

Health Inequalities of Intra-Family Expertise Accessibility: Evidence From China

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Research

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Abstract

Objectives

To investigate whether unequal exposure to health-related expertise of intra-family is the root of health inequality in China, and to explore the underlying mechanisms through which health-related expertise shapes health outcome.

Methods

In a representative sample of Chinese adults ages over 18 from the 2017 Chinese General Social Survey (CGSS) (n = 3,047 respondents), we use multiple linear regression model and the two-stage least-squares model to analyze the correlation between health-related expertise of intra-family and self-rated health.

Results

The presence of a health professional (HP) in the family is associated with better self-rated health (SRH), and the effect is more important in rural areas than urban areas. An increased chance of exercising appears to explain a part of the association between HP and SRH.

Discussions

Health professionals doing for their family members would have the potential to make a substantial dent in population health and reduce health inequality. Future work will need to understand the patterns of intra-family expertise in health (and other) domains, and the potential replicability of this transmission by public policies.

Introduction

There is a widespread belief that the deficiency in health information and medical knowledge is the main barrier to achieving high-quality health outcomes, have been observed in many countries (Frakes, Gruber, & Jena, 2020). Health-related expertise knowledge is key for people to change the stages of behaviors: pre-contemplation, contemplation, preparation, action, maintenance and termination (Eibich & Goldzahl, 2020; Prochaska & Velicer, 1997). The stage from pre-contemplation to contemplation is the most important in part, because an individual evolves from being uninformed or underinformed about health behavior to intend to change behavior, prove awareness and balance the pros and cons of health behaviors. For example, information disseminated by screening programs leads to an increase in various testing (Callaghan, Eves, Norman, Chang, & Lung, 2011; Spencer, Pagell, & Adams, 2005).

There may be two ways to obtain health-related expertise by others, one is by formal health services (e.g., hospitals, private clinics, and home care center), and the other is by non-informal health information provision (e.g., family and friends). Compared to the high cost and inaccessibility of formal health services, informal health information provision providing by family and friends has no additional cost and is particularly important for determining individual's behaviors. People are bound to their family and friends, therefore, fundamentally affected by them (Fadlon & Nielsen, 2019). Similarly, a lifetime of interaction with family and friends could be a role in forming health behaviors, via health-related expertise information, awareness, and the creation of habits and norms. Fadlon and Nielsen (2019) found that spouses and adult children would increase their consumption of preventive, when a family member suddenly has a health shock (Fadlon & Nielsen, 2019); Female physicians are less likely to receive a C-section when they themselves give birth, suggesting that their expertise on the health costs of this procedure affects their own health care consumption (Johnson & Rehavi, 2016); Chen et al., (2019) found that exposure to family expertise raises preventive health investments throughout the lifecycle, improves physical health, and prolongs life by using rich administrative data in Sweden (Chen, Persson, & Polyakova, 2019).

Within 95% of China's health insurance and health care services coverage ("National Medical Insurance Administration of China," 2019), there are still significant mortality and morbidity across gender, ages and conditions (Ji et al., 2019). This fact motivates us to examine informal health information provision other than access to formal healthcare that may perpetuate health inequality. First, we aim to investigate whether unequal exposure to health-related expertise of intra-family is the root of health inequality in China, and whether differences in such exposure across the household registration system (*hukou*) contributes to health difference. Furthermore, we quantify the potential underlying mechanisms through which health-related expertise shapes health outcome.

Data And Method

Data

The Chinese General Social Survey (CGSS) is an annual cross-sectional survey of Chinese households that began in 2003 and included about 10,000 households, which is a national and continuous largescale social survey (Bian & Li, 2012). The CGSS collected detailed demographic background, socioeconomic information, health status and functioning, and social identity, aiming at reflecting the transition of economics, politics, society, and culture in China.

