

Predictors of Medical Care Delay or Avoidance Among Chinese Adults During the COVID-19 Pandemic

Lili Kang¹, Changle Li¹, Huifeng Du²

¹School of Health Management, Fujian Medical University, Fuzhou, People's Republic of China; ²School of Health Management, Inner Mongolia Medical University, Hohhot, People's Republic of China

Correspondence: Huifeng Du, School of Health Management, Inner Mongolia Medical University, Chillechuan Dairy Development Zone, Hohhot, 010110, People's Republic of China, Email dhfeng2009_9@163.com

Purpose: Medical care delay or avoidance increases morbidity and mortality risk and is costly for the national healthcare system. The objective of this study was to identify factors associated with medical care delay or avoidance among Chinese adults during the COVID-19 pandemic.

Materials and Methods: A cross-sectional analysis was conducted using data from the 2020 China Family Panel Study (CFPS). The CFPS was conducted from July to December 2020 during the COVID-19 pandemic. The final sample included 4369 adults. A logistic regression model was employed to identify the factors associated with medical care delay or avoidance.

Results: The empirical results indicate that regardless of rural-urban residence, older adults and adults with chronic conditions were less likely to delay or avoid medical care during the pandemic. However, individuals who had completed more than three years of college showed a higher likelihood of delaying or avoiding medical care. In urban areas, larger family sizes, greater general trust in physicians, and higher provider structural quality were associated with a decreased probability of delaying or avoiding medical care during the pandemic. In contrast, employed adults were more likely to delay or avoid medical care. In rural areas, current smokers were more likely to delay or avoid medical care during the pandemic.

Conclusion: This study has identified several factors affecting medical care delay or avoidance, some of which are amenable to policy changes. Policymakers can help improve the utilization of health facilities and patient health outcomes by implementing a series of reforms.

Keywords: delay or avoidance behavior, medical care, COVID-19 pandemic, China

Introduction

People often delay or avoid medical visits even when they suspect they should go.¹ 36.0% of American adults, 10.9% of French adults, and 40.4% of Chinese breast cancer patients delayed or avoided doctor visits they had deemed necessary before the coronavirus disease 2019 (COVID-19) pandemic.²⁻⁴ During the COVID-19 pandemic, COVID-19-related factors such as stay-at-home orders, physical distancing measures, and fears of COVID-19 within hospitals have prompted people to delay or avoid seeking medical care.^{5,6} Figure 1 shows the proportion of medical care delay or avoidance before and during the COVID-19 pandemic in China. Medical care delay or avoidance has been observed to increase during pandemics. Nevertheless, the factors that may influence medical care delay or avoidance among Chinese adults during the COVID-19 pandemic are not well understood.

At the individual level, medical care delay or avoidance may increase morbidity and mortality risk associated with underlying, preventable, and treatable medical conditions and contribute to excess mortality, including deaths related to COVID-19 directly or indirectly.^{8,9} In addition, medical care delay or avoidance can extend hospital stays, use more medications, and visit high-frequency emergency departments, and may generate higher medical expenditures in the long run.^{2,10,11} At the societal level, medical care delay or avoidance is costly for the national healthcare system.¹²

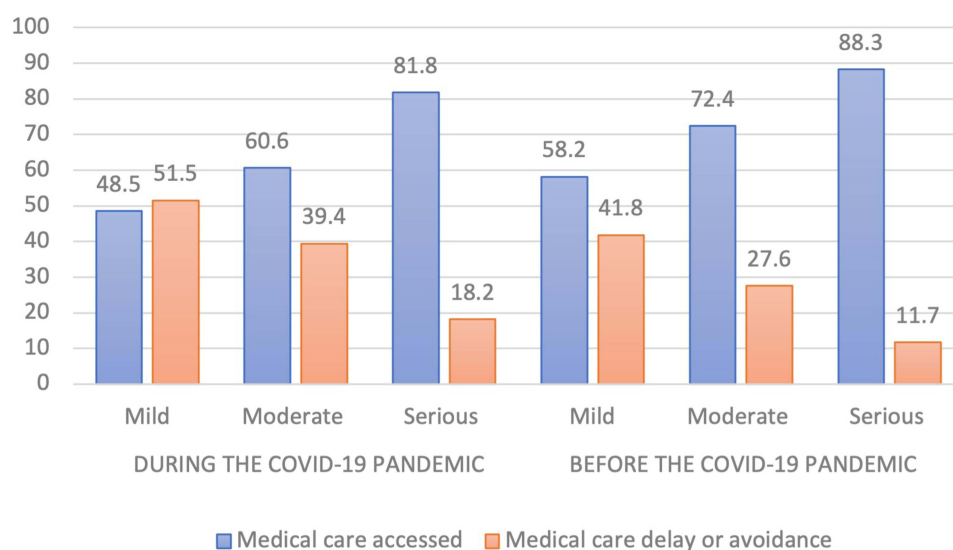


Figure 1 Medical care delay or avoidance according to the severity of self-reported physical symptoms before and during the COVID-19 pandemic.
Note: Data were from the 2018 and 2020 China Family Panel Studies.⁷

Medical care avoidance is defined as the act of keeping away from medical care that is thought to cause mental or physical distress.^{1,13} Medical care delay is often combined with avoidance, which incorporates a temporal element (postponing medical care until a later time) into the definition of medical care avoidance.¹³ Medical care delay or avoidance can also occur due to barriers, including financial limitations, time constraints, and lack of access to a medical care provider.^{1,13,14} Delay or avoidance of medical care can occur at any point using preventive healthcare, treatment seeking, and treatment adherence.^{1,13} A review of the literature implies that many factors affect medical care delay or avoidance, including the following three categories of variables: individual-level socioeconomic status and demographic characteristics, personal barriers, and institution-related care avoidance factors.

