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Essays on healthcare provision and utilization in Pakistan

S.M S.M Nabeel Ul Haq

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ESSAYS ON HEALTHCARE PROVISION AND
UTILIZATION IN PAKISTAN

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To all those who have lost their lives and limbs due to insufficient healthcare facilities

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Abstract

This research work is a collection of three essays focusing on the issues pertinent to public healthcare provision and healthcare choices in Pakistan. The provision of healthcare by the government is of utmost importance to the public and the role of public healthcare providers becomes more prominent or even a lifeline for the relatively poor and marginalized. These studies analyze different aspects of the healthcare sector in Pakistan. The focus of this study is to explore the prevailing issues in the public healthcare sector of Pakistan. We shed light on the issues related to the existing healthcare disparities in the public sector, utilization of different public healthcare institutions post devolution, and healthcare choices of households because of migrant remittance receipts. The findings of this research reveal some interesting pieces of evidence and try to fill the gap in the existing body of literature. The results of this study confirm the existence of healthcare disparities among the districts of Pakistan. The public healthcare resource distribution in Pakistan is uneven and is relatively more skewed towards urban centers and provincial capitals. The disparities in the public healthcare sector are prominent in terms of the population and area of the districts. The devolution of public healthcare has not been effective in increasing the utilization of public healthcare institutions by the public. The public healthcare utilization in the districts of Pakistan has declined after devolution, both in general consultations and primary healthcare. Although, there is some evidence for improvement in public healthcare utilization for prenatal, childbirth, and postnatal healthcare utilization. The low utilization of public healthcare institutes versus private healthcare leads to the understanding that migrant remittances are one of the important factors influencing the choice of healthcare providers in Pakistan. The households receiving remittance are more

likely to receive healthcare consultations and hospitalization from the private healthcare sector. Considering these findings, we propose some policy measures that can be helpful in the reduction of healthcare disparities at the districts level and could increase healthcare utilization in the public healthcare sector.

Résumé

Ce travail de recherche est une collection de trois essais portant sur les problématiques liées au système public de santé et aux choix de soins au Pakistan. Nous mettons la lumière sur les questions liées aux disparités existantes en matière de disponibilité des soins dans le secteur public, à l'utilisation des différents établissements de santé publique après la dévolution du système de santé, et aux choix de soins des ménages suite à la réception des transferts de fonds des migrants. Les résultats de cette thèse confirment l'existence de disparités en matière de soins entre les départements. La répartition des ressources de santé publique est inégale et est orientée vers les centres urbains et les capitales provinciales. Les disparités dans le secteur de la santé publique sont importantes en termes de population et de superficie des districts. La dévolution du système de santé public ne semble pas contribuer à accroître l'utilisation des établissements de santé publics par la population. Les consultations générales et l'utilisation des soins primaires ont diminué après la dévolution, bien qu'il y a des indications d'une meilleure utilisation du système de santé public pour les consultations prénatales, les accouchements et les soins de santé postnatales. Nous trouvons que les ménages qui reçoivent des fonds sont plus susceptibles de faire des consultations médicales et d'être hospitalisés dans le secteur de santé privé. Cette faible utilisation des établissements de santé publics par les ménages des immigrés par rapport aux établissements de santé privés laisse penser que les transferts de fonds des migrants sont l'un des facteurs importants qui influencent le choix des prestataires de soins au Pakistan. Au regard de ces résultats, nous avons formulé des recommandations politiques qui peuvent contribuer à réduire les disparités en matière de santé entre les départements du Pakistan et à augmenter l'utilisation des soins dans le

secteur public.

Chapter 1

Introduction

1.1 Foreword

“Health is not just a matter of being alive, and living a long time, but of living in good health”

Angus Deaton, *The Great Escape*

Health is an integral part of human well being. To maintain good health, we need a healthcare system that is efficient and capable. A quality healthcare system can efficiently respond to the healthcare needs of its population and is also proficient in the provision of healthcare. The [Merriam-Webster \(2020\)](#) dictionary defines “*Healthcare*” as “*Efforts made to maintain or restore physical, mental, or emotional well-being especially by trained and licensed professional*”. The [Collins English Dictionary \(2019\)](#) refers to “*Healthcare*” as “*Various services for the prevention or treatment of illness and injuries*”. The meaning or definition of healthcare may differ, but the importance of healthcare and the provision of healthcare through an efficient healthcare system cannot be underestimated in today’s world. Modern healthcare systems reflects the prevailing socio-economic situation in a society.

The provision of healthcare is regarded as one of the crucial responsibilities of the public sector. From early Greek public physicians to today’s sophisticated modern healthcare systems, the public healthcare sector has played a vital role in the provision of healthcare ([Porter, 2005](#)). The role of public healthcare became an issue of great importance during the Covid-19 pandemic. In addition to the public sector, private healthcare sector is also a major contributor to the provision of healthcare in the developing countries. [Preker et al. \(2007\)](#) notes that with the inclusion of private healthcare providers, especially in developing countries, the healthcare access and quality of service provision has increased. In developed nations, the choice among public or private hospital depends more on waiting time, proximity, and quality of the healthcare provider with lower emphasis on the economic aspects, given that the provision of healthcare in the majority of developed countries is insurance-based. Whereas, in the majority of developing countries, much of healthcare expenditure is out-of-pocket ([Wallace, 2013](#)). Generally, in the developing

nations the choice of healthcare among public or private mainly depends upon the ability to pay. The merits and demerits of having a fully public, quasi-public, or fully private healthcare system are widely debated in recent literature. The proponents and critics of all these alternative healthcare systems agree that an efficient healthcare system can significantly improve healthcare outcomes and can influence the socio-economic structure. The existing healthcare systems in a country or region can significantly influence factors like preventive and curative healthcare. The system of healthcare provision is influenced by several factors ([Kroeger, 1983](#)), these include socioeconomic conditions, culture, history, environment, and political structure. Healthcare utilization also depends on factors like location, gender, healthcare infrastructure, and economic conditions ([Shaikh and Hatcher, 2005](#)). The provision of healthcare-by-healthcare providers and healthcare utilization by public, both complement each other. A healthcare system will potentially serve more efficiently if it focuses on the factors that affect both the healthcare provision and healthcare utilization.