Our sample was come from CGSS2017, because it collected reliable social network information^[1], allowing us to estimate the effect of health-related expertise accessibility on self-rated health among CGSS respondents. We restricted respondents over the age of 18 with valid health information and social network information. Combined with those respondents who also provided detailed sociodemographic information, our final analytic sample comprises 3,047 individuals, including 1,484 men and 1,563 women, respectively. Characteristics of the sample are summarized in Table 1.

Measurement

Health Outcome

A single item self-rated health (SRH) measure with five response categories was used in the CGSS. Respondents were asked 'In general, would you say your health is excellent, very good, good, fair or poor?' We coded this variable as 1 = poor, 2 = fair, 3 = good, 4 = very good and 5 = excellent.

Intra-family Expertise Accessibility

We are interested in whether unequal exposure to health-related expertise affects individuals' health outcomes. We use the presence of a health professional in the family to measure intra-family expertise accessibility. It is reasonable to think that family members and friends of a health professional have greater access to such expertise in daily informal communication, which in turn may improve their own health knowledge, change health behavior and thereby improve their health outcomes. HP is a binary variable based on a question: "Do you know anyone who works as a nurse?" and there are 5 options, which are "family or relative, close friends, someone else, no one, and can't chose.(Sapin, Joye, & Wolf, 2020)" We coded this variable as 1 = family or relative or close friends, 0 = someone else or no one.

Mechanism variables

Exposure to expertise may affect individuals through multiple mechanisms. For example, they can transmit health knowledge about the costs and benefits of healthy behaviors and health investments, improving the assessment of the marginal efficiency of health care consumption and prevention (L. Chen, Fan, & Chu, 2020; Y. Chen, Persson, & Polyakova, 2019; Eibich & Goldzahl, 2020); On the other hand, they can remind, nudge or corroborate existing knowledge, enable individuals to better internalize the new health information in their decision making process and guide them to seek formal care and improve their health.

According to the question in the survey, we test two potential mechanism variables in total: taking exercise and having relax regularly. The two variables were based on the two questions "do you take exercise regularly?" and "do you have relax regularly". We coded these two variables as 1 = never, 2 = less, 3 = average, 4 = often and 5 = very often, respectively.

Control variables

Regression analyses adjust for sociodemographic characteristics that are associated with self-rated health (Grossman, 1972; Kino, Jang, Takahashi, Ebner, & Kawachi, 2020; Mikkonen, Remes, Moustgaard, & Martikainen, 2020; Vonneilich, Ludecke, & von dem Knesebeck, 2019), including sex (male versus female), age, age-squared, *hukou* (rural *hukou* vs urban *hukou*), and *minzu* (*han* vs minority). We also control for individual's educational attainment (continuous variables), income level (we took the natural log of self-reports of personal income last year) and spouse's educational attainment (continuous variables), which relates to individual's health outcomes. Additional control variables reflect formal health

services accessibility that could be associated with self-rated health. These include whether or not participate in endowment insurance (yes vs no) and medical insurance (yes vs no).

Analytic Strategy

Stata 15.0 was used to analyze the impact of health-related expertise accessibility on the health outcome in China. First, self-rated health was regressed on the presence of a health professional in the family, controlling for sex, age, age square, *minzu*, *hukou*, educational attainment, spouse's educational attainment, endowment insurance, and medical insurance. Second, two-stage least-squares model was used to resolve the endogenous problems of health-related expertise accessibility and health outcome.

It seems plausible that the effect of health-related expertise differs by *hukou*. For example, the household registration (*hukou*) system divided China into two separated societies, with the majority of the population confined in the rural areas and entitled to have fewer chance to access to health resources compared with urban residents. To investigate differences in the explanatory contribution by *hukou*, we conducted separate heterogeneity analyses by groups.

To further investigate the potential mechanisms linking health-related expertise accessibility to respondent's self-rated health, we conduct Sobel-Goodman mediation tests (Sobel, 1982), which assess whether the inclusion of mechanisms variables to the baseline model explains a significant amount of the relationship between health-related expertise and health outcome in China.

