Healthcare Accessibility and Medical Expenditure: Evidence from Rural China

Yue Yang Liu Jingfang

Xiamen University

July 3, 2025

Overview

Introduction

Unequal Distribution of Healthcare Resources Between Urban and Rural Areas:

- China's healthcare system has expanded rapidly in recent years (Li Fu, 2017; Lancet, 2019), but **urban-rural disparities remain significant** (Yip et al., 2012; Meng et al., 2019).
- Rural areas face persistent shortages of medical resources (Li et al., 2017; Sun et al., 2021):
  - Insufficient healthcare facilities
  - Fewer qualified medical professionals
  - Poor accessibility to basic services
- Inadequate access to healthcare can lead to (Yu et al., 2020; Zhang et al., 2023):
  - Delayed treatment
  - Increased health risks
  - Higher medical expenditure

Research Question:

- Do rural residents face higher medical costs due to limited access to healthcare services?

Introduction

Empirical Challenges:

- Existing studies mainly focus on **urban populations or national-level data**, with limited attention to rural dynamics over time (Li et al., 2019; Xiong et al., 2012).
- There is a lack of **long-term, micro-level empirical evidence** on how healthcare accessibility affects rural medical expenditure(Yu et al., 2020).

This study utilizes panel data from the China Rural Fixed Observation Point System (2009–2017)—

- Covers 356 rural sites, 20,745 households, and 488,234 individual records.
- Offers rich and continuous data on income, health, and medical use.

Objective:

- Investigate how accessibility to healthcare resources influences the medical spending of rural residents.

Key Empirical Findings

1. **Significant negative correlation** between distance to medical institutions and medical expenditure: A 1% increase in distance leads to a 0.1–0.3% decrease in average medical spending.
2. **Heterogeneity analysis:** The suppressing effect of distance is more pronounced among:
   - Suburban residents
   - Individuals with poor health
   - Low-income households
3. **Mechanism analysis:** Greater distance reduces the frequency of doctor visits and total treatment costs, which ultimately lowers medical expenditure.
4. **Extended result:** Increased distance to healthcare facilities also has a **significant negative impact on long-term health status**.

Data & Variables

China Rural Fixed Observation Point System (2009–2017)

- Covers **356 rural observation points**, **20,745 households**, and **488,234 individual-level records**.
- Provides panel data on: Household income and expenditure

Amap Point-of-Interest (POI) Data

- *Healthcare facilities:* Tertiary Grade-A hospitalsPrimary healthcare institutions (village clinics, outpatient clinics)
- *Government institutions:* Sub-township, township, prefecture, provincial, and national levels

Linkage: Datasets are matched geographically to measure healthcare resource accessibility.

Research Design

Empirical Specification:

$$Outcome_{ihct} = \alpha + \beta\, dist_{ct} + X'_{ict}\delta + \mu_i + \gamma_t + \varepsilon_{ict} \tag{1}$$

Where:

- y_{ihct}: Average medical expenditure of individual i in household h, in county c, year t.
- β: Measures the effect of distance to healthcare facilities on medical expenditure
- $dist_{ct}$: Distance from village c to the nearest healthcare facility in year t
- X_{ict}: Vector of control variables at the individual and household level.
- μ_i: Individual fixed effects
- γ_t: Year fixed effects
- Standard errors are clustered at the villiage level.

Two-Stage Regression Model

First Stage:

$$Z_{ct} = \alpha + \beta\, dist_{ct} + X'_{ict}\delta + \mu_c + \gamma_t + \varepsilon_{ict}$$

Second Stage:

$$y_{ihct} = \lambda_0 + \lambda_1 \widehat{Z}_{ct} + X'_{ict}\delta + \mu_c + \gamma_t + \nu_{ict}$$

- y_{ihct}: Average medical expenditure of individual i in household h, county c, year t
- $dist_{ct}$: Distance from village c to the nearest tertiary hospital
- Z_{ct}: Distance to the nearest actual healthcare facility
- $\widehat{Z}_{ct}$: Predicted value of Z_{ct} from the first stage (instrumented)
- X_{ict}: Vector of control variables (e.g., income, household size, health status)
- μ_c, γ_t: County and year fixed effects
- ε_{ict}, ν_{ict}: Error terms

