Proceedings of ICMRED 2025 Symposium: Effective Communication as a Powerful Management Tool
DOI: 10.54254/2754-1169/2025.BL24170

The Influence of Different Economic Development Levels on Unequal Allocation of Medical Resources: A Case Study of China

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Abstract: China has been a case study of economic success based on recent rapid economic growth, which, according to the GIS mapping data, has shown huge disparities in the regional development of healthcare facilities. The eastern coastal regions disproportionally share the benefit of the developments, while the western and central regions remain relatively underserved. This study proposes to investigate the dynamics influencing this relationship as they affect the availability of specialty professionals, hospital bed capacity, and state-of-the-art diagnostic equipment. The study uses national health statistics and peer-reviewed studies in a mixed-method approach to undertake a correlation analysis and make sense of the data. The study will rely on source materials using a literature review to understand what drives investment in healthcare resources and how to overcome barriers creating unequal access to healthcare resources. The study also intends to use the results to inform on strategies that could be adopted in these unique circumstances for China as a case study for improved infrastructure balance and equitable access to healthcare.

Keywords: Economic development level, Allocation of medical resources, Regional differences, Chinese case, Mixed research method.

1. Introduction

China is one of the most geographically large countries and home to over 1.4 billion people, making it one of the most populous nations worldwide. The country has experienced enormous economic progress, which has caused it to become one of the world's most industrialized and advanced societies. However, there are visible economic divides between the coastal eastern regions and the inland areas in the central and western regions. Therefore, the country demonstrates various attributes of a mature economy, such as a high urban population, especially on the eastern coast, where most cities are located**.** The demand for medical resources in these regions has caused disproportionate investment during the rapid economic transformation, whereby most advanced medical facilities and, by logic, most healthcare specialists opt to practice in this region. The socioeconomic disparities between futuristic eastern cities and rural-urban central and western regions cause a domino effect[1]. Since citizens from the western regions lack immediate access to world-class healthcare facilities and top-tier medical specialists enjoyed by the eastern parts, they prefer to travel to developed provinces to

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DOI: 10.54254/2754-1169/2025.BL24170

meet their clinical care needs, overwhelming healthcare facilities in wealthier regions. In contrast, facilities in western areas remain underutilized, further expounding the region's economic imbalances.

The demand for healthcare resources in the People's Republic of China is high due to the high citizen population and ever-growing demand for healthcare services. However, The coastal cities such as Shanghai, Hangzhou, Nanjing, Wenzhou, Fuzhou, and Beijing are disproportionately funded in the nation's national budget, helping them secure state-of-the-art medical resources while also attracting higher healthcare investment. Conversely, the central and western regions, especially in the rural setups, lack the same socioeconomic dynamics and influence on government investment and attracting investment in the healthcare sector, causing the underdeveloped regions to be left behind[1]. The economic inequalities create a chain reaction of imbalances in healthcare in that rural populations lack access to medical services that help in disease prevention, hence negatively impacting the life expectancy and stability of the social fabric due to higher poverty degree[2]. This research proposal explores the impact of different economic development levels and the underlying causes that increase unequal healthcare distribution in China. The paper also evaluates the socioeconomic disparities and identifies strategies to tackle the using mixed methods, from government efforts in promoting equitable healthcare access to supporting long-term socioeconomic development of all regions in the country.

2. Research questions

The critical challenge of unequal economic development demands focused investigation to address medical resource allocation, leading to the main questions of this study:

i. What influence do differing economic levels have on medical resource allocation in the People's Republic of China?
ii. How impactful is GDP per capita in the prediction of medical resource density in a region?
iii. Considering MRI machine allocation as a case example, what is their special pattern across the different provinces?

3. Literature review

3.1. The current situation of unequal distribution of medical resources

One of the United Nations' major objectives by 2030 involves ensuring equitable access to healthcare services to promote the well-being of all, irrespective of region, and thus guarantee global access to high-quality healthcare. China, however, has shown a pattern of accelerated urbanization in some regions, which causes high population density in these areas, therefore attracting higher investment in healthcare resources[3]. The prevalence of rural-urban migration creates obstacles around offering equitable and efficient health resource allocation, as demonstrated by the Chinese case study. China currently exhibits an "inverted triangle" pattern whereby there is a higher concentration of medical resources in metropolitan areas, resulting in poorer service capacity and fewer high-quality healthcare talent willing to relocate to grassroots and work in remote and underserved regions' healthcare institutions. According to Du[3], almost all medical resources and patients are concentrated within tertiary institutions, which are located in urban areas and account for 8% of all healthcare facilities. Thus, this imbalance in critical resource distribution widens the unbalanced development of healthcare and regional medical infrastructure, which disproportionately affects remote regions. This highlights that despite efforts to rationalize the phenomenon on the need basis, the imbalance distribution and limited mobility of state-of-the-art medical resources remain a problem which necessitates governmental interventions.