Footnote:

[1] A third of the subsample was randomly selected from full sample over 10,000 respondents and asked for detailed social network information, leading to smaller sample size for our analysis.

Results

Descriptive Statistics

Table 1 presents descriptive statistics for all variables by the presence of a health professional in the family. Respondents having a health professional in the family, report a better SRH ($Mean = 3.18$ $SD = 1.21$) than their counterparts. Compared with those having no health professional in family, respondents having a health professional in the family are more likely to be young age, rural *hukou*. Moreover, respondents having a health professional in the family have slightly more years of education and higher income level, but have no difference by formal health services accessibility, like participating in endowment insurance and medical insurance.

Table 1
Characteristics of variables by HP

Variable	The presence of a health professional in the family				P value
	HP = 1		HP = 0		
	Mean	SD	Mean	SD	
SRH	3.18	1.21	2.78	1.22	< .01
Male	0.47	0.50	0.49	0.50	0.24
Age	46.71	14.63	53.61	13.90	< .01
Han	0.94	0.24	0.92	0.27	0.10
Rural <i>Hukou</i>	0.55	0.50	0.68	0.47	< .01
Educational level	10.67	4.12	8.37	4.43	< .01
Income Level	9.17	3.53	8.28	3.75	< .01
Spouse's Educational level	10.51	4.27	8.21	4.43	< .01
Medical insurance	0.92	0.27	0.93	0.25	0.29
Endowment insurance	0.75	0.43	0.74	0.44	0.58
N	868		2179		

The Effect of the Presence of a Health Professional in the Family on SRH

As is shown in Table 2, the presence of a health professional in the family has a positive and significant effect ($\beta = 0.127$, $p = 0.008$) on SRH, that is, unequal exposure to health-related expertise is an underlying causal mechanism that contributes to better self-rated health. This effect is robust to several changes of the model specification, e.g., controlling for additional sociodemographic characteristics (sex, age, age square, *hukou*, *minzu*, educational attainment, income level, spouse's educational attainment), health insurance (endowment insurance and medical insurance).

Compared with female, male ($\beta = 0.127$, $p = 0.005$) had a higher self-rated health. The age effect shows that self-rated health decreases first and then increases with age, following a U-shaped curve over age. In addition, individual and spouse's educational status and self-rated health showed a positive and significant association: individual's higher educational level ($\beta = 0.023$, $p = 0.000$) and spouse's higher educational level ($\beta = 0.018$, $p = 0.006$) were associated with reporting better self-rated health, respectively. Further, individual with a higher income ($\beta = 0.028$, $p = 0.001$) had a better self-rated health outcome. In contrast, having health insurance was associated with higher self-rated health outcome, but not significantly. This revealed the importance role of informal health accessibility other than social insurance and formal access to healthcare in sustaining health inequality in China.

Table 2 Associations of the presence of a health professional in the family with SRH (N = 3,047)

Variables	β	<i>SE</i>	<i>t</i>	<i>p</i>	95% CI	
HP	0.127	0.048	2.630	0.008	0.032	0.221
Male	0.127	0.045	2.800	0.005	0.038	0.216
Age	-0.041	0.009	-4.280	0.000	-0.059	-0.022
Age^2	0.000	0.000	2.120	0.034	0.000	0.000
Rural <i>Hukou</i>	-0.008	0.053	-0.140	0.885	-0.111	0.096
<i>Han</i>	0.024	0.080	0.300	0.761	-0.133	0.182
Educational attainment	0.023	0.007	3.440	0.001	0.010	0.037
Income level	0.028	0.006	4.520	0.000	0.016	0.040
Spouse's Educational attainment	0.018	0.007	2.730	0.006	0.005	0.031
Endowment insurance	0.007	0.086	0.090	0.932	-0.160	0.175
Medical insurance	0.069	0.052	1.310	0.190	-0.034	0.171

Robustness Test

In the above benchmark model, it is likely the key explanatory variable the presence of a health professional in the family is endogenous, leading to potential bias in the estimation. Theoretically, the endogeneity may arise due to three reasons: (1) omitted variables affecting key explanatory variable and self-rated health; (2) reverse causality between the presence of a health professional in the family and self-rated health; (3) measurement error in individuals' reported health variables (Eriksson, Pan, & Qin, 2014; Y. Liu, Duan, & Xu, 2020). In our model, it is not likely that (3) will be the case, as the self-rated health does not usually suffer from substantial recalling errors. Thus, possible endogeneity would most likely arise from unobserved factors and reverse causality.