By decreasing the obstacles in healthcare utilization, especially for the poor and the marginalized. An efficient public healthcare system ensures that the provision of healthcare by the public sector leads to the overall well-being of the society. The utilization of public healthcare services is an effective tool to gain insights and evaluations on the efficiency of a public healthcare system. For instance, in the presence of an alternative healthcare service provider, like private healthcare services or traditional healers, low utilization of the public healthcare sector can raise concerns regarding the public healthcare provision and the existing public healthcare system. Further, low utilization of public healthcare can raise questions associated with the public healthcare infrastructure, existing healthcare disparities, financing, and issues related to the accessibility to healthcare services.

In the recent decades, the policy debate on healthcare provision has focused on the improvements in healthcare systems, especially in developing countries by decreasing disparities in healthcare (see [Wagstaff et al. \(1991\)](#); [Kakwani et al. \(1997\)](#)), improving accessibility using spatial analysis (see [Wang and Luo \(2005\)](#)), and through structural changes like devolution (See [Akin et al. \(2005\)](#); [Faguet \(2012\)](#); [Faguet and Sánchez \(2014\)](#)). Such policy propositions aim at improving public healthcare services delivery.

for example, (Deaton, 2013) suggested that the improvement in healthcare systems has increased life expectancy in the majority of the world.

In this thesis we examine the case of the public healthcare system in Pakistan and seek answers to a number of questions. The first question is related to the existence of public sector healthcare disparities among the sub-national regions or districts of Pakistan. Our analysis is based on spatial illustrations using manually-compiled district-level administrative data and measures like rankings and mean comparison. We find considerable evidence of existing healthcare disparities at the district level. The second question relates to the impact of devolution process that was launched in 2010 on the utilization of healthcare services. Our findings show that the effects of devolution on healthcare utilization are mostly negative, except in maternal healthcare. The devolution of the healthcare system in Pakistan has mostly failed to increase the demand for public healthcare services, which may be a consequence of the local healthcare services being unable to improve their quality subsequent to devolution. The third question relates to the healthcare choices of households which receive domestic and foreign migrant remittances. We observe that the remittance recipient households in Pakistan prefer private healthcare services over public healthcare services. Before discussing the main research topics, we try to introduce some of the prominent aspects of healthcare in Pakistan.

1.2 Healthcare Profile of Pakistan

Pakistan lies in one of the world's most populated regions, bordering India and China. Being a developing nation, it shares many characteristics of developing countries. For instance, a high population growth rate is one of the concerns of developing nations and Pakistan is no exception. The estimated population of Pakistan is around 210 million making it the world's 6th most populated country (World Bank, 2019). The average growth rate of the population from 1961 to 2019 was around (2.66%). The population growth rate was highest in the 1980's and peaked at (3.36%) in 1983. Since then the growth rate of the population has gradually declined. The population growth rate recorded in 2019 is the lowest since 1961, and it is around (2.02%). The population growth in Pakistan is one

Figure 1.1: Trend of population growth rate in Pakistan (1960-2019)

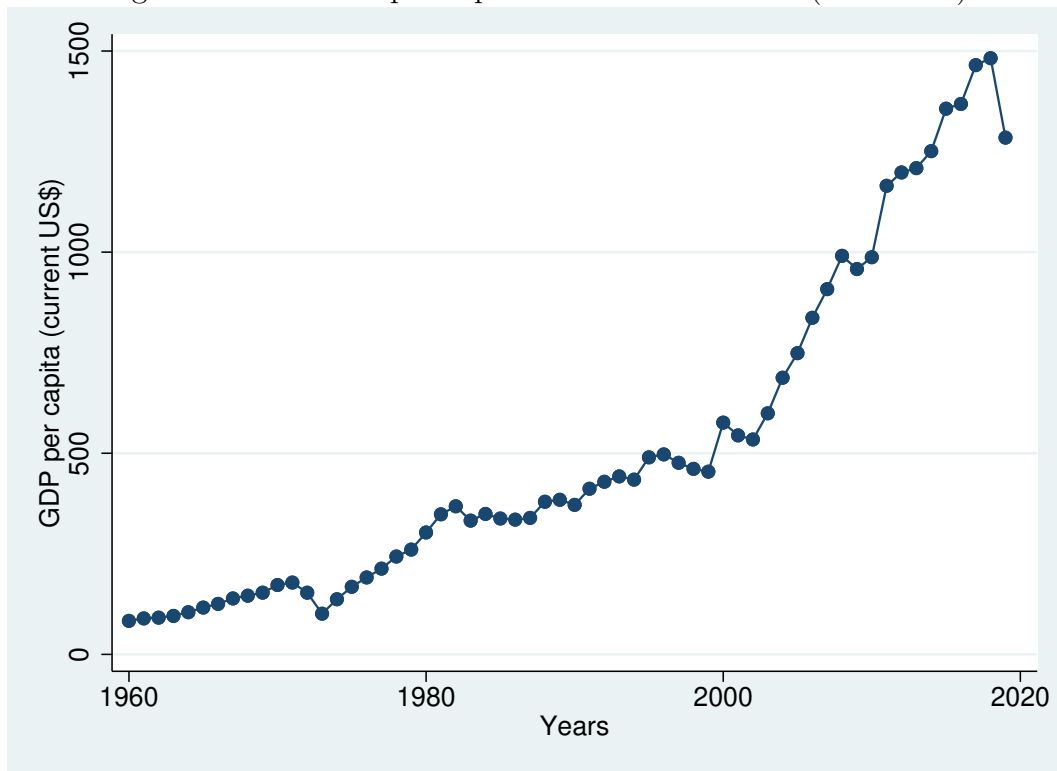


Source: World Development Indicators (2019)

of the highest in the region, as well as globally. Higher population growth can significantly increase the burden of disease. Rising population can also pose difficulties to the existing healthcare infrastructure for rendering healthcare services. Higher population growth may require additional investment in the healthcare sector to maintain the existing healthcare infrastructure.