Basic Outcomes

VARIABLES	(1)	(2)	(3)	(4)
		Avg. Medical Cost		
log_tertiary	**-0.147****	**-0.150****	**-0.146****	**-0.147****
	(0.0589)	**(0.0587)**	**(0.0553)**	**(0.0557)**
Household-level characteristics (e.g., gender, income, land, labor)	Y	Y	Y	Y
Controls for topographic features (e.g., terrain type, urban/suburban classification)	N	Y	Y	Y
Controls for county-level characteristics (e.g., gov. seat, economic dev.)	N	N	Y	Y
Controls for village-level demographics & economy	N	N	N	Y
Constant	2.325***	2.022***	2.237***	2.082***
	(0.556)	(0.645)	(0.522)	(0.564)
Observations	488,234	485,494	485,494	485,494
R-squared	0.014	0.014	0.015	0.016
Number of individual_id	89,931	89,820	89,820	89,820
Age Group	Y	Y	Y	Y
Health Status	Y	Y	Y	Y
Primary Income Source	Y	Y	Y	Y
Primary Household Occupation	Y	Y	Y	Y
Occupation	Y	Y	Y	Y
Individual Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

2SLS Outcomes

| VARIABLES	Tertiary Grade-A Hospital	Primary Healthcare
	Avg. Medical Cost	
log_distance	-0.390***	-0.414***
	(0.0486)	(0.0517)
Household-level characteristics (e.g., gender, income, land, labor)	Y	Y
Controls for topographic features (e.g., terrain type, urban/suburban classification)	Y	Y
Controls for county-level characteristics (e.g., gov. seat, economic dev.)	Y	Y
Controls for village-level demographics & economy	Y	Y
Other control varibles	Y	Y
Observations	477,842	477,842
R-squared	0.014	0.013
Number of individual_id	82,168	82,168
Age Group	Y	Y
Health Status	Y	Y
Individual Fixed Effects	Y	Y
Time Fixed Effects	Y	Y

Does Distance to Healthcare Affect Medical Visit Decisions?

VARIABLES	(1)	(2)
	Medical Visit (Yes/No)	
log_tertiary	-0.0307**	
	(0.0114)	
log_primary		-0.0263**
		(0.0114)
Constant	0.403***	0.374***
	(0.115)	(0.113)
Other control varibles	Y	Y
Observations	485,494	485,494
R-squared	0.012	0.011
Number of individual_id	89,820	89,820
Age Group	Y	Y
Health Status	Y	Y
Individual Fixed Effects	Y	Y
Time Fixed Effects	Y	Y

Suburban vs. Rural

VARIABLES	2SLS Suburban Area	2SLS Rural Area
log_tertiary	-12.55**	-0.416***
	(5.840)	(0.0494)
Other control varibles	Y	Y
Observations	85,020	388,253
R-squared	-3.902	0.013
Number of individual_id	18,140	67,924
Age Group	Y	Y
Health Status	Y	Y
Individual Fixed Effects	Y	Y
Time Fixed Effects	Y	Y

