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# The Disadvantages of a Disparate Health Care System: A Spatial Analysis

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# The Disadvantages of a Disparate Health Care System

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## A Spatial Analysis

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### *Abstract*

*This study first aims to answer the question: does location affect quality of care? It does so by investigating the disparities between urban and rural health care focusing on advantageous factors inherent in urban areas and disadvantageous factors inherent in rural areas. Findings indicate that significant differences between these types of locations do exist and contribute to the quality of care that residents receive. In addition, these differences are found to have detrimental effects on mortality rates within disadvantaged rural areas and thus lead to the “nonmetropolitan mortality penalty.” After analyzing counter arguments and policy suggestions, the study concludes with possible opportunities to combat the nonmetropolitan mortality penalty in the future.*

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## I. Introduction

Health care is a catalyst for American revenue, research, and pride. The United States spends over twice as much on per-capita health care than any other country in the world which has observable impacts on the quality of care that Americans receive. Individuals seek out the most reputable physicians and those who can afford it pay high premiums to ensure that they are receiving the best care available because after all, poor health is the leading cause of death.

Because Americans place such high importance on quality of care, it follows that individuals would want to know where to find the best care. While some may be able to travel long distances, others are restricted to local health care options because of monetary or capability constraints. This paper evaluates the discrepancies in health care outcomes in metropolitan<sup>1</sup> and nonmetropolitan<sup>2</sup> areas and aims to answer the question: does location affect quality of care?

Studies have indicated that a “nonmetropolitan mortality penalty” exists in the United States which implies that nonmetropolitan, or rural, areas have higher mortality rates than metropolitan areas (Cossman, 2010, p.1417). Research published in the American Journal of Public Health shows that this penalty equates to an estimated 40,200 excessive deaths per year and is a result of “persistent spatial clusters of metropolitan and nonmetropolitan differences” (Cossman, 2010, p. 1418). The unnecessary loss of over forty thousand American lives seems to suggest that a real problem may exist in the care that rural residents receive.

A detailed study concerning the disparities between health outcomes in diabetic individuals, “Diabetes Care and Outcomes: Disparities across Rural America” was performed to better understand this problem. Authors Hale, Bennett, and Probst (2010) find that it is less

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<sup>1</sup> The terms “metropolitan” and “urban” will be used interchangeably throughout the paper and are used to reference areas with more than 50,000 residents.

<sup>2</sup> The terms “nonmetropolitan” and “rural” will be used interchangeably throughout the paper and are used to reference areas with 50,000 residents or less.

likely for those living in a nonmetropolitan area to receive the same quality of diabetes care than those living in a metropolitan area and these differences in care result in unequal health outcomes. To illustrate this point, the prevalence of self-reported diabetes is found to be 17% higher in rural areas than in urban areas (Hale, Bennett, and Probst, 2010, p.372). In addition, a higher percentage of rural residents report retinopathy, or damage to the retina, and foot sores as a result of complications from diabetes than their urban counterparts do (25.8% rural versus 22.0% urban) (Hale, Bennett, and Probst, 2010, p.371). The study concludes with assumptions regarding possible causes of these differences in health outcomes which may be attributed to advantages that are unique to the metropolitan health care sector in comparison to disadvantages that are unique to the nonmetropolitan health care sector.

These studies illustrate the ever-increasing need to investigate the American health care system in order to better understand the quality of care that individuals in different locations of the nation receive. If locational attributes do in fact contribute to quality of care, implications for policy reform can be considered to ensure that equality exists for all regions within the health care system.

## **II. Advantages of the Urban Health Care Sector**

The disparities between health outcomes may be the product of the unique advantages which are present in metropolitan areas but are absent in nonmetropolitan areas. It has been shown that there are significant benefits that arise when firms cluster in general and the health care industry is no exception. Advantages that may lead to an imbalance in quality of care include the positive effects of agglomeration economies and ability sorting, the density of physician supply in an area, and the benefits of specialized medical facilities locating in urban areas as explained by the Central Place Theory.