Individual-level socioeconomic status and demographic characteristics affecting medical care delay or avoidance include age, gender, educational attainment, employment status, income level, and health insurance status. The findings are mixed on how age, gender, and educational attainment affect medical care delay or avoidance. For example, Sulku et al, Reisinger et al, and Splinter et al found that the probability of delaying or avoiding medical care increases as age increases.^{15–17} However, Kannan et al, Ratnapradipa et al, and Spleen et al reported the opposite.^{2,11,18} Reisinger et al and Spleen et al found that men are more likely to delay or avoid medical care.^{16,18} These two population-based cross-sectional studies were conducted in the USA. In contrast, Sulku et al, Splinter et al, and Karim et al reported that women are more likely to delay or avoid medical care.^{15,17,19} These three population-based cross-sectional studies were conducted in Turkey, the Netherlands, and Bangladesh. Hwang et al, Farina and Ailshire, and Zhong et al showed that higher educational attainment is positively associated with medical care delay or avoidance.^{20–22} However, Splinter et al and Needham et al found that lower educational attainment is more likely to be associated with medical care delay or avoidance.^{17,23}

The effects of income level, health insurance status, and employment status on medical care delay or avoidance were found to be similar across several studies. Ratnapradipa et al, Jatrana and Crampton, and Vilhjalmsson found that lower income is positively associated with medical care delay or avoidance.^{11,24,25} Gertz et al, Reisinger et al, Wisk and Witt, and Mollborn et al reported that individuals without health insurance are more likely to delay or avoid medical care.^{9,16,26,27} Reisinger et al and Pharr et al found that unemployed or retired people are less likely to delay or avoid medical care.^{16,28}

Personal barriers associated with medical care delay or avoidance include emotions (anxiety, fear, denial, worry), attitude, financial or resource limitations, health beliefs, lack of knowledge, lack of support, language barriers, perception of risk, transportation, stigma or embarrassment of illness, and time constraints.¹³ For example, Hwang et al reported that

higher levels of fear of COVID-19 show increased odds of delaying or avoiding medical care.²⁰ Wisk and Witt found that people with high family financial burdens are more likely to delay or avoid medical care.²⁶ Kannan and Veazie showed that low health self-efficacy is positively associated with medical care delay or avoidance.² Tipirneni et al found that higher health insurance literacy is associated with a lower likelihood of delaying or avoiding medical care.²⁹ Reisinger et al reported that people without social support are more likely to delay or avoid medical care.¹⁶ Sulku et al found that people who feel severe pain are less likely to delay or avoid medical care.¹⁵ During the COVID-19, social distancing and lockdowns turned many patients to online forums, where various forms of lay expertise were mobilized to cope with disease and illness,³⁰ pushing some patients away from credentialed experts.

Institution-related care avoidance factors are found to be associated with medical care delay or avoidance, including attitude and knowledge of the provider, distrust of providers, lack of access to a provider, and lack of user-friendly service hours. For example, Kannan and Veazie reported that fear or dislike of medical treatment and time is positively associated with medical care delay or avoidance.² Spleen et al found that rural residents who reported lower levels of trust in physicians are more likely to delay or avoid medical care.¹⁸ Lack of trust in medical professionals brought on by the dismissal of experiences of those suffering from the complications of COVID-19 or Long COVID,³¹ as well as instances of bribery of medical professionals by patients.^{32,33} Arnetz et al showed that a negative patient healthcare experience had a higher probability of delaying or avoiding medical care.³⁴

Since the launch of the new health reform of 2009, the Chinese government has made considerable investments to strengthen the provision of primary care and extend healthcare coverage. However, people continue to delay or avoid medical care. Delay or avoidance behavior and factors affecting medical care delay or avoidance have implications for government policies related to types of investments that will be most effective in improving the utilization of health facilities and patient health outcomes. However, little is known about delay or avoidance behavior during emergency situations in China, and this study is an attempt to understand delay or avoidance behavior in rural and urban areas of China and to identify factors associated with medical care delay or avoidance among Chinese adults during the COVID-19 pandemic.

Methods and Materials

Theoretical Model

The current study employed the Behavioral Model of Health Services Use (BMHSU), initially developed by Andersen.³⁵ In the BMHSU model, the individual's use of health services (delay or avoidance of health services) is a function of his or her predisposition characteristics to use healthcare, enable or impede use, and his or her need for health services. Figure 2 presents the theoretical model of this study. Each part of the model can be an independent contribution to delaying or avoiding medical care. More importantly, the model presents an explanatory process or causal ordering.³¹ Predisposing characteristics can be measured by socio-economic and demographic characteristics. Demographic factors suggest the probability that an individual needs medical care, and socio-economic characteristics express an individual's ability to deal with presenting problems. Therefore, Predisposing characteristics can influence an individual's subsequent perceptions of need and delay or avoidance of medical care. Enabling resources emphasize the resources available to an individual for using medical care. Perceived need refers to an individual's own judgment about his or her health status and need for medical care, and evaluated need means health personnel's judgment, which directly influences an individual's delay or avoidance of medical care.^{35,36}

Participants

The database used in this study was obtained from the 2020 China Family Panel Studies (CFPS) conducted from July to December 2020 during the COVID-19 pandemic. The CFPS is a general-purpose, nationally representative, longitudinal survey conducted by the Institute of Social Science Survey of Peking University. The survey sample was drawn from twenty-five provinces and their administrative equivalents; thus, it represents 95% of the total population in mainland China. A multistage probability proportional to size (PPS) sampling method was used for the survey. More details about the sampling design are available from Xie and Lu.³⁷ The CFPS used multi-module designs for questionnaires, including

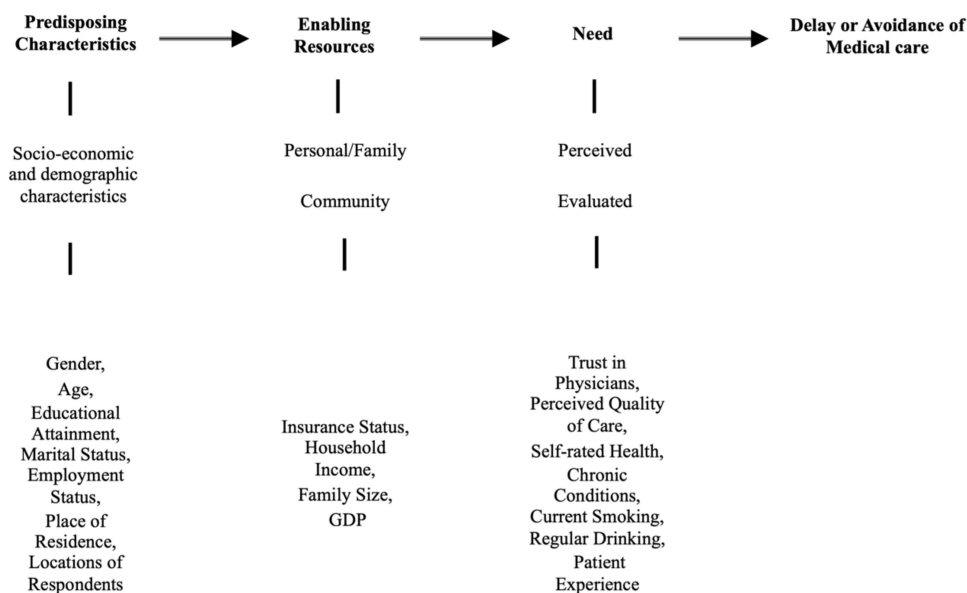


Figure 2 The theoretical model of this study.

household information, family income, family assets, demographic background, educational history, schooling, language use, marriage, subjective measurements, health status and physical functioning, mental health, work, retirement, and pension, etc.³⁸

Due to the COVID-19 pandemic, the CFPS primarily conducted telephone interviews, and 89% of respondents were interviewed by telephone.³⁹ The CFPS respondents are reinterviewed every two years, with the first wave occurring in 2010. The 2020 CFPS had a total sample of 28,530 individuals. From the full sample, only the adults (16 years old or older) who reported feeling any physical discomfort in the past two weeks prior to the survey interview were selected (5830 adults). Figure 1 shows the proportion of medical care delay or avoidance according to the severity of self-reported physical symptoms during the COVID-19 pandemic. The proportion of medical care delay or avoidance was as high as 51.5% among adults with mild physical symptoms. Adults with mild physical symptoms reported low perceived need to seek medical care, often because they expected their illness or symptoms to improve over time.¹ Most of them choose self-treatment or no treatment at all. Therefore, this study excluded adults with the severity of self-reported physical symptoms as mild (1260 adults). After all missing data were eliminated (201 adults), the final sample consisted of 4369 adults.

Measures

Dependent Variable

Medical care delay or avoidance was set as a binary variable, indicating the decision to avoid visiting a doctor (or not) among the adults who reported moderate or serious physical symptoms in the past two weeks. The CFPS question that represents this variable is: “Have you seen a doctor within the past two weeks?”. Response options are yes or no. If the adult reported “no”, the respondent was categorized as delaying or avoiding medical care.

Independent Variables

General trust in physicians:

In the CFPS, each adult was asked, “Considering everything together, how much do you trust physicians in China? Please answer by picking a number between 0 and 10, where 0 stands for not at all and 10 for completely” (An 11-point Likert scale). For the analysis, we have categorized reported levels of general trust in physicians into three groups: low level of trust (0–3), medium level of trust (4–6), and high level of trust (7–10).

Perceived quality of care:

The present study measured the perceived quality of care from provider competence and structural quality. Provider competence was set as a dummy variable equaling one if the adults answered “very good” and 0 otherwise. The question in the CFPS that collected information on provider competence is: “How would you evaluate the knowledge, expertise, skills, and abilities of the health care provider that you visit most often?”. Provider structural quality was also set as a dummy variable that equaled one if the adults who answered “very satisfied” and 0 otherwise, based on a question that asks: “Are you satisfied with the condition of the health care facility that you visit most often (such as the adequacy of facilities, equipment, staff, and drug, qualifications of physicians and nurses, administrative structures, and convenient transportation)?”.

The analysis also considered the following three categories of variables to explain medical care delay or avoidance. (1) Predisposing factors: gender, age, educational attainment, marital status, employment status, place of residence, and locations of respondents. (2) Enabling factors: insurance status, household income, family size, and GDP. (3) Need factors: in addition to general trust in physicians, provider competence, and provider structural quality, other need factors included in the analysis were self-rated health, chronic conditions, current smoking, regular drinking, and patient experience (a proxy indicator for primary care visits). The definitions of the variables are provided in Table 1.

Statistical Analysis

Bivariate analyses were used to examine differences between adults who consulted a doctor (seeking health care) and those who did not consult a doctor (medical care delay or avoidance) when they felt physical discomfort during the

Table 1 Definitions of Variables Used in the Empirical Analysis of Avoiding Medical Visits (2020 China Family Panel Study)

Variable	Description	Mean (Std)/%
Dependent variable		
Medical care delay or avoidance	Dichotomous variable, 1=yes or 0=no	31.84% [#]
Independent variables		
Gender	1 if the individual is male; 0 for female	41.79%
Age	Actual age in years	51.94 (15.22)
Educational attainment		
Illiterate/Semi-literate	1 if the individual is illiterate or semi-literate; 0 otherwise	27.19%
Elementary school	1 if the individual attended elementary school; 0 otherwise	21.40%
Middle school	1 if the individual graduated from middle school; 0 otherwise	27.01%
High school	1 if the individual graduated from high school; 0 otherwise	13.18%
> 3-years of college	1 if the individual had above three-years of college; 0 otherwise	11.22%
Marital status		
Married	1 if the individual is married; 0 otherwise	81.41%
Other	1 if never married, divorced, widowed or cohabitation; 0 otherwise	18.59%
Employed	1 if the individual is employed in the past week; 0 otherwise	62.71%
Place of residence	1 if urban resident; 0 for rural resident	46.07%
Locations of respondents		
Northeast region	1 if the individual lives in the Northeast region; 0 otherwise	13.34%
East region	1 if the individual lives in the East region; 0 otherwise	28.79%
Central region	1 if the individual lives in the Central region; 0 otherwise	23.32%
West region	1 if the individual lives in the West region; 0 otherwise	34.54%
No Insurance	1 if the individual does not have medical insurance; 0 otherwise	8.95%
Household income		
Low income	1 if the individual's household income is in the first quartile; 0 otherwise	26.14%
Lower middle income	1 if the individual's household income is in the second quartile; 0 otherwise	25.25%
Upper middle income	1 if the individual's household income is in the third quartile; 0 otherwise	26.18%
High income	1 if the individual's household income is in the highest quartile; 0 otherwise	22.43%

(Continued)

Table 1 (Continued).

Variable	Description	Mean (Std)/%
Family size	Number of members with the household	4.11 (2.05)
GDP*	The total health expenditures as a percentage of gross domestic product (GDP)	7.64 (1.94)
Self-rated health		
Poor	1 if the individual reports health status to be poor; 0 otherwise	40.97%
Fair	1 if the individual reports health status to be fair; 0 otherwise	14.99%
Good	1 if the individual reports health status to be good or better; 0 otherwise	44.04%
Chronic conditions	1 if the individual has had doctor-diagnosed chronic diseases in the past six months; 0 otherwise	36.46%
Current smoking	1 if the individual currently smokes tobacco products; 0 otherwise	24.31%
Regular drinking	1 if the individual has drunk alcohol at least 3 times a week in the past month; 0 otherwise	10.05%
Primary care	1 if the individual often visits primary care facility for healthcare; 0 otherwise	52.44%
General trust in physicians		
Low level of trust	1 if the individual reports low level of trust in physician; 0 otherwise	8.95%
Medium level of trust	1 if the individual reports medium level of trust in physician; 0 otherwise	31.95%
High level of trust	1 if the individual reports high level of trust in physician; 0 otherwise	59.10%
Provider structural quality	1 if the individual reports being very satisfied with the condition of the health care facility that he or she visits most often, 0 otherwise	9.93%
Provider competence	1 if the individual reports the knowledge, expertise, skills, and abilities of the health care provider that he or she visits most often is very good, 0 otherwise	14.05%

Notes: #The proportion of medical care delay or avoidance is 36.31% in urban areas, and 28.01% in rural areas. *The total health expenditures as a percentage of GDP in each province and municipality were collected from the China Health Statistical Yearbooks.

COVID-19 pandemic. Statistical significance between groups was assessed through Pearson's chi-square test for categorical variables and two-sample *t*-tests for continuous variables.

This study used a logistic regression model to identify factors associated with medical care delay or avoidance. This model is based on a latent regression and is defined as follows:

$$y^* = x'a + \varepsilon$$

where x' is a vector of independent variables, including predisposing, enabling, and need factors; β is the coefficient vector; and y^* is an unobserved latent variable linked to the observed dichotomous response of medical care delay or avoidance (MCDA). We assume that ε has mean zero and has a standardized logistic with variance $\pi^2/3$. Our observation is

$$MCDA = 1 \text{ if } y^* > 0$$

$$MCDA = 0 \text{ if } y^* \leq 0$$

where MCDA = 1 indicates that the individual delay or avoid medical care.

Then, the probability that MCDA = 1 is

$$P(MCDA = 1|x) = P(y_{it}^* > 0|x)$$

$$= P(x'a + \varepsilon > 0|x)$$

$$= P(\varepsilon_{it} > -x'a|x)$$

$$= F(x'a)$$

The logistic regression model was estimated using maximum likelihood estimation.⁴⁰ Since the health care delivery and health insurance systems differ between urban and rural areas, the logistic regression model was used to analyze factors affecting medical care delay or avoidance stratified by urban-rural residence, which should help avoid potential bias created by

differences between urban and rural health systems. The results are presented as odds ratios (ORs) and 95% confidence intervals (CIs). All statistical analyses were conducted employing Stata Version 17 (Stata Corp, College Station, TX).

Results

General Characteristics of Subjects

Table 1 shows the characteristics of the study sample. The sample size was 4369, with 41.79% of adults being male and 51.41% completing at least a middle school education. The average age of adults was approximately 52 years. Among those who reported moderate or serious physical symptoms, the proportion of medical care delay or avoidance was 31.84%. About 59% of adults reported a high level of trust in physicians. The proportion of adults who reported provider competence being very good was 14.05%. Approximately 10% of adults reported satisfaction with provider structural quality in 2020.

Bivariate Analyses of Medical Care Delay or Avoidance

Table 2 reports predisposing, enabling, and need factors by medical care delay or avoidance. The descriptive analysis implies that gender, primary care, and provider competence did not significantly relate to medical care delay or avoidance. Other variables, however, are related to medical care delay or avoidance as a group. These include age, educational attainment, marital status, medical insurance coverage, family size, place of residence, household income, employment status, self-rated health status, chronic conditions, current smoking, regular drinking, general trust in physicians, provider structural quality, locations of respondents, and GDP.

Logistic Regression Analysis on Medical Care Delay or Avoidance

The results of the logistic regression are reported in Table 3. The results imply that the probability of delaying or avoiding medical care decreased as age increased, although the odds ratio is close to 1 (OR=0.99, 95% CI: 0.99–1.00).

Table 2 Differences Between Avoiding Medical Visits and Non-Avoiding Medical Visits According to Predisposing, Enabling, and Need Characteristics

	Avoiding medical visits	
	Yes (N= 1391)	No (N= 2978)
Gender (%)		
Males	43.93	40.80
Females	56.07	59.20
Age (mean)**	48.47	53.56
Educational attainment (%)**		
Illiterate/Semi-literate	19.48	30.79
Elementary school	19.12	22.46
Middle school	29.48	25.86
High school	14.95	12.36
> 3-years of college	16.97	8.53
Marital status (%)**		
Married	77.93	83.04
Other	22.07	16.96
Employed (%)**		
Yes	67.00	60.71
No	33.00	39.29
Place of residence (%)**		
Urban	52.55	43.05
Rural	47.45	56.95

(Continued)

Table 2 (Continued).

	Avoiding medical visits	
	Yes (N= 1391)	No (N= 2978)
Locations of respondents (%)**		
Northeast region	18.48	10.95
East region	32.42	27.10
Central region	20.78	24.51
West region	28.32	37.44
No Insurance (%)*		
Yes	10.42	8.26
No	89.58	91.74
Household income (%)**		
Low income	23.72	27.27
Lower middle income	22.86	26.36
Upper middle income	27.75	25.45
High income	25.66	20.92
Family size (mean)**	3.94	4.18
GDP (mean)**	7.49	7.71
Self-rated health (%)**		
Poor	33.21	44.59
Fair	15.89	14.57
Good	50.90	40.83
Chronic conditions (%)**		
Yes	20.13	44.09
No	79.87	55.91
Current smoking (%)**		
Yes	27.46	22.83
No	72.54	77.17
Regular drinking (%)**		
Yes	12.22	9.03
No	87.78	90.97
Primary care (%)		
Yes	52.26	52.52
No	47.74	47.48
General trust in physicians (%)**		
Low level trust	11.00	7.99
Medium level trust	31.27	32.27
High level trust	57.73	59.74
Provider structural quality (%)*		
Very satisfied	8.27	10.71
Otherwise	91.73 89.29	89.29
Provider competence (%)		
Very good	12.65	14.71
Otherwise	87.35	85.29

Notes: Pearson's chi-square test for categorical variables and t-test for continuous variables.

**Significantly different (P<0.01); *Significantly different (P<0.05).

Higher educational attainment had a positive association with medical care delay or avoidance. For example, compared to illiterate or semi-literate adults, adults who graduated from middle school were more likely to delay or avoid medical care (OR=1.31, 95% CI: 1.06–1.61). High school completion showed an increased probability of delaying or avoiding medical care compared to those who were illiterate or semi-literate (OR=1.30, 95% CI: 1.00–1.68). Compared to illiterate or semi-literate adults, completing more than three years of college showed increased odds of delaying or avoiding

Table 3 Logistic Regression Analysis on Avoiding Medical Visits

	Full Sample Odd Ratios (95% CI)	Urban Odd Ratios (95% CI)	Rural Odd Ratios (95% CI)
Gender			
Males	0.95 (0.80–1.13)	0.96 (0.74–1.23)	0.96 (0.75–1.24)
Females	1.00	1.00	1.00
Age	0.99 (0.99–1.00)	0.99 (0.98–1.00)	0.99 (0.98–1.00)
Educational attainment			
Illiterate/Semi-literate	1.00	1.00	1.00
Elementary school	1.15 (0.93–1.42)	1.15 (0.81–1.63)	1.17 (0.89–1.52)
Middle school	1.31 (1.06–1.61)	1.36 (0.98–1.88)	1.27 (0.96–1.69)
High school	1.30 (1.00–1.68)	1.40 (0.97–2.02)	1.11 (0.75–1.65)
> 3-years of college	1.72 (1.28–2.31)	1.60 (1.07–2.40)	1.95 (1.21–3.16)
Marital status			
Married	0.86 (0.72–1.03)	0.89 (0.69–1.15)	0.86 (0.67–1.11)
Other	1.00	1.00	1.00
Employed			
Yes	1.18 (1.01–1.38)	1.29 (1.03–1.62)	1.09 (0.88–1.36)
No	1.00	1.00	1.00
Place of residence			
Urban	1.25 (1.09–1.45)	–	–
Rural	1.00	–	–
Locations of respondents			
Northeast region	1.00	1.00	1.00
East region	0.59 (0.46–0.76)	0.65 (0.46–0.93)	0.55 (0.38–0.78)
Central region	0.47 (0.37–0.61)	0.54 (0.38–0.78)	0.44 (0.30–0.63)
West region	0.46 (0.36–0.57)	0.46 (0.33–0.64)	0.47 (0.34–0.65)
No Insurance			
Yes	1.06 (0.84–1.34)	0.98 (0.70–1.37)	1.12 (0.81–1.54)
No	1.00	1.00	1.00
Household income			
Low income	1.00	1.00	1.00
Lower middle income	0.89 (0.73–1.09)	0.88 (0.64–1.22)	0.89 (0.69–1.15)
Upper middle income	0.98 (0.80–1.20)	0.99 (0.72–1.36)	0.95 (0.72–1.24)
High income	1.04 (0.83–1.31)	1.08 (0.77–1.52)	1.00 (0.72–1.40)
Family size	0.96 (0.92–0.99)	0.90 (0.85–0.96)	1.00 (0.95–1.06)
GDP	0.97 (0.93–1.02)	1.00 (0.92–1.07)	0.96 (0.89–1.03)
Self-rated health			
Poor	1.00	1.00	1.00
Fair	1.14 (0.93–1.40)	1.01 (0.75–1.35)	1.29 (0.96–1.73)
Good	1.07 (0.91–1.26)	1.01 (0.79–1.27)	1.13 (0.90–1.41)
Chronic conditions			
Yes	0.37 (0.31–0.43)	0.37 (0.29–0.46)	0.37 (0.29–0.46)
No	1.00	1.00	1.00
Current smoking			
Yes	1.18 (0.98–1.44)	0.97 (0.73–1.29)	1.37 (1.06–1.79)
No	1.00	1.00	1.00
Regular drinking			
Yes	1.21 (0.97–1.52)	1.24 (0.89–1.74)	1.22 (0.89–1.67)
No	1.00	1.00	1.00
Primary care			
Yes	1.10 (0.95–1.27)	1.03 (0.83–1.27)	1.21 (0.98–1.48)
No	1.00	1.00	1.00

(Continued)

Table 3 (Continued).

	Full Sample Odd Ratios (95% CI)	Urban Odd Ratios (95% CI)	Rural Odd Ratios (95% CI)
General trust in physicians			
Low level trust	1.00	1.00	1.00
Medium level trust	0.71 (0.55–0.90)	0.59 (0.42–0.85)	0.81 (0.57–1.16)
High level trust	0.71 (0.56–0.89)	0.67 (0.47–0.93)	0.73 (0.52–1.03)
Provider structural quality			
Very satisfied	0.86 (0.67–1.12)	0.64 (0.42–0.97)	1.06 (0.75–1.49)
Otherwise	1.00	1.00	1.00
Provider competence			
Very good	1.00 (0.80–1.25)	1.02 (0.73–1.43)	1.00 (0.75–1.35)
Otherwise	1.00	1.00	1.00
Observations	4369	2013	2356

Note: Bold indicates statistical significance, $p < 0.05$.

medical care (OR=1.72, 95% CI: 1.28–2.31). Family size was negatively associated with medical care delay or avoidance (OR=0.96, 95% CI: 0.92–0.99). Urban residents reported a higher likelihood of delaying or avoiding medical care compared to rural residents (OR=1.25, 95% CI: 1.09–1.45). Employed adults showed a higher likelihood of delaying or avoiding medical care (OR=1.18, 95% CI: 1.01–1.38). Adults with chronic conditions were less likely to delay or avoid medical care (OR=0.37, 95% CI: 0.31–0.43). Adults who reported higher levels of trust in physicians were less likely to delay or avoid medical care (OR=0.71, 95% CI: 0.55–0.90; OR=0.71, 95% CI: 0.56–0.89). Adults who lived in the east, central, and west regions show decreased odds of delaying or avoiding medical care compared to those who lived in the northeast region (OR=0.59, 95% CI: 0.46–0.76; OR=0.47, 95% CI: 0.37–0.61; OR=0.46, 95% CI: 0.36–0.57).

Regardless of rural-urban residence, the probability of delaying or avoiding medical care decreased with age increased (OR=0.99, 95% CI: 0.98–1.00). Compared to illiterate or semi-literate adults, completion of more than three years of college showed increased odds of delaying or avoiding medical care in both rural and urban areas (OR=1.60, 95% CI: 1.07–2.40; OR=1.95, 95% CI: 1.21–3.16). Adults with chronic conditions showed a lower probability of delaying or avoiding medical care in both rural and urban areas (OR=0.37, 95% CI: 0.29–0.46; OR=0.37, 95% CI: 0.29–0.46). In both rural and urban areas, adults who lived in the east, central, and west regions were less likely to delay or avoid medical care compared to those who lived in the northeast region.

In urban areas, larger family sizes decreased the probability of delaying or avoiding medical care (OR=0.90, 95% CI: 0.85–0.96). Employed adults were more likely to delay or avoid medical care in urban areas (OR=1.29, 95% CI: 1.03–1.62). Urban adults who reported higher levels of trust in physicians had a lower probability of delaying or avoiding medical care (OR=0.59, 95% CI: 0.42–0.85; OR=0.67, 95% CI: 0.47–0.93). Urban adults who reported being very satisfied with the provider structural quality were less likely to delay or avoid medical care (OR=0.64, 95% CI: 0.42–0.97). In rural areas, adults who currently smoke tobacco products reported increased odds of delaying or avoiding medical care (OR=1.37, 95% CI: 1.06–1.79).

Discussion

The present study examined the factors associated with medical care delay or avoidance among Chinese adults during the COVID-19 pandemic. The results indicate that approximately 32% of Chinese adults delay or avoid medical care during the pandemic. Our finding is consistent with research conducted during the pandemic from both Australia (32.9%) and Hong Kong SAR (30.4%).^{41,42} There are some countries, however, where medical care delay or avoidance is relatively high (the USA (40.9%) and Portugal (44.0%)) or low (the Netherlands (20.2%) and South Korea (4.0%)).^{8,17,20,43} The delay or avoidance behavior in different countries may have been affected by varying access to medical care, health insurance coverage, health system performance, and various individual-level predisposing, enabling, and need characteristics. Since medical care delay or avoidance may increase morbidity and mortality risk and generate higher medical expenditures in the

long run, addressing the medical care delay or avoidance issue should significantly impact individuals' health outcomes and health system efficiency. Therefore, identifying the factors associated with delaying or avoiding medical care will help policymakers gain a deeper understanding of the issue of medical care delay or avoidance.

Regardless of rural-urban residence, the probability of delaying or avoiding medical care decreased with age increased during the COVID-19 pandemic. The result is consistent with other findings in the literature.^{2,11,18} The Grossman model emphasizes that people inherit an initial health stock that depreciates with age and can be increased by investment.⁴⁴ Older adults who often have complex medical needs belong to a particularly vulnerable and high-risk population.²² The complex medical needs of older adults make them particularly vulnerable and high-risk to the negative health consequences of medical care delay or avoidance.⁴⁵ Therefore, older adults seek medical care services more promptly than their younger counterparts when uncertain about their physical symptoms' severity.⁴⁶ We found that adults with chronic conditions were less likely to delay or avoid medical care during the COVID-19 pandemic. People with chronic conditions are similar to older adults and have complex care needs, especially those with multiple chronic conditions.⁴⁷ We also found that completing more than three years of college showed increased odds of delaying or avoiding medical care during the COVID-19 pandemic. This finding is in line with previous research.^{20–22} Educational attainment is an indicator of socioeconomic status (SES), and higher SES may also be associated with better knowledge about the relative quality of services offered through primary and upper levels facilities. Patients with better educational status in China prefer tertiary hospitals that represent the most advanced level of service provided in China.⁴⁸ However, long waiting times for registration to see a doctor is problematic in tertiary hospitals.⁴⁹ Moreover, the amount of outpatient registration per day has been reduced to mitigate the risk of COVID-19 spread, which leads to a longer wait time.⁵⁰

In both rural and urban areas, adults who lived in the east, central, and west regions were less likely to delay or avoid medical care compared to those who lived in the northeast region. The medical care delay or avoidance across regions may have been influenced by variations in primary healthcare center (PHC) accessibility. For example, northeastern provinces show more inequalities in PHC accessibility, while less inequalities in southwestern and south-central provinces.⁵¹ We found that urban residents reported a higher likelihood of delaying or avoiding medical care compared to rural residents. Rural residents often rely on primary care facilities in the area due to the difficulty of accessing alternative healthcare providers. Because of the "one village, one village clinic" principle in China, most village clinic doctors and villagers live in the social environment of acquaintances in the same village.⁵² Frequent contact and long-term relationships decrease the probability of delaying or avoiding medical care.⁵³ In addition, urban residents are less likely to trust physicians compared to rural residents, which may hinder access to medical care.⁵⁴ In rural areas, current smokers were more likely to delay or avoid medical care during the COVID-19 pandemic. Current smokers are more risk tolerant and may more willingly bear disease risk. A higher willingness to bear risk increases the probability of delaying or avoiding medical care.⁵⁵

In urban areas, larger family sizes decreased the probability of delaying or avoiding medical care. The bigger family sizes increase the likelihood that patients receive support from their family members. Family support plays an essential protective role in delaying or avoiding medical care.⁵⁶ Employed adults were more likely to delay or avoid medical care in urban areas. Additional paid sick leave or additional benefits during the COVID-19 pandemic is not universally available to Chinese employees. Those without paid sick leave are more likely to delay or avoid medical care.⁵⁷ Moreover, time constraints may delay employed adults from seeking medical care services.¹ Urban adults who reported higher levels of trust in physicians had a lower probability of delaying or avoiding medical care. High general trust in physicians is associated with effective physician-patient communication, higher patient satisfaction, and good continuity of care.²⁷ Moreover, patient experiences with past visits to healthcare providers are the proximate causes of trust in physicians.⁵⁴ Those factors are associated with a decreased probability of delaying or avoiding medical care. Urban adults who reported being very satisfied with the provider structural quality were less likely to delay or avoid medical care. This result is not unexpected - high provider structural quality is associated with lower organizational barriers such as adequacy of facilities, qualifications of physicians, and convenient transportation.

Policymakers can help improve the utilization of health facilities and patient health outcomes by implementing a series of reforms. This study has identified several factors affecting medical care delay or avoidance, some of which are amenable to policy changes. First, more providers and resources should be offered to meet the vulnerable and high-risk population's needs for medical care services. Second, the Chinese government may consider improving the quality of primary care and referral

systems in community health centers to attract educated people. Third, primary care should deliver screening programs to rural smokers. Fourth, night and holiday medical care services should be provided to employed persons. Last, the Chinese government should focus on the physician-patient relationship performance and improve general trust in physicians.

Limitations

Even though the present study employed a national survey to analyze factors affecting delay or avoidance behavior among Chinese adults during the COVID-19 pandemic, several limitations should be mentioned. First, this was a cross-sectional study based on the 2020 CFPS. It has limitations in proving causality that could use longitudinal study designs. Second, medical care delay or avoidance is a single-item self-report medical care utilization question, and there are no follow-up questions to understand the reasons of medical care delay or avoidance. Third, limitations of all self-reported data exist, such as recall bias and unreliability of responses under pressure. Last, the current study excluded adults with the severity of self-reported physical symptoms as mild and only concerned with severe cases and emergency situations. Further studies should be performed to extend a general model of all patients.

Conclusion

This study aimed to identify factors associated with medical care delay or avoidance among Chinese adults during the COVID-19 pandemic. The results indicate that approximately 32% of Chinese adults delay or avoid medical care during the COVID-19 pandemic. Moreover, urban residents reported a higher likelihood of delaying or avoiding medical care than rural residents. The empirical findings suggested that regardless of rural-urban residence, older adults and adults with chronic conditions were less likely to delay or avoid medical care during the pandemic. However, completing more than three years of college showed increased odds of delaying or avoiding medical care. In urban areas, larger family sizes, high general trust in physicians, and high provider structural quality decreased the probability of delaying or avoiding medical care during the pandemic. In contrast, employed adults were more likely to delay or avoid medical care. In rural areas, current smokers were more likely to delay or avoid medical care during the pandemic. These results can be used to design policy reforms to improve the utilization of health facilities and patient health outcomes.

Ethics Approval

Ethical approval was issued by the Peking University Biomedical Ethics Review Committee (IRB00001052-14010), and all respondents signed an informed consent form before the study was initiated. The study was conducted in accordance with the regulations and ethics followed in compliance with the Declaration of Helsinki.

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Disclosure

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