According to the World Bank classification, Pakistan is classified as a Lower-Middle Income country. Figure 1.2 shows the per capita income of Pakistan over seven decades. The average value of the Gross Domestic Product (GDP) per capita in the last seven decades is (517.71 US \$). The highest value of GDP per capita was recorded in 2018, which was (1482.31 US \$). We observe that the above trend shows a notable improvement in the GDP per capita, but some comparisons can depict a more concrete situation. For instance, in 2019 the per capita GDP of Pakistan was (1248.7 US \$). The average per capita GDP of the lower-middle-income countries was (2174.4 US \$) and per capita GDP for the South

Figure 1.2: Trend of per capita income in Pakistan (1960-2019)



Source: World Development Indicators (2019)

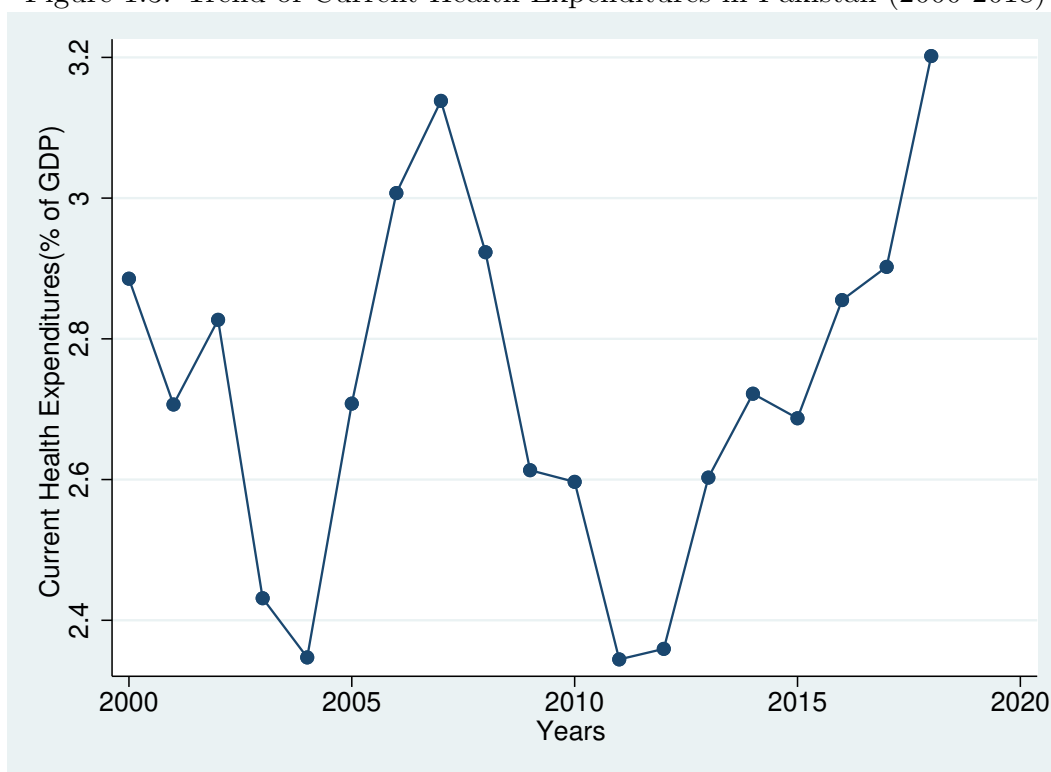
Asian region was (1956.6 US \$). The value of per capita GDP for the least developed¹ countries was (1079.2 US \$) and for low-income countries it was (810.1 US \$). This implies that Pakistan's per capita GDP is well below the average of lower-middle-income countries and it is slightly above the least developed and low-income countries. Low per capita income can indicate reliance of a large segment of the population on healthcare provision from the public healthcare sector, hence making the public healthcare sector a lifeline for the millions of Pakistanis'.

The sustenance of any healthcare system is central to the provision of finances from the government. Like many other countries, the public healthcare system in Pakistan is funded through budgetary allocations by the government. The allocations for healthcare expenditures are shown in figure 1.3.

The average healthcare expenditures as a percentage of GDP in Pakistan has remained around (2.7%) in the last two decades. In 2018, the healthcare expenditures, at (3.2%)

¹Based on the Classification of the United Nations.

Figure 1.3: Trend of Current Health Expenditures in Pakistan (2000-2018)



Source: World Health Organization (2018)

of the GDP was the highest. In the same year, average healthcare expenditures for the lower-middle-income countries were (4.07%), for South Asia (3.48 %), for the low-income countries (5.34%) and the least developed countries (4.0%), and the world average of healthcare expenditures were (9.84 %) WHO (2018). This implies that relative to all comparable groups average healthcare expenditure in Pakistan is significantly low.

Out-of-pocket payments (OPP) are another important measure. Figure 1.4 present the trend of OPP in Pakistan. OPP as a percentage of current health expenditures explains the share of households expenditure on healthcare. In the year 2018, the out-of-pocket payment in Pakistan was (56.24%) of the total expenditures on health. OPP in the case of Pakistan is comparable to other lower-middle-income (55.67%) but higher than that of low-income countries (44.09%), and the least developed nations (49.19%), and is lower than the South Asian average of (62.36%). OPP is an important measure for healthcare financing by households. A relatively high amount of OPP indicates, as in the case of Pakistan, the lack of adequate public healthcare financing system. Further,

Figure 1.4: Trend of out-of-pocket expenditures in Pakistan (2000-2018)



Source: WHO - Global Health Expenditure database (2018)