## **A. Positive Effects of Agglomeration Economies**

The most evident advantages to urban health care are the benefits associated with clustering that rural areas are unable to compete with. For all firms, these benefits of knowledge spillovers, labor pool sharing, better labor matching, and increased learning opportunities are higher when firms choose to locate near each other in larger cities. Specifically, in localization economies where firms of the same industry cluster, scale economies result. For example, the clustering of the health care industry in urban settings can lead to distinct advantages when hospitals and other medical facilities share suppliers of intermediate inputs. Because an agglomeration of health care providers will produce a large enough demand for suppliers of health care inputs to take advantage of scale economies of production, prices will be lower. In addition, urban areas enable suppliers to sell their technology face-to-face which is favorable given that health care products generally require a greater degree of explanation.

In his article, “The Creation of Economic Efficiencies in Hospital Mergers,” author William J. Lynk claims that economic efficiencies are created when hospitals merge which serves as an extreme example for the advantages of localization economies within the health care industry. When hospitals or other medical facilities merge or clustered together, fixed capital costs are spread over a greater number of patients and average costs fall. Also, clustering makes it easier for health care providers to exploit economies of scale of production through clinical consolidation. For example, it is more common for hospitals in metropolitan areas to consolidate smaller clinical departments into a single department which can help to reduce variability within patient care. These consolidating efforts lead to economic efficiencies in production because the same medical equipment can be shared more easily among varied patient needs and idle time is minimized which lowers average costs of use. From the findings of this article, it is clear that

significant economic benefits exist when medical facilities cluster and it can be inferred that these benefits have the potential to lead to better quality of care and thus better outcomes for patients.

### **B. Ability Sorting**

In addition to increased economies of scale, urban areas also reap the benefits of ability sorting which is defined by Professor Sanghoon Lee (2009) in his article, “Ability Sorting and Consumer City.” Lee argues that “high-skill healthcare workers are more concentrated in large cities” because these type of workers have “great earning power and thus great demand for urban [consumption] amenities” (Lee, 2009, pg. 4). In other words, because some consumption is considered to be a luxury good and because urban areas offer a wider variety of consumption amenities, higher-skilled workers who can afford these amenities tend to locate in metropolitan areas. He then validates his assumptions by proving that a positive relationship exists between urban concentration and Medical College Admission Test (MCAT) scores, which he uses to illustrate doctor quality. His findings indicate that size of an area positively correlates with the quality of physician care provided in that area which has obvious implications for the advantages of metropolitan areas over nonmetropolitan areas and the health outcomes of respective residents. (See Table 1 in Appendix).

### **C. Density of Physician Supply**

Another advantage of urban health care is the higher density of physicians that locate in metropolitan areas versus nonmetropolitan areas in order to accommodate higher demand. In a spatial analysis study in the Journal of Health Policy, German researchers Leonie Sundmacher and Reinhard Busse (2011) find that physician supply is negatively and significantly correlated with avoidable cancer death (ACD) rates. For example, as physician density per 100,000

patients increases by one unit in an area, ACD rates for female breast cancer are found to *decrease* by a factor of 0.9994 in that area (Sundmacher and Busse, 2011, p.53). The results are shown to be consistent across many countries including the United States. In addition, the authors find that the most densely physician-populated areas tend to be wealthy, urban areas and, like the article describing discrepancies in diabetic health care, they find a correlation between these urban areas and better health outcomes. These outcomes are found to improve not only because of the greater amount of services offered in urban areas, but also because of the greater accessibility and quality of care that is associated with higher physician density. The article describes three possible causes of the negative relationship between physician supply and the ACD rates. First, a higher density of physicians is shown to decrease both the opportunity cost of waiting times and the economic cost of travelling which provides residents with cheaper access to care. Second, an increased density of all types of physicians implies an increase in the density of specialists and specialist centers that have a tendency to cluster in nonmetropolitan areas. Because “the geographic proximity of specialized care reduce[s] the economic costs for access to high quality care,” high quality, specialized care is also cheaper for urban residents than it is for rural residents (Sundmacher and Busse, 2011, p. 59). And lastly, a greater supply of physicians increases competition between health care providers in an area which incentivizes higher quality care to attract consumers who have a greater number of choices. These findings indicate that consumers in areas of high physician density, or urban areas, receive better quality of health care which may provide evidence for the nonmetropolitan mortality penalty.

### **1. Central Place Theory**

Looking more closely at the second cause of the positive relationship between physician density and improved health outcomes, it is important to understand why specialized health care



centers tend to cluster in urban areas. This assumption can be best explained by the Central Place Theory. This theory asserts that low-demand products and services cluster in larger cities to obtain the benefits of a larger population. More specifically, the per-capita demand for specialized medical facilities such as neurosurgery departments, specialty cancer treatment centers, and pediatric hospitals is low relative to the economies of scale in production these facilities can generate. Because of the comparatively low demand for the services provided by these institutions, these types of firms must locate in larger urban areas in order to reach enough people to leverage their scale economies. Thus, urban residents living in larger areas have better access to specialized care which gives them an advantage over rural residents who must travel further for specialized care.