Heterogeneity Analysis
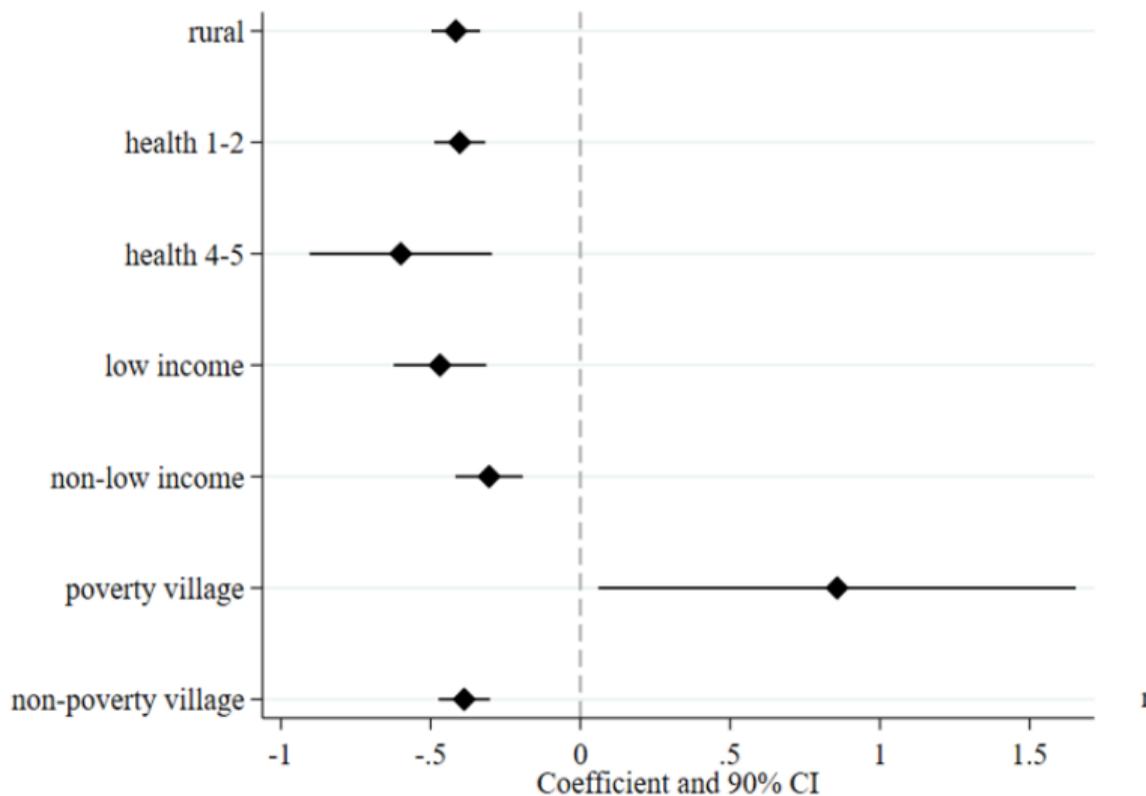
Health Status Change in the Past Year

	(1)	(2)
VARIABLES	Health Status Change in the Past Year	
log_tertiary	0.0393***	
	(0.0117)	
log_primary		0.0448***
		(0.0134)
Other control varibles	Y	Y
Observations	388,751	388,751
R-squared	0.043	0.043
Number of individual_id	74,703	74,703
Age Group	Y	Y
Health Status	Y	Y
Individual Fixed Effects	Y	Y
Time Fixed Effects	Y	Y

Robustness Checks

VARIABLES	Tertiary Grade-A Hospital	Primary Healthcare Institution Avg. Medical Cost	Healthcare Facility
log_tertiary	-0.390*** -0.0486		
log_primary		-0.414*** -0.0517	
log_medical			-0.390*** (0.0486)
Household-level characteristics (e.g., gender, income, land, labor)	Y	Y	Y
Controls for topographic features (e.g., terrain type, urban/suburban classification)	Y	Y	Y
Controls for county-level characteristics (e.g., gov. seat, economic dev.)	Y	Y	Y
Controls for village-level demographics & economy	Y	Y	Y
other control varibles	Y	Y	Y
Observations	477,842	477,842	477,842
R-squared	0.014	0.013	0.014
Number of individual_id	82,168	82,168	82,168
Age Group	Y	Y	Y
Health Status	Y	Y	Y
Individual Fixed Effects	Y	Y	Y
Time Fixed Effects	Y	Y	Y

Conclusion

- Limited accessibility to healthcare significantly reduces medical utilization and expenditures in rural areas.
- Vulnerable populations—such as the poor, the unhealthy, and those in suburban areas—are disproportionately affected by distance barriers.
- While reduced expenditure may appear favorable, it actually reflects **underutilization of necessary medical care**, potentially leading to worse long-term health outcomes.
- Improving healthcare accessibility is essential for promoting **health equity and long-term welfare** in rural China.

Thank You!