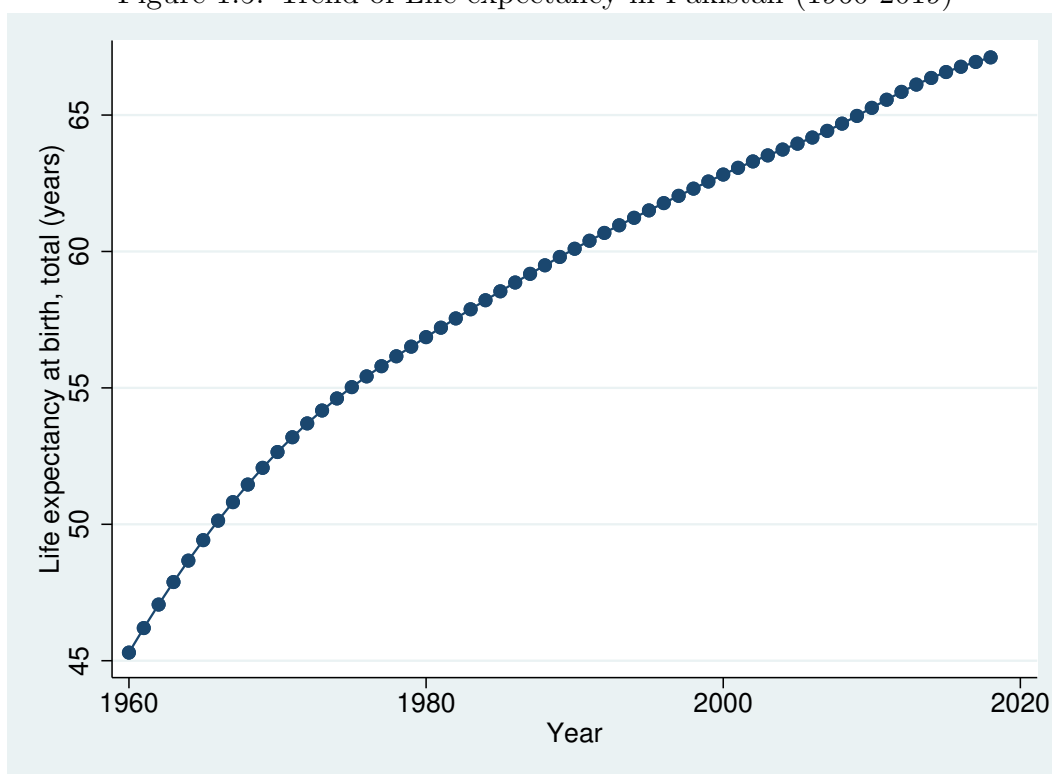
OPP can also reflect on certain costs associated in case of public healthcare utilization. Public healthcare services can be accessed in Pakistan by paying nominal charges but there are some costs associated with them which include, traveling, food, and lodging (for attendants), especially in the case of hospitalization.

After discussing some key trends affecting the healthcare system, we now briefly discuss some of the indicators related to health outcomes.

The trend in figure 1.5 shows that life expectancy has increased by (22) years, from (45.29) in 1960 to (67.11) in 2018. The life expectancy in Pakistan is similar to that of lower-middle-income (68) and South Asian region (69). The improvements in the life expectancy in Pakistan indicate that over time the healthcare system in Pakistan has progressed.

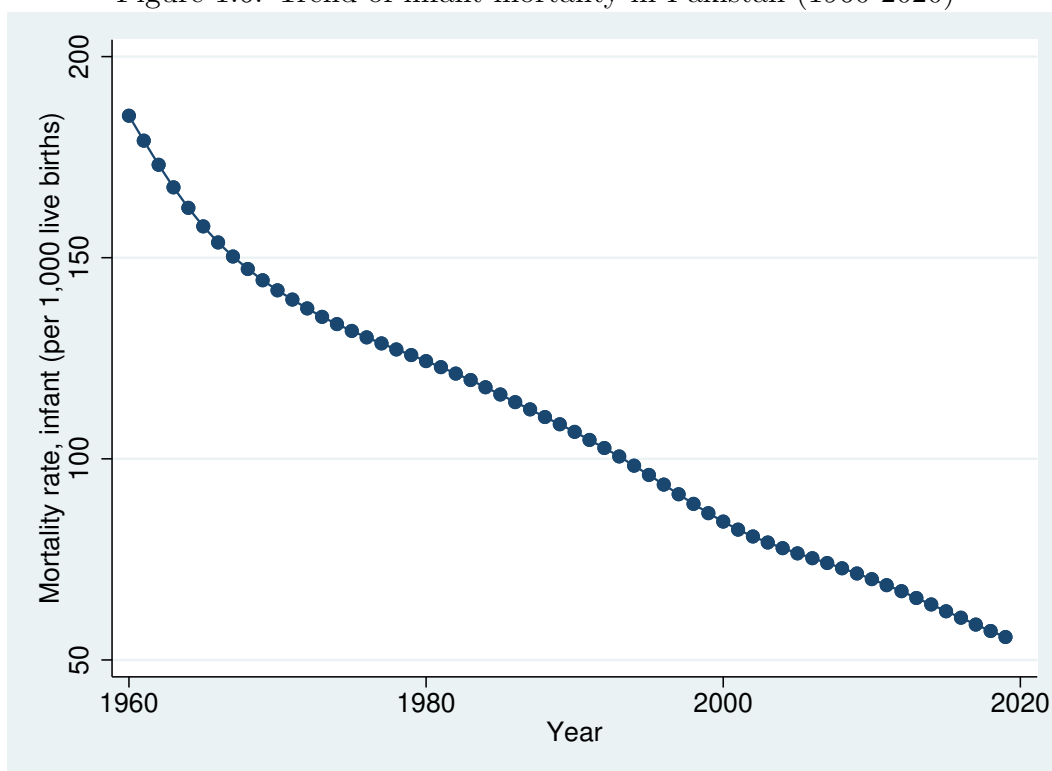
Despite low per capita income, high OPP, and relatively low financial allocations for healthcare in GDP. We observe that Pakistan has managed to considerably decrease the extent of infant mortality over the last 7 decades. In the year 1960, infant mortality per

Figure 1.5: Trend of Life expectancy in Pakistan (1960-2019)



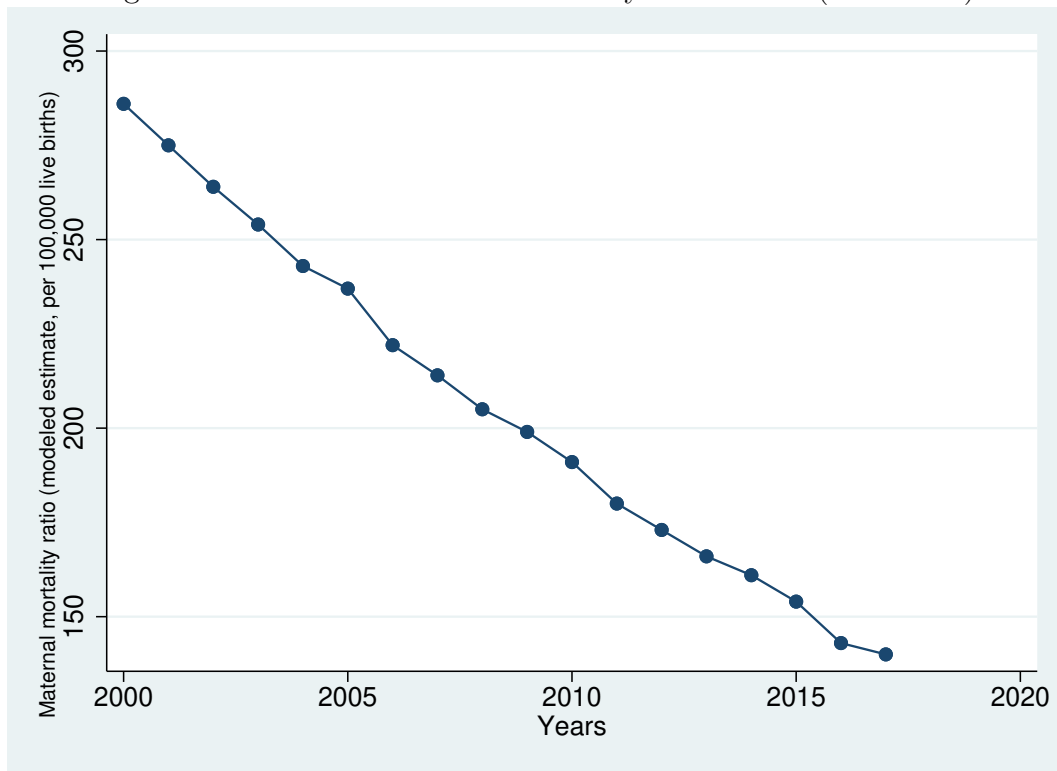
Source: World Development Indicators (2019)