#### **D. Implications for the Nonmetropolitan Mortality Penalty**

The evidence above illustrates how advantages of locating in metropolitan areas can affect the quality of care that residents receive. Agglomeration economies reduce average costs of operation and increase efficiencies to provide more people with care at larger facilities. Ability sorting leads to a higher concentration of higher quality doctors in urban areas which suggests that urban residents generally receive superior care compared to rural residents. Physician density also seems to play a role in the quality of care that residents receive by decreasing the total cost of care, increasing the amount of specialized care, and increasing the competition of health care providers in an urban area. Finally, the Central Place Theory explains why specialized medical centers are more likely to locate in urban areas and because of this; urban residents have greater access to this type of care than their rural counterparts. After analyzing the advantages specific to urban health care, it can be inferred that the higher quality care in urban areas may lead to lower mortality rates. In other words, it is evident that the

inherent advantages of urban health care could be significantly contributing to the nonmetropolitan mortality penalty.

### **III. Disadvantages of the Rural Health Care Sector**

In addition to the benefits associated with urban health care, the weaknesses of rural health care must also be addressed. The intrinsic characteristics of the rural population, increased travel times, barriers to information, and technology constraints can lead to inferior quality of care for rural residents which may also contribute to the nonmetropolitan mortality penalty.

#### **A. Characteristics of the Rural Population**

The United States Department of Agriculture's Economic Research Service estimates the 2010 United States rural population to be 51,043,753 people (USDA, 2010). In this year almost 17% of the rural population was living below the poverty level and 23% did not have health insurance (USDA, 2010). In 2011 less than 4% of rural residents had a bachelor's degree (USDA, 2011). These characteristics of the rural population could be placing residents at an increased risk of poor health.

In the research article concerning diabetic care in rural areas discussed above, authors draw some key conclusions about the characteristics of rural residents. Rural residents are found to be "less well educated, more likely to report low incomes, more likely to lack health insurance and more likely to report deferring care due to cost than urban adults" (Hale, Bennett, and Probst, 2010, p. 372). These factors are shown to have significant negative relationships with variables such as number of physician visits, health screenings, and diabetic testing. For example, it is found that lower levels of education negatively correlate with the likelihood of an

individual receiving a dilated eye exam. This evidence suggests that the individual traits of rural populations negatively affect quality of care and health outcomes.

## **B. Travel considerations**

Obstacles to access for rural residents may also play an important role in the nonmetropolitan mortality penalty. Because rural areas are often isolated from larger medical facilities located in urban areas, travel costs must be taken into consideration and, as discussed above; extra expenses are not something that many rural residents have the capacity to afford. As a result of increased travel costs and thus decreased access to care, mortality rates associated with certain health issues also increase in rural areas. Economists Buchmueller, Jacobson, and Wold (2006) find that increased distance from hospitals positively correlates with mortality rates of patients suffering from conditions such as heart attacks and unintentional injuries in the article, “How far to the Hospital?” Their studies show that a one mile increase in distance to a hospital is associated with a 6.5% increase in the number of deaths resulting from heart attacks and an 11-20% increase in the number of deaths resulting from unintentional injuries (Buchmueller, Jacobson, and Wold, 2006, p.755).

In addition to pure travelling time costs, rural residents also have a higher opportunity cost of receiving health care because of longer travel times. This may be why it is found in the article that as distance from metropolitan health care centers increases, the amount of people receiving hospital-intensive diagnostic care such as health screenings notably declines. The higher emergent mortality rates and lower health screening rates related to distance from hospitals illustrates how decreased access to care could considerably affect the nonmetropolitan mortality penalty.

