity test

The study participants were grouped according to gender and place of residence to analyze the heterogeneity of the impact of social participation on physical and mental health, and the results are shown in Table 4. Relative to men, emotional support had a more significant effect on the depression level of female elderly (regression coefficient of -0.059, $P < 0.05$), relative to towns, emotional support had a more significant effect on the psychological functioning of rural elderly (regression coefficient of -0.108, $P < 0.01$), and financial support had a more significant effect on the mental health level of both rural elderly (regression coefficient of -0.025, $P < 0.001$), and life support had a significant effect on the mental health of the elderly across gender and place of residence ($P < 0.05$).

Table 4: Heterogeneity test

Variable	Mental health		Mental health	
	Male	Female	Countryside	Town
Emotional support	-0.034	-0.059*	-0.108**	0.025
	(0.023)	(0.034)	(0.034)	(0.065)
Economic support	-0.018	-0.015	-0.025***	-0.015
	(0.044)	(0.002)	(0.075)	(0.006)
Life support	-0.148***	-0.116**	-0.124***	-0.158**
	(0.029)	(0.035)	(0.0648)	(0.078)
Control variable	YES	YES	YES	YES
Constants	-3.018**	0.305	17.948***	20.164***
	(1.148)	(1.187)	(1.384)	(2.185)
N	2948	3048	4054	1546
Adjust R2	0.108	0.089	0.198	0.269

V. D. Analysis of intermediation effects

The previous empirical analysis shows that child care has a significant impact on the mental health of the elderly, and this subsection further explores how child care affects the health of the elderly. Specifically, based on the health needs theory, this paper proposes the mediating variable of medical service accessibility and analyzes the mechanism, after controlling for individual characteristics, family endowment and socio-economic characteristics, the logistic regression method is used to empirically test the mediating effect, and the mediating effect analysis is shown in Table 5. Models (1) to (3) report the results of the mediation analysis of the effects of child care on the mental health of the elderly. According to the test method, the effect of child care on the accessibility of medical services is first analyzed, as shown in model (2), child care can significantly satisfy the medical needs of disabled older adults, specifically, enjoying child care increases the probability of timely access to medical care for older adults by 7.5%, which is significant at the 5% confidence level, indicating that the pathway proposed in the previous analysis is reasonable. Model (3) is a mediation analysis model, and the results show that after adding the variable of timely access to medical care, the dimensions of health of the elderly remain significant, respectively, at the 0.05 confidence level, indicating that the mediating effect of child care affecting the mental health of the elderly by promoting the accessibility of medical care is established.

Table 5: Analysis of mediating effect

Variable	Model (1)	Model (2)	Model (3)
	Mental health	Timely medical treatment	Mental health
Child care satisfaction	0.148***	0.075**	0.074**
	(0.034)	(0.024)	(0.023)
Timely medical treatment			0.254**
			(0.578)
Other explanatory variables	Control	Control	Control
Constant term	21.054***	0.148***	21.548***
	(0.248)	(0.038)	(1.536)
N	1546	1546	1546

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, The errors in parentheses are standard mistakes.

VI. Conclusions and recommendations

VI. A. Conclusion

This paper explores the principles of social support and mental health in turn, establishes a logistic regression model based on the basic principles of logistic regression, and solves the vector of regression parameters in the function using numerical methods. Taking the elderly as an example, the research experiment is designed to use the logistic regression model to develop the research related to the impact of social support on mental health. The data variability of the research sample, from the point of view of the total score of social support, the elderly over 80 years old have the lowest score, the mean and standard deviation are 3.278, 0.482, respectively, indicating that the sense of social support of the elderly gradually decreases with the increase of age. And the age difference of social support variables is more significant, significance $F=3.048$, $P<0.05$. Using the logistic regression model to analyze the influence relationship between the variables, after adding the covariate model, the results of the model analysis remain unchanged, the emotional support and the life support and the psychological health of the elderly show a significant positive correlation, P is less than 0.05 and less than 0.001, respectively. To verify the impact of care satisfaction on the psychological health of the elderly, enjoyment of children and the psychological health of the elderly are not affected. The impact of care satisfaction on the mental health of the elderly, enjoyment of child care increases the probability of timely medical care for the elderly by 7.5%, which is significant at the 5% confidence level, indicating the rationality of the pathway proposed in this paper.

VI. B. Recommendations

Based on the above findings, the following policy recommendations are made to further improve the mental health of the elderly.

VI. B. 1) Improvement of mental health services for the elderly

In order to address the mental health problems of the elderly, especially those whose family structure has changed to living alone or intergenerationally, family members should regularly observe the mood changes of the elderly, take timely preventive measures for those who may have mental health problems but have not yet developed them, and provide timely psychological counseling for those who have already developed mental health problems. Increase intergenerational economic support to cover up the negative impact on the mental health of the elderly caused by the change in family structure to living alone. Government departments can follow the example of other countries and do a better job of helping the elderly and improving their mental health.

VI. B. 2) Actively building a livable environment for the elderly

Children should, on the one hand, support and encourage the elderly to choose to live together as husband and wife, and on the other hand, it is advisable to strengthen intergenerational relationships and to reinforce the positive impact of family structure on the mental health of the elderly. In addition, the government can communicate and coordinate with the real estate industry to actively create a livable environment for the elderly and provide a comfortable living environment for elderly couples to live together.

VI. B. 3) Children should emphasize communication with the elderly

In order to improve the mental health of the elderly who live with their children as a result of the change in family structure, children should improve the way they get along with the elderly in terms of living habits and emotional expression. When communicating with their parents, children should try to stand in the position of the elderly and listen patiently, understand their emotional fluctuations in a timely manner, respect the living habits of the elderly, and allow each other to act according to different habits under reasonable circumstances. For the old man's bad habits, children can remind and guide its change, but do not blame. Always praise the elderly sincerely. Sincere compliments to the elderly can reduce their sense of uselessness as they age, and contribute to their sense of well-being.

VI. B. 4) Meeting the ageing needs of older persons living in multi-generational households

There are bound to be many differences in thinking, habits and values between older persons living in multi-generational households and their children and grandchildren. Future generations should uphold the principle of mutual respect, understand the elderly and keep abreast of their needs. Elderly people should also not rely on the elderly to interfere too much in the lives of their children and grandchildren. The community can set up mediation committees to prevent conflicts from escalating through rational communication and legal literacy. The mental health of the elderly can also be improved by creating a multigenerational family atmosphere of mutual respect. The government should continue to optimize all kinds of social security. Higher vocational colleges and universities are encouraged to offer courses related to the mental health of the elderly in their elderly care, geriatric

management and services, medicine and social work programs, so as to improve their ability to identify and intervene in common mental health problems among the elderly.

VI. B. 5) Improving the Mental Health of Older Women

Children should not only minimize intergenerational living and alleviate the physical and mental burdens of intergenerational parenting on older persons, but also increase the frequency of visits to their parents and pay attention to their parents' mental health. Governments should formulate relevant social policies and take active measures to shorten the distance between generations, encourage children to visit their parents more often, help older persons to reduce the pressure of intergenerational caregiving, and provide regular psychological counselling services for older persons living in intergenerational housing, as well as custodial education services for children, among other things.

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