Figure 1.6: Trend of infant mortality in Pakistan (1960-2020)



Source: UN Inter-agency Group for Child Mortality Estimation

Figure 1.7: Trend of maternal mortality in Pakistan (2000-2017)



Source: World Health Organization (2017)

1000 live birth was (185.3), which had fallen to (57.64) per 1000 live birth by 2020. This indicates that on average in a decade, there is a reduction of (18.2) in infant mortality. Although a comparison with lower-middle-income (37), low income (48), South Asia (33), and least developed (45) reveal that infant mortality is still high in Pakistan.

Maternal mortality ratio in Pakistan is on the decline². The value of maternal mortality per 100,000 births in 2017 was (140) (see figure 1.7). This was lower than the averages of lower-middle-income (265), South Asia (163), low-income countries (455), least developed nations (415). From the above discussion, we observe that Pakistan has managed to improve its healthcare profile over the years, but there are still several endeavors to achieve.

²Maternal mortality rate is defined as the number of women who die from pregnancy-related causes while pregnant or within 42 days of pregnancy termination per 100,000 live births. The data are estimated with a regression model using the information on the proportion of maternal deaths among non-AIDS deaths in women aged 15-49, fertility, birth attendants, and GDP measured using purchasing power parities (PPPs)

1.3 Prevailing Issues and Challenges

There are few aspects of health and healthcare system which are important to discuss here, as it would allow us to better understand the prevailing issues and challenges faced by the Pakistani healthcare system.

The first important aspect to consider is the prevailing health concerns in Pakistan. The data on the global burden of diseases show that the top ten health-related causes of death in Pakistan are Neonatal disorder, Heart problems, Stroke, Diarrhea, Lower respiratory diseases, Tuberculosis, Chronic obstructive pulmonary disease (COPD), Diabetes, Chronic kidney diseases and Cirrhosis. The top risk factors behind death and disabilities are malnutrition, air pollution, hypertension, dietary risks, and the use of tobacco (Vos et al., 2020).

The second aspect to note is the wide spread presence of germ infections. WHO (2019) shows that the incidence of malaria per thousand in Pakistan is (3.4) and the incidence of tuberculosis is (265) per hundred thousand. The healthcare system in Pakistan also faces issues like dengue outbreaks, which have claimed several lives in recent years³. Another challenge faced by the healthcare sector is the eradication of Polio. Hepatitis is a growing concern, and it is estimated that 12 million people are suffering from hepatitis B or C and each year 150 thousand new cases are reported⁴. Along with the burden of diseases Pakistan has faced an era of terrorism and several natural disasters, further increasing the stress on the existing healthcare infrastructure. The recent pandemic has also presented a serious challenge to the healthcare system⁵.

Thirdly, healthcare resources in Pakistan are insufficient or scarce, and this scarcity of healthcare resources can induce issues in healthcare provision. In the year 2018, the country had 0.98 physicians and 0.66 nurses and midwives per thousand population. Both values show a relatively low number of healthcare professionals as per recommended guidelines of the WHO. The WHO recommends 2.5 medical personals per thousand for adequate coverage in primary healthcare (WHO, 2015). Furthermore there were 0.63

³<https://www.dawn.com/news/1515168>

⁴<http://www.emro.who.int/pak/programmes/prevention-a-control-of-hepatitis.html>

⁵<https://www.dawn.com/news/1618429>

hospital beds per thousand population which is low for inpatient care. We need to point out that the above-mentioned statistics are country-based and include both the private and public healthcare sectors. The detailed discussion on public healthcare services at the sub-national level is presented in the next chapter.

1.4 Objectives

The underlined objective of this study is to examine the healthcare sector considering the provision of public healthcare services, improvement/deterioration in the public healthcare sector, and the healthcare choices of households. The questions examined in this research can be grouped in three sets and are summarized as follows:

- 1) Is there an evidence of disparities among the districts of Pakistan in terms of the availability of public healthcare resources? Are available public healthcare services sufficient to cater for the needs of the population residing in these districts? What is the magnitude of disparities in public healthcare resources at the sub-national level?
- 2) What is the impact of devolution on public healthcare utilization at the sub-national level? Has devolution of the healthcare system improved the utilization of public health care facilities for general consultations, primary healthcare consultations, and maternal health? What is the heterogeneous impact of terrorism, natural disasters, and the level of development on healthcare utilization after devolution?
- 3) What is the role of migrant remittances as a deciding factor in the utilization of private healthcare services, instead of free public healthcare services? What is the role of the type of remittances in shaping up this choice?

In this research work we seek answers to the above questions.

1.5 Data

This thesis is based on three different data sets. The data used in the first chapter comprises data from 114 districts of Pakistan, data are collected from published reports of the provincial development statistics from the year 2008 to 2016. This data set reports the healthcare infrastructure and human resources at the district level. Due to the

unavailability of any district-level database, this data set was manually compiled from various published official reports, which are only available in paper format. The data set was constructed by administering each available value manually, then transforming data into an electronic form for this analysis.