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3.2. Regional disparities: east vs. west and impact on health outcomes

China's socioeconomic inequalities, which are heavily skewed in favor of the affluent neighborhoods of the eastern coast cities, are most evident in the health and medical institutions. As Zhang[2], a 2018 study to understand China's national economy and the improvement of people's lives, demonstrated that the eastern provinces shared a larger share of healthcare service centers disproportionately compared to its western provinces. The eastern region, which is currently home to the highest number of the nation's medical resources, is well endowed with medical institutions, currently accounting for 37.5% of all the 997,433 facilities. The establishment of such a large number of institutions with additional support services, by default, attracts the nation's cream of healthcare specialists due to the ease of access to peerage and medical training to hone their craft. In comparison, the western and central regions account for 31.4% and 31.1% of these institutions, respectively[2]. In the post-COVID-19 pandemic era, the gap persisted, whereby the eastern region had aligned with United Nations bed capacity goals at 6.3 per 100 people while the eastern region lagged behind at partly 4.1 beds per 1000 people[4]. This compelling data further supports the existence of inequalities in healthcare provision due to socioeconomic factors characterizing the different regions.

Unequal economic development has led to a visible disparity in the allocation of advanced medical technologies across the People's Republic of China, as demonstrated by the heavy favoring in equipment investment for the affluent eastern provinces with concurrent disadvantaging of the central and western populations. The disproportionality is evident in that 78% of all MRI scanning machines were found in the eastern healthcare institutions, thus leaving the citizens in the central and western parts of the country exposed to uncertainties[5]. The data shows that in the continuum of time, the disparity increases with the big cities being greatly favored, as demonstrated by this trend. According to Statista[6], the GDP per capita of Beijing in the Yuan of ¥200,278 is 3.7 times greater than that of Guizhou at ¥54,172 and 2.2 times the national average of ¥89358.Such differences cause wealthier provinces to have greater leverage on economic policies, leading to disproportionate health prioritization based on the needs and economic productivity of the wealthier regions[2]. In the course of time, more healthcare infrastructures are established in these regions, resulting in a domino effect that disproportionally favors the eastern regions. Over time, the feedback loop established on economic foundations results in more investment going toward the eastern region, which, by logic, attracts more talent and technology in these provinces. The evidence implies that due to better medical care and immediate access to healthcare services, the life expectancy in wealthier cities such as Shanghai at 80.26 years, as demonstrated by data, far exceeds that of western remote regions such as Tibet at 68.17 years[2]. The analysis implies that economic disparities are the primary cause of the persistent cycle of advantages accrued in the wealthier regions while challenges that undermine the welfare and health concerns of citizens in the underprivileged rural areas mostly distributed within central and western China.

3.3. Urbanization causing urban-rural divide

The unequal allocation of medical resources between the urban and rural regions is deeply rooted in the latter's shortage of healthcare literacy, sufficient facilities, and medical personnel. In recent research by Xi[7] aimed at establishing residents' evaluation of medical resource allocation, the study found that rural areas, on average, have 1.2 doctors serving 1000 patients. In comparison, the urban residents have an average of 3.8 doctors per 1000 residents, hence sealing any deficit gap for healthcare professionals that the rural citizens show. It is also noteworthy noting that more than 50% of rural healthcare facilities lack critical diagnostic tools such as MRIs, the noninvasive medical imaging test scanners[8]. This implies that limited diagnostic tools access, lower literacy levels, and lack of specialist medical personnel undermine the remote and underserved regions' medical

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capabilities, hence affecting the quality of care in these regions disproportionately compared to metropolitan urban regions.