## **C. Barriers to information and technology**

Another disadvantage of being isolated from metropolitan centers is the fact that rural physicians and residents must overcome barriers to obtaining quality information and technology. For example, author Josephine L. Dorsch (2000) in her article<sup>3</sup> regarding information needs of rural health professionals asserts that “isolation, lack of library services, and inadequate access to information” are “more prominent among rural health professionals” which could create significant disadvantages to the quality of care offered by these professionals (Dorsch, 2000). Because rural health care professionals are geographically isolated, communication among colleagues in rural areas occurs at a much slower rate than it does in urban areas. Dorsch finds that “discussion with colleagues [is] the top way to identify and access information,” but rural health professionals do not have access to quite the number of colleagues that urban professionals do and so they are at a distinct disadvantage (Dorsch, 2000). In addition, rural areas are not known to be ideal locations for medical information centers. They are ill-equipped with medical schools and academic health science libraries which tend to locate in urban areas which can be understood using the Central Place Theory. Because of the relatively low demand for specialized medical information, these types of facilities are most commonly located in larger cities in order to capitalize on the greater density of medical professionals concentrated in urban areas. While the internet removes some of these barriers, inadequate access to medical information may have a real impact on the quality of care that rural residents receive.

Technology barriers also create disadvantages for the rural health care sector. The greatest obstacles for rural health care providers are the costs associated with acquiring new technologies. Because “rural health professionals are more likely to have to assume the costs

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<sup>3</sup> “Information Needs of Rural Health Professionals: a review of the literature”

individually” compared to their urban counterparts, more expensive, advanced technology is out of reach for most rural practices (Dorsch, 2000). Because of this, rural health providers are considered to be some of the slowest adopters of new innovations. These lagging adoption rates and less sophisticated equipment could seriously influence the quality of care that is provided in rural areas.

#### **D. Implications for the Nonmetropolitan Mortality Penalty**

The preceding evidence of the disadvantaged rural population suggests that rural residents may have a more difficult time obtaining the same quality of care as their urban counterparts. First, the unique characteristics of the rural population hinder the ability of residents to receive quality health procedures and tests. In addition, longer commuting times seem to place rural residents at a disadvantage compared to urban residents who live much closer to medical facilities. Finally, inferior access to information and technology may diminish quality of care provided in rural areas. All of these factors have the potential to exacerbate the nonmetropolitan mortality penalty.

#### **IV. Counter Arguments**

While it may seem obvious that advantages associated with urban centers and disadvantages associated with rural areas lead to an imbalanced health care system in the United States, there are other factors that may challenge the nonmetropolitan mortality penalty theory. In other words, there are some disadvantages to urban health care that may outweigh the benefits of locating in a city. For example, urban economists have found that congestion and pollution inherent in urban areas may lead to inefficient operations within health care facilities and worsened health conditions for urban residents respectively.

##### **A. Disadvantages to Urban Health Care: The Congestion Effect**

The congestion effect can have negative results for many aspects of urban living and health care is no exception. In hospitals and other medical facilities, overcrowding due to poorly forecasted demand and inconsistent patient inflows can lead to congestion. Congestion has noticeable negative effects on the efficiency of care in a medical facility which may have implications for quality of care and mortality rates. Professor David Bailer (1992) asserts that there is a “significant relationship between congestion and mortality rates in all hospitals” in his article “A Theory of Congestion in General Hospitals” (Bailer, 1992, pg. 2). This conclusion, supported by his research, provides evidence which should be considered in opposition to the nonmetropolitan mortality penalty.

### **B. Disadvantages to Urban Health Care: Pollution**

Pollution is also a concern for urban health care systems. In a medical study measuring the effects of particulate air pollution on the health of urban residents, research doctors Seaton, Godden, MacNee, and Donaldson (1995) find that pollution both worsens illness for those with respiratory disease and increases the number of deaths from respiratory and cardiovascular disease. They also find that the explanation for this relationship “lies in the nature of the urban particulate cloud” (Seaton, 1995, pg. 176). Again, the adverse outcomes resulting from residing in urban locations may contest the nonmetropolitan mortality penalty.

### **V. Policy Suggestions**

After reviewing the evidence for both the advantages and disadvantages of receiving health care in urban areas and the disadvantages associated with health care in rural areas, one can presume that government policy must aim to balance these opposing forces. Many studies have provided insight into the specific types of policy changes that would be necessary in order to reduce discrepancies that could intensify the nonmetropolitan mortality penalty. For

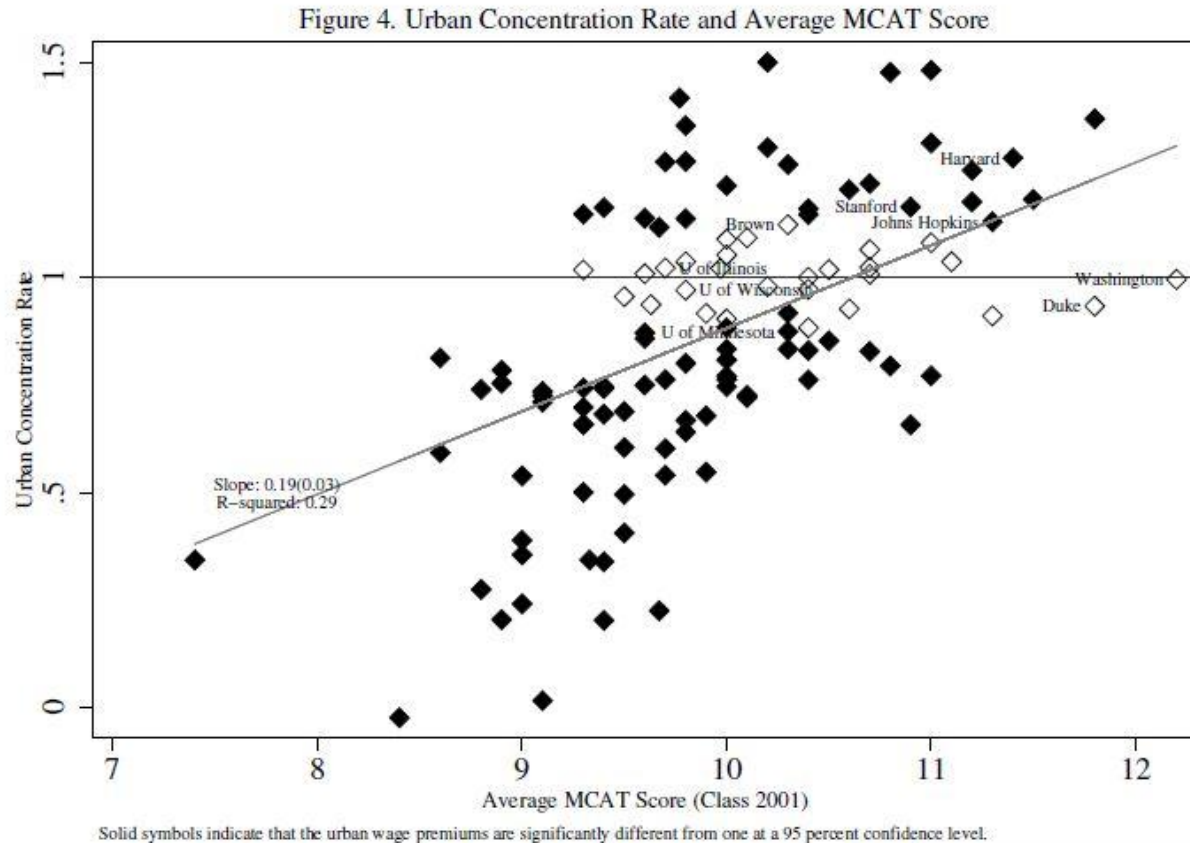
example, former senator Craig Thomas (2003) argues that current health care policies in the U.S. “have placed additional burdens on rural citizens and health providers” in his essay regarding policy responses to the needs and challenges of rural Americans (Thomas, 2003, p. 259). In his research, he finds that reducing cost barriers may improve service quality in rural locations. For example, policy reform may need to focus on how to both provide better access to affordable health insurance for rural residents and to decrease costs for rural providers. It is argued that by reducing the costs that the rural sector faces, better quality care can be provided which may have positive implications for the nonmetropolitan mortality penalty.

## **VI. Conclusion**

This discussion of rural and urban health care highlights the points of disparity in quality of care and mortality rates that can result from locational differences. In other words, the answer to the question: does location affect quality of care posed in the introduction to this study is a resounding “yes.” Although there are some arguments to the contrary, most research leads to the conclusion that locating closer to an urban center has more favorable effects on an individual’s health. However, while the discrepancies that exist appear to have negative implications for mortality rates in rural areas, medicine and technology is advancing in ways that may help to narrow this gap. For example, telemedicine, or the utilization of information and telecommunication technologies to extend the reach of quality care, and increasing numbers of health education programs targeting rural areas may be the answers to combating the nonmetropolitan mortality penalty. And when it is a question of health, answers are always welcome.

Appendix

Table 1:



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