The second data set used in this research is the Pakistan Social and Living Standards measurement (PSLM) survey which is conducted on the district level. We use four rounds of district-wise (PSLM) namely, 2008-09, 2010-11, 2012-13, and 2014-15. A two-step stratified random sampling scheme was used for data collection.

The third data set used in this research is the latest round of the nation-wide PSLM household data set conducted in 2019-2020. This data set comprises data on 160,654 households, this data set is a country-wide household representative survey which provides detailed information on the surveyed population.

1.6 Thesis Outline

This thesis consists of five chapters. The 1st chapter is related to the introduction of this thesis. 2nd chapter describes various dimensions of healthcare disparities at the district-level. Chapters 3rd and 4th are empirical. The 3rd chapter investigate the impact of devolution process on public healthcare utilization at a sub-national level. The 4th chapter examines the change in the use of public versus private healthcare services by the migrant remittance recipient households. The last chapter of this research concludes the discussion from these chapters and gives some policy recommendations in light of this research work.

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Chapter 2

Spatial Disparities in Healthcare

Abstract

The health of the population is dependent upon the provision of essential healthcare services in a country. Universal health coverage (SDG Target 3.8) is one of sustainable development goals. Universal health coverage has several dimensions and one of its major components is the availability of quality healthcare services. Equitable public healthcare services ensure effective healthcare for all individuals. Some questions in this regard need to be pondered upon. Are there regional disparities in the distribution of the healthcare resources? The extent of these differences in the availability of healthcare resources are due to certain demographic characteristics? Are the available healthcare services enough to cater for the need of the population residing in different areas? and what are the differences between the populous and urban areas with other respective regions?

In this study we examine these questions using sub-national (district) level data from Pakistan. The data set reports the healthcare infrastructure and human resources available at the district level . Due to the unavailability of any district-level database, this data set was manually compiled from various published official reports, which are only available in paper format. The data set was constructed by administering each available value manually, then transforming data into an electronic form for this analysis. This is the first such analysis conducted using dis-aggregate data from all the countries four provinces.

District are ranked based on three criteria: number of healthcare facilities, availability of facilities by population, and availability of facilities by the area of the district. The availability of public healthcare resources is also evaluated by constructing Public Healthcare Service Availability Index (PHSAI). This index is calculated using variables pertaining to health infrastructure, and medical staff. The mean comparison tests are carried out to check for the differences in healthcare services among more-and-less populated districts, as well as among more and less urbanized districts. The district level rankings and PHSAI show substantial healthcare disparities among districts. The district ranking varies substantially based on the three criteria. The ranking by facilities in 2016 shows that 20 districts out of 30 from the Balochistan province lie in the bottom quantile, While

18 districts from the Punjab lie in the top quantile. Allocations of resources in public healthcare are more concentrated in the provincial headquarters or capital cities (Lahore, Karachi, Peshawar, and Quetta). Rankings based on population indicates that districts with a low population are better ranked compared to densely populated districts. Ranking in terms of the area of a district shows that small or average-sized districts have relatively better ranking as compared to the large-sized districts.

The growth rate for facility density, inpatient beds, and medical staff also varies among districts. In general, high growth rates are recorded in districts that had relatively fewer facilities in the past (Tharparkar, Kohistan, and Harnai). Due to the growth of the facilities, the rankings of the districts have also evolved over time. The growth patterns reveal the lack of a policy-driven mechanism based on either population or need.

The lowest value of PHSAI in 2016 was 1.24 reported for Qambar Shahdadkot and the highest value of 8.45 for Sibi. In general, the more-populous districts lag behind the less-populous districts, similarly small districts have better healthcare facilities as compared to the larger districts. The mean-based comparison test show clear patterns of disparities in the distribution of healthcare resources, by population and degree of urbanization. This study concludes that there persists an enormous difference in the distribution of public health care facilities among the districts of Pakistan. Based on the analysis of the availability of healthcare resources, both physical and human, are low in most of the districts. The findings of this study highlight the need for the improvement of public healthcare in larger and less urbanized districts.

Keywords: Health Disparities, District Ranking, Pakistan

JEL Codes: I14, I18, H75, H10

2.1 Introduction

“Healing is a matter of time, but it is sometimes also a matter of opportunity”

Hippocrates, 460-370 BC

Public healthcare services serve as a lifeline for millions of people. These services are essential to support and regulate the health issues in a population. The debate on the provision of public healthcare is not a matter of recent times, rather it has deep historic roots. Public physicians were an integral part of the Greek city-states, the Byzantine empire, and ancient Egypt. In the medieval period, Church developed methods for the cleansing of the soul, body, and isolated engagement with the impure (having a contagious disease) people. The advancement in the medicine and chemistry by Arabs and their transmission of ancient Greek paved the path of modern medicine and healthcare ([Porter, 2005](#))

Over the years, healthcare services in the majority of countries of the world have led to an increase in life expectancy of their population ([Deaton, 2013](#)). Healthcare services have overcome challenges like fever, plague, and pneumonia, but several new challenges in healthcare need to be conquered like Covid-19, HIV, AIDS, Hepatitis, Tuberculosis, and Polio in the case of Pakistan. The establishment of the World Health Organization (WHO) in 1948 saw increasing focus on healthcare policies and regulations, standardization of healthcare, eradication of disease, and concepts like healthcare for all ([Ruger and Yach, 2009](#)).

There is an ongoing debate whether the provision of healthcare services should be pure public, quasi-public, or private. Unlike private healthcare sector which is profit motivated and therefore limits health access of those without adequate financial means, the public healthcare services are accessible to all. Although, a resource deficient public healthcare system can negatively impact the health outcomes. Most health professionals and researchers agree that access to healthcare and equity in healthcare should be prioritized to achieve better health outcomes for the population ([Baquet et al., 2004](#); [Mayberry et al., 2006](#); [Hasnain-Wynia and Beal, 2012](#)). [Deaton \(2004\)](#) goes a step further to edify the role

of globalization in healthcare services. He is of the view that deaths can be prevented with the help of technological transfers, improving the lives of people living in poor countries.

2.1.1 An Overview of Healthcare in Pakistan

Pakistan is the sixth most populous country in the world, having a population above 210 million (PBS, 2017). According to the World Bank (2018), the country spends (3.2%) of the GDP on healthcare, this share is one of the lowest in the South Asian region. The Healthcare Access and Quality Index (HAQ) in 2016 ranked Pakistan at 154th position out of 195 countries (Fullman et al., 2018). The Universal Health Coverage (UHC) index (WHO, 2017) gives a values of 45 for Pakistan, well below the global average of 64. The Out-of-pocket payment for medical healthcare in Pakistan is (56.24%) (WHO, 2018). The National health accounts report 2015-16 reveals that private health insurance in Pakistan is very low and only contributes around (0.9%) to the total health expenditures (PBS, 2018).

2.1.2 Healthcare Delivery Systems in Pakistan

The healthcare delivery system in Pakistan is broadly divided into two major sectors: the public healthcare sector and the private healthcare sector. Private healthcare includes hospitals owned by private individuals or organizations, Homeopathic practitioners, medical centers run by Non-Governmental Organizations (NGOs), and traditional herbal medicine (Hakims). Most of the private healthcare institutions are profit earning organizations. Public healthcare sector operates under the federal or the provincial governments. The provincial health departments manage all the medical institutions including Dispensaries, Rural Health Centers (RHCs), Basic Healthcare Units (BHUs), Tehsil Headquarter Hospitals (THQs), District Headquarter Hospitals (DHQs) within their respective domains. While the federal government regulates the operations of all military hospitals and all medical entities within the federal capital and other parts of the country.

The public healthcare sector in Pakistan has a widespread network. There are full-scale government hospitals or teaching hospitals in more populated areas. While dispensaries,

RHCs and BHUs are mostly located in the rural areas. There are (1282) hospitals, (5743) dispensaries, and (756) maternity and child welfare centers in the public sector (PBS, 2019). Before 2010, healthcare provision was a federal subject, but after the 18th constitutional amendment, the responsibility of providing healthcare services has been transferred to the provinces.

According to WHO (2013) Pakistan faces shortages of healthcare staff and infrastructure, for instance there are (0.298) hospitals, (6) inpatient beds, and (11.179) doctors per ten thousand population. Likewise the number of nurses and midwives per ten thousand in Pakistan is (4.832)¹ (WHO, 2019). It is worth mentioning here that these values are well below the WHO recommendations of a minimum of two hospitals, 25 inpatient beds, and 25 medical staff per ten thousand of the population. Besides over half of the healthcare expenditures (56.24%) are out-of-pocket. The probable reasons for such high out-of-pocket payments are due to the lack of social and private insurance in Pakistan. The government of Pakistan has taken steps to increase access to healthcare for the poor by introducing schemes like Sehat-Sahulat cards. These cards were provided to 1.2 million families in 36 districts of Pakistan and these numbers are increasing. This card enables a poor family to utilize healthcare facilities in the assigned public or private hospitals. The card has a limit between 60 thousand to 300 thousand per family, depending on the medical condition².

2.1.3 Healthcare Policies in Pakistan

Unlike the right of life, education, and equal opportunities of earning for all, Pakistan's constitution does not recognise the right to healthcare as a basic human right. However, the healthcare policies documented in Pakistan shed some light on the right to access public healthcare facilities. The national health policy document by MoH (2001) and MoH (2009) are national-level policy documents. The 2001's national healthcare policy focuses on reforms in the health sector. This document emphasizes improving the district-level healthcare infrastructure, ensuring gender equity in health, and decreasing the urban bias of healthcare both in public and private sectors. The updated policy of 2009, prior

¹The before-mentioned values are inclusive of both the public and private sectors

²<https://www.pmhealthprogram.gov.pk/>

to devolution, emphasizes the provision of essential health services, improving human resources, and the use of technology at the district level for better evaluation of the healthcare facilities.

Subsequent to the 18th amendment of the constitution the federal health ministry was devolved and the Ministry of National Health Services Regulation and Coordination (MNHSR & C) was established. A national health vision from 2016 to 2025 was introduced (see [The Ministry of National Health Services \(2016\)](#)). One of the main objectives of this vision is to provide essential healthcare services to all and achieve the Sustainable Development Goal (SDG) related to healthcare. This vision emphasis strengthening the district healthcare information systems for effective healthcare delivery at the district level.

2.1.4 Objectives

There are 122 districts in the four provinces of Pakistan. These districts have their specific heterogeneous characteristics like terrain, ethnicity, population, and others. The idea pursued in this research revolves around the existence of disparities in the public healthcare provision. We intend to elaborate on the existing disparities in the public healthcare sector among these districts and try to deliberate on the causes of these disparities. Here it is important to state that though information on public healthcare services is available at the national and provincial level. So far, no comprehensive analysis has been carried out on such a dis-aggregate data. There is no national database that contains data at the district level and much of the data are currently available in paper format only. For the sake of this study, a complete data set for 114 districts was constructed from 2008 to 2016 by a thorough collection, compilation, and computation.

The main aim of this study is to find out the disparities in the availability of healthcare resources at the district level. Our discussion focuses on three major issues. First, we want to develop an understanding of the existing differences in the availability of public healthcare facilities in the districts of Pakistan. The second is to enquire if the available public healthcare services are sufficient to cater for the needs of the population residing in these districts. Lastly, are there considerable disparities in the distribution and growth

patterns of public healthcare services.

As discussed previously, the steering idea for this study is to find out disparities in the provision of public healthcare at a sub-national level. This intrigues the need to identify districts that are performing well in the provision of public healthcare service availability and those that are not. To find this we employ different methods. First, we obtain district rankings based on three criteria: 1. absolute number of medical facilities and medical staff, 2. provision of public healthcare facilities by district population, 3. provision of public healthcare facilities by geographical area of the districts.

Second, we calculate district-wise growth rates for facility density, the density of inpatients beds, and the density of medical staff from 2008 to 2016. These growth rates provide important intuition regarding policy mechanism adopted by the government for the development of the healthcare sector and its role in eradicating disparities. Third, following the [WHO \(2015a\)](#) to evaluate the service availability assessment of healthcare infrastructure. We construct Public Healthcare Services Availability Index (PHSAI) to further investigate the existing disparities in the healthcare sector. This index includes public healthcare infrastructure and core medical staff. Lastly, we test hypotheses based on the mean differences among more and less populous, and more and less urbanized districts.

This study has five sections. The next section sheds some light on the existing body of literature. The third section presents the data and methodology employed. The fourth section discusses the results. The last section concludes this study and provides policy recommendations.

2.1.5 Theoretical Framework

There is a burgeoning body of literature on inequalities in the provision of healthcare services. The nature of disparities in healthcare is multidisciplinary and major contributions in this field are from public health professionals, social scientists, and health economists. The seminal contribution of ([Arrow, 1978](#)) paved the path to understand the economic intuition related to healthcare in the context of uncertainty and welfare. [Hammer et al. \(2003\)](#) notes the importance of Arrow's seminal work in today's world. Especially, in the

area of health markets. Although some aspects of his works have been critically evaluated, his contribution remains one of the foundation stones which has paved the path of a debate in the field of health economics.

The existing literature can be broadly divide into four themes. The first theme of literature is relates to inequity in healthcare, the second theme focuses on literature related to health inequalities due to socioeconomic factors. The third theme of literature involves inequalities in the access of healthcare, and regional and geographic aspects of health inequality. The last theme relates to the different indices used to determine differentials in the provision of healthcare services.

Literature on health inequity and health inequalities is extensive, and enough work has been done in this area. This not only includes the purely economic aspects but also several social and demographic aspects. Some studies provide the definition of health inequity and health disparities. Studies like ([Aday et al., 1984](#); [Braveman and Gruskin, 2003](#); [Culyer and Wagstaff, 1993](#); [Murray et al., 1999](#); [Whitehead, 1991](#)) focus on defining the concept of health equity. [WHO \(2015b\)](#) defines equity in health as “*The absence of systematic or potentially remediable differences in the health status, access to health care and health-enhancing environments, and treatment in one or more aspects of health across populations or population groups defined socially, economically, demographically or geographically within and across countries*”³.

A widely used definition in literature for health inequality is “*Health inequalities that are avoidable, unnecessary, and unfair are unjust*” ([Whitehead, 1991](#)). [Norheim and Asada \(2009\)](#) argues that the before-mentioned definitions lacks of the concept of distributive justice. Health inequalities are measured using methods like the Gini Coefficient, Lorenz Curve, Concentration Curves, and Concentration Index. [Wagstaff et al. \(1991\)](#) critically reviews different measures of health inequality like range, Gini, index of dissimilarity, concentration index, and index of inequality. They argue in favour of using the concentration index and the slope index of inequality, as these measures produce more robust and reliable results. Using the Dutch health survey data [Kakwani et al. \(1997\)](#) shows that the

³Originally taken from Starfield B. Basic concepts in population health and health care. *Journal of Epidemiology and Community Health* 2001;55:452-454

relative index of inequality and concentration index can give relatively accurate and close results in survey data sets by offsetting the inequalities due to the demographic attributes within the data.

[Wagstaff et al. \(2001\)](#) uses the concentration index and decomposition method to observe the causes of health inequalities in malnutrition of children in Vietnam. Inequality decomposition, Oaxaca decomposition, and total differential decomposition methods are used for the assessment of the causes of inequalities in malnutrition. [Van Doorslaer and Van Ourti \(2011\)](#) uses concentration index, its decomposition, and its measurement in case of bounded variables, with an application on the measurement of horizontal inequality. [Erreygers et al. \(2006\)](#) uses the Atkinson's measure as an alternative approach for the measurement of socioeconomic health inequality. The literature on the concentration curve points out some discrepancies in the measurement of concentration index, a corrected measure for concentration index was proposed by ([Erreygers, 2009](#)).

Studies by [Barbosa and Cookson \(2019\)](#); [Fleurbaey and Schokkaert \(2011\)](#) have used multivariate analysis to find out health inequity in healthcare and health outcomes. The former study uses standardized regression and decomposition to account for the unfair inequalities due to demographic and socioeconomic factors. The latter study shows a linkage between the horizontal and vertical inequity in health. The study also emphasizes the advantages and disadvantages of different approaches for the evaluation of the joint distribution among the income and health variables.

There is an ample research on health inequalities as a consequence of socio-economic factors. Researchers in this area usually define single or multiple socio-economic factors that can be a potential cause of health disparities. These economic factors include race, gender, location, migration, education, employment status, and health insurance. Few prominent studies in this area are by ([Barbosa and Cookson, 2019](#); [Braveman et al., 2005](#); [Bryant et al., 2009](#); [Demakakos et al., 2008](#); [Malmusi et al., 2010](#); [Wilkinson, 1997](#)).

In the same spirit ([Freeborn and Greenlick, 1973](#)) and [Aday and Andersen \(1974\)](#) define access to healthcare in terms of the distribution of the available facilities and medical staff. [Penchansky and Thomas \(1981\)](#) proposes a multi-dimensional definition of access which includes the availability of healthcare services (doctor, hospitals), accessibility (location,

transportation), accommodation (facilitating the needs of patients), and affordability (ability to pay through insurances) and acceptability (an overall environment of healthcare institution). The definition of access to healthcare has evolved and WHO (2015b) defines “*Accessibility (of health services) as aspects of the structure of health services or health facilities that enhance the ability of people to reach a health care practitioner, in terms of location, time, and ease of approach.*”⁴

Andersen (1995) argues that there are two dimensions of access (potential and perceived access). Potential access is related to the availability of services and perceived access is related to healthcare outcomes. Chapman et al. (2002) is of the view that access is related to the availability of healthcare infrastructure and the use of the existing facilities. Gulliford et al. (2002) define the dimensions of access to healthcare based on affordability, accessibility to healthcare services, and acceptability. Access to healthcare for all may also be restricted due to financial, organizational, and personal barriers. Goddard and Smith (2001) are of the view that variations in healthcare access are due to supply-side factors, such as availability, quality of services, cost, and lack of information about the healthcare service. They further elaborate on inequity in healthcare access using a supply-demand framework.

From the above discussion, we can see that there are three major ways of evaluating healthcare access in literature. The first method is based on the analysis of supply-side factors such as the availability of healthcare resources. The second method uses the utilization of healthcare services, while the third method incorporates regional and geographical access to healthcare. The methods related to the utilization of services in healthcare facilities has been widely used as a proxy to measure healthcare access (Allin et al., 2010). On the similar footings studies by (Allin et al., 2007, 2010; Boccolini and de Souza Junior, 2016; Buisman and García-Gómez, 2015; Flatø and Zhang, 2016; Macinko and Lima-Costa, 2012; Winetrobe et al., 2016) use variables like visits to the doctor, inpatient bed occupancy, inpatient and outpatient