Since access to specialists is a medical necessity, this rural population compensates for this lack by traveling to large cities to access medical care. The fact that they have to meet additional costs also pronounces inequality as they have to use more funds to access the same quality care from top-tier specialists. Moreover, the need to travel and the lack of specialists who can serve emergency cases also result in healthcare services disparities. Additionally, the lack of immediacy in consultancy services is the major cause of "medical migration," which increases the cost of healthcare for rural persons disproportionately[9]. This has been shown to increase the cost of medical care by a factor of 2 or 3 for patients coming from rural areas compared to their peers in urban centers. This has created generation cycles of poverty whereby the rural population is estimated to allocate about 34% of their income to medical care compared to the urban families who only set aside 15% of their incomes. The higher strain placed on rural families when accessing medical facilities further pronounces the economic disparities, thereby underling the urgent need for multisectoral collaboration to offer targeted interventions with the aim of bridging the medical gap in these regions.

4. The impact of unequal distribution of medical resources

4.1. Disparities in health levels across regions

In China, unequal distribution of medical resources leads to significant differences, particularly in underserved and remote regions. The disadvantaged regions show a disproportionate prevalence of chronic conditions such as respiratory illnesses, chronic obstructive pulmonary disease (COPD), and cardiovascular diseases[5]. The western regions have a disproportionate prevalence of these conditions, particularly COPD, due to increased indoor pollution as the regions depend on biomass fuels in the heating and cooking processes, which increases the prevalence of chronic illnesses. Additionally, these regions have bustling mining activities, such as in coal mines, which increases dust exposure to residents, further increasing chronic respiratory disease incidences. Moreover, there is delayed diagnosis of such treatable conditions, thus delaying effective medical care and exacerbating health disparities in these regions[8]. Disproportionate investment in medical resources results in specialist medical professionals being concentrated in urban regions, and thus, the preventable cases go unnoticed due to a lack of early diagnosis services and facilities. Moreover, there is inadequate infrastructure in these areas, which further contradicts the ability to offer timely interventions. The poorer clinical services translate to poorer overall health of the local citizenry in underserved regions, leading to poorer health outcomes than wealthier city centers.

4.2. Increased economic strain on rural population

Healthcare accessibility refers to the ease with which a population in a given area can easily access medical care without much strain, regardless of an individual's socioeconomic status or location within a country. The term relates to the timeliness of accessing medical services, the appropriateness and affordability of such services when needed. According to Zhou[10], rural patients in pursuit of medical care have to spend, on average, about ¥2,300 for every trip they make to the eastern cities. This is about 40% of their gross annual income, making health a steep expenditure for the rural populace, and thus, the households in the western and eastern regions are trapped in endless poverty cycles[8]. Distance is a key factor in health equality, and the distance separating one from prime medical regions in the eastern provinces directly determines one's health expenditure. Greater distance and the high need for such medical services from tertiary medical institutions result in exorbitant healthcare expenditure, which causes rural households to get trapped in annual poverty cycles.

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On the contrary, urban residents benefit from service immediacy, and therefore, they can save on accommodation and transportation costs. In addition, due to the higher literacy levels in these regions, residents in urban centers more willingly adopt medical coverage and health insurance policies at a higher rate of 92% compared to their rural peers, with 68% adoption[11]. The above scenario highlights that as healthcare costs escalate, rural poor have to set aside a substantial amount of their resources to cater to a sick family member[8]. Thus, impoverished families often face economic difficulties that could ruin their financial position, which leads them to poverty cycles and thus acts as the catalyst to deepening economic divides.

4.3. Social discontent and instability

The unequal allocation of medical resources is the major cause of tensions within the healthcare system and a trigger to social unrest. Resource shortage is, for instance, a major cause of tension between medical professionals and clients since a lack of adequate resources results in delayed treatment services. Lack of timely medical care can result in a compromised healthcare professional's integrity, especially when working in emergency care, and has been cited as a major source of public unrest and mass protests[12]. Rural families that take loans, sell or lease their property, and, in some severe cases, sell their homes may also feel betrayed by the healthcare system that lacks safeguards to protect the welfare of the vulnerable. According to Jiang[11], in some regions, for instance, protests have occurred when the public perceives unequal healthcare distribution to be causing deteriorating health in some regions. Moreover, healthcare disparities are viewed as a perpetuation of injustices and thus can affect the foundations upon which social stability is anchored, causing various forms of dissidents, among them social unrest. Worse still, families facing high medical expenses, particularly the residents in the western and central rural regions, often fall into poverty traps due to illness. Many families are forced to borrow money, sell property, or even their homes to pay for treatment—a common phenomenon in China's impoverished areas[8]. The rise in tension due to healthcare disparity is argued to undermine trust in healthcare institutions and threaten broader social harmonious co-existence.