We used the instrumental variable method to resolve the endogenous problems. A valid instrumental variable must satisfy two conditions: (1) Correlation, where the instrumental variable is related to the informal health accessibility; (2) Independence, where the instrumental variable is not related to the error term (the random error that affects self-rated health). We selected "number of contacts per day" as instrumental variables. The motivations are as follows. First, there is a strong correlation of social network and social resources, particularly in developing countries. In general, the more people an individual has access to, the more likely it is to have exposure to health-related expertise. Second, the number of contacts per day should (arguably) not directly impact the individual's self-rated health, because it is unlikely to be correlated with the unobserved individual's heterogeneity (such as genetic formation).

Table 3 shows the regression results using the instrumental variables. The regression results of the first stage show that number of contacts per day significantly increase the likelihood of people espouse to health-related expertise controlling for other characteristics ($\beta = 0.027, p = 0.000$). After dealing with the endogenous problems of informal health accessibility and self-rated health, it was found that informal health accessibility still had a larger positive effect on their self-rated health ($\beta = 2.627, p = 0.007$), comparing to the previous result.

Table 3
Instrumental variable regression results

Variables	β	SE	t	p	95% CI	
First stage						
Male	-0.023	0.018	-1.270	0.203	-0.058	0.012
Age	-0.020	0.004	-5.110	0.000	-0.027	-0.012
Age^2	0.000	0.000	4.070	0.000	0.000	0.000
<i>Hukou</i>	-0.039	0.021	-1.860	0.063	-0.081	0.002
<i>Minzu</i>	0.030	0.029	1.060	0.289	-0.026	0.087
Educational attainment	0.008	0.002	3.290	0.001	0.003	0.013
Spouse's Educational attainment	0.007	0.002	2.680	0.007	0.002	0.011
Income level	0.005	0.002	1.940	0.053	0.000	0.009
Endowment insurance	-0.053	0.035	-1.540	0.123	-0.121	0.014
Medical insurance	0.018	0.020	0.940	0.349	-0.020	0.057
Number of contacts per day	0.027	0.007	3.680	0.000	0.013	0.042
Second stage						
HP	2.627	0.973	2.700	0.007	0.720	4.534
Male	0.197	0.066	2.960	0.003	0.066	0.327
Age	0.009	0.024	0.370	0.710	-0.038	0.055
Age^2	0.000	0.000	-0.880	0.377	-0.001	0.000
<i>Hukou</i>	0.095	0.083	1.140	0.253	-0.068	0.259
<i>Minzu</i>	-0.008	0.126	-0.070	0.947	-0.256	0.239
Educational attainment	-0.001	0.013	-0.050	0.956	-0.026	0.024
Spouse's Educational attainment	0.000	0.012	-0.020	0.981	-0.023	0.023
Income level	0.012	0.010	1.200	0.228	-0.008	0.032
Endowment insurance	0.135	0.140	0.970	0.334	-0.139	0.409
Medical insurance	0.013	0.076	0.170	0.866	-0.137	0.162
Observations	2,949					
1st stage F/P value	13.561/ 0.000					

Heterogeneity by Hukou

In China, the preferential treatment of urban areas, which among other things implies different health care systems for urban and rural residents, led to increasing gap in health care and health status between urban and rural sectors (Eriksson et al., 2014; Yuanli Liu, Hsiao, Eggleston, & medicine, 1999). Meanwhile, the residential registration regime (*hukou*), which restricts internal migration from countryside to urban cities, also tends to exacerbate the health disparity (Gao, Tang, Tolhurst, Rao, & Planning, 2001; Yuanli Liu et al., 1999). The persistent urban–rural inequality in health raises concerns regarding the already segregated and unbalanced development paths between the two sectors. Thus, it is important to examine the role of health-related expertise in accounting for the health inequality, justifying separate analyses on urban and rural populations.

These results indicate that exposure to health-related expertise can have differing effects for urban and rural residents, and might therefore contribute differently to the explanation of self-rated health inequalities. Specifically, among rural *hukou*, exposure to health-related expertise has a positive and significant effect ($\beta = 2.253$) on health outcome, while the coefficient of urban *hukou* is not significant. Taken together, Table 4 shows that the more importance of health-related expertise as a key explanatory factor in rural areas.

Table 4
Heterogeneity analysis by *hukou*

	Rural hukou	Urban hukou
HP	2.523 ^{***}	3.622
	(3.105)	(0.496)
Male	0.191 ^{**}	0.248
	(2.348)	(1.020)
Age	0.020	0.008
	(0.704)	(0.090)
Age^2	-0.000	-0.000
	(-1.210)	(-0.167)
Minzu	-0.076	0.209
	(-0.530)	(0.716)
Educational attainment	-0.010	0.021
	(-0.625)	(0.888)
Spouse's Educational attainment	0.007	-0.026
	(0.576)	(-0.424)
Income level	0.011	0.020
	(0.913)	(0.809)
Endowment insurance	0.051	0.449
	(0.364)	(0.527)
Medical insurance	0.091	-0.316
	(1.143)	(-0.429)
<i>N</i>	1895	1054
<i>Note: t statistics in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01</i>		

Potential Mediating Pathways

We turn to examining underlying mechanisms through which engagement in health-related expertise shapes respondent's self-rated health. Before a formal test of mediation, we examine whether health-related expertise is associated with proposed mechanism variables. Columns 1 and 3 of Table 5 presents the associations between health-related expertise and the two mechanism variables. Consistent with

earlier studies, results show that health-related expertise is associated with the mechanism variables of healthy behavior in the expected directions. Furthermore, Columns 2 and 4 present results for the mechanisms linking health-related expertise to self-rated health,

suggesting that taking exerciser regularly is important mediator connecting HP to SRH, while having relax is not a valid mechanism variable.

Table 5
Mechanism analysis

	Taking exercise	SRH	Having relax	SRH
HP	3.148 ^{***}	2.462 ^{**}	1.040 [*]	2.592 ^{***}
	(2.594)	(2.498)	(1.794)	(2.638)
Male	0.086	0.190 ^{***}	0.026	0.196 ^{***}
	(1.041)	(2.945)	(0.646)	(2.958)
Age	0.085 ^{***}	0.004	0.011	0.008
	(2.927)	(0.182)	(0.803)	(0.356)
Age^2	-0.001 ^{**}	-0.000	0.000	-0.000
	(-2.327)	(-0.735)	(0.569)	(-0.903)
Rural <i>Hukou</i>	-0.328 ^{***}	0.111	-0.109 ^{**}	0.099
	(-3.063)	(1.415)	(-2.149)	(1.206)
Han	0.053	-0.009	-0.196 ^{***}	-0.002
	(0.396)	(-0.074)	(-2.629)	(-0.012)
Educational attainment	0.034 ^{**}	-0.002	0.002	-0.001
	(2.161)	(-0.195)	(0.203)	(-0.059)
Spouse's Educational attainment	0.026 [*]	-0.001	0.003	-0.000
	(1.780)	(-0.117)	(0.402)	(-0.033)
Income level	0.001	0.013	-0.014 ^{**}	0.013
	(0.052)	(1.293)	(-2.160)	(1.245)
Medical insurance	0.230	0.124	0.043	0.134
	(1.330)	(0.909)	(0.527)	(0.963)
Endowment insurance	0.051	0.013	-0.024	0.014
	(0.537)	(0.173)	(-0.502)	(0.180)
Taking exercising		0.047 [*]		
		(1.829)		

Note: *t* statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	Taking exercise	SRH	Having relax	SRH
Having relax				0.034
				(0.953)
<i>N</i>	2947	2947	2949	2949
<i>Note: t statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$</i>				

Discussion

Growing evidence across various disciplines reveals stark correlations between formal access to healthcare throughout the course of life and health outcome. Although China is becoming a universal formal access to healthcare and a well-developed social safety net, mortality and morbidity across a range of ages and conditions still persist. Hence, identifying informal access to health care that affect health outcome is of a great public health concern to improve overall population health and reduce health inequalities. This study examined the association between informal health accessibility and self-rated health status and their underlying mechanisms in China.

We find that exposure to health-related expertise in a family is associated with better self-rated health outcomes. To examine whether the association between health-related expertise and health outcome was confounded by unobserved family background and reverse causality, we estimated models with instrument variable. The estimated result of the instrumental variable documents a robust association between health-related expertise and self-rated health, and the estimate effect of health-related expertise in a family increased. In general, these findings build on previous studies about the roots of health inequality.

In addition, consistent with previous research on rural-urban differences, our results reveal the effect of health-related expertise differs by *hukou* status. Health-related expertise is even more important in rural areas than urban areas. Furthermore, we also apply mediation analysis to uncover the mechanisms connecting health-related expertise to health outcome. Our results suggest that an increased chance of exercising appears to explain a part of the association between health-related expertise and self-rated health.

Yet, the findings should also be considered in light of several limitations. First, this study used cross-sectional survey data from 2017 and cannot identify a causal relationship between health-related expertise and self-rated health outcome in China, even we use the instrument variable. Second, self-rated health is easily measured and has been shown to be a stable predictor of subsequent mortality in different populations (Bopp et al., 2012). However, the use of self-rated health can be influenced by cultural or mood backgrounds. Moreover, it might not be very sensitive to variation in health especially in younger age groups. Third, compared to the main models, the elaborated model of mediation analyses is less rigorous and insufficient informed from a causal point of view.

Despite these limitations, the results of this study offer information that may influence public policy. As the first study to examine the effect of informal health accessibility in China, distinguishing the different effects of urban and rural exposure to the health-related expertise, our study adds new empirical evidence to the literature on the origin's health inequality. With the improvement of the access to formal health resources, such as medical and health service system and social endowment insurance, policy-makers and practitioners should take a more holistic and multifaceted approach to know about the important influence of non-institutional health resources on individual health, instead of solely emphasizing the importance of institutional resource acquisition as their strategy. A public health policy that should be able to "mimic" what health professionals do for their family members would have the potential to make a substantial dent in population health and reduce health inequality. In light of the intra-family transmission of Covid-19, understanding the patterns of intra-family expertise in health (and other) domains, and the potential replicability of this transmission by public policies, remains an important area for current and future work.

Conclusion

The presence of a health professional (HP) in the family is associated with better self-rated health (SRH), and the effect is more important in rural areas than urban areas. Health professionals doing for their family members would have the potential to make a substantial dent in population health and reduce health inequality. Future work will need to understand the patterns of intra-family expertise in health (and other) domains, and the potential replicability of this transmission by public policies.

Declarations

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Authors' contributions

Dh X and Jw W developed the study design. Dh X was responsible for data management, statistical analysis and drafting of this paper. Jw W provided critical knowledge in drafting of the paper. All authors read and approved final manuscript.

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Availability of data and materials

The datasets generated and/or analyzed during the study are publicly available.

<http://cgss.ruc.edu.cn/index.htm>

Ethics approval and consent to participate

The original CGSS was approved by the Ethical Review Committee of Renmin University of China, and all participants signed informed consent forms.

Consent for publication

All authors agree to publish.

Competing interests

The authors have declared that no competing interests exist.

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