5. Methodology

This case study of China employs a mixed-methods design combining quantitative spatial analysis and qualitative policy review. Quantitative data from China National Knowledge Infrastructure (CNKI), subscription-based database model for 2019–2024 will be accessed for specific articles or downloaded for further review. The publications, working papers and double-blind peer-reviewed journal articles will provide provincial GDP, hospital bed density, MRI machine distribution, and specialist physician counts quantitative data. The proposal using GIS mapping will visualize regional disparities, and investigates how economic development levels, such as GDP per capita, influence medical resource allocation. In the future further in-depth exploration may be based on panel data for regression analysis, using a fixed-effects model:

$$\text{Medical Resources}_{it}=\alpha+\beta Economical\ Level_{it}+\gamma X_{it}+\mu_{it}$$

$X_{it}$is control variable,$\mu_{it}$is individual effect.

6. Data analysis

Compute mean, standard deviation (SD), and other summary statistics for healthcare resources by province using STATA.

Data from China Health and Health Statistics Yearbook, National Bureau of Statistics, National Health Commission Statistical Information Center and other databases, existing empirical studies in

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the literature generally confirm the existence of a significant impact of China's regional economic disparities on the distribution of health care resources.

Economic data: provincial GDP, per capita disposable income (National Bureau of Statistics).

Medical resource data: number of beds per 1,000 people, number of doctors, financial health expenditure (National Health Commission).

Control variables: population density, aging rate, urbanization rate (Seven-Population Data).

7. Expected contribution and outcome

7.1. Promoting resource redistribution

There is a need to create a sustainable redistribution strategy that encourages the transfer of infrastructural resources from well-endowed urban healthcare facilities to clinics and hospitals in underserved rural settings[12]. Establishing regular joint clinics, shared hospital wards, and expert consultation centers is a noble solution to supporting the sustainable redistribution of talent, technology, and services[13]. Additionally, encouraging patients at tertiary hospitals to seek initial consultations at primary facilities would help reduce service bottlenecks experienced at tertiary levels.

7.2. Leveraging digital health technologies for remote healthcare service delivery

Urban hospitals (second-tier and above) should leverage telemedicine and internet-based healthcare services to reach out to communities in underserved regions. Establishing and facilitating two-way referral systems will help solve the long waiting line issues experienced at tertiary-level hospitals in urban centers[2]. Further optimization of resource allocation between urban and rural facilities would ensure that there is equal distribution of and allocate outpatient and inpatient resources from community centers and clinics to serve locals' needs before they could seek additional care services at the tertiary levels.

7.3. Policy reforms and financial investments

The national government has a stake in finding a solution path by creating initiatives that will help prioritize equitable healthcare access. Firstly, the government should introduce incentives such as healthcare infrastructures and additional cultural training to encourage “specialists’ migration” to rural healthcare facilities[13]. The incentives would lure top-tier clinical experts to decentralize service delivery and embrace working from underserved regions. Therefore, the government should invest in laboratories and digital highway infrastructure to ease information decentralization[2]. In addition, there should be more communication channels about community center clinics with certain services. Moreover, the government could leverage established mobile applications such as WeChat to reach citizens in rural areas when rolling out newly equipped specialty equipment within the reach of rural populations.

8. Conclusion

The unequal distribution of medical resources in China is not just an economic issue but rather a multilayered problem that requires concerted efforts of multisectoral stakeholders. The issue of health disparity touches on the foundation of society as it is a matter concerned with social equity and public health. Addressing this problem requires coordinated efforts in policy, financial investment, and infrastructure development to promote balanced allocation. The imbalance in healthcare resource allocation can be corrected by reforming the policies that define the nation's healthcare funding model. In addition, engaging the community in the disproportionally affected regions would help solve the problem. The government should invest in digital health systems such as telemedicine to enable top-

DOI: 10.54254/2754-1169/2025.BL24170

tier medical professionals to offer services to patients remotely, thus breaking the physical barrier limitations. There is also a need to approach the issue from a long-term approach by creating a balanced health system that takes care of citizens irrespective of the province of origin, as it shows the value of human dignity and upholds the course for social justice. Therefore, through policy reforms, increased investment in health care establishment in remote areas, and leveraging advanced technology, the Chinese government can guarantee its citizenry a more equal distribution of medical resources.

Acknowledgement

Xu Zhou and Xingyan Liu contributed equally to this work and should be considered co-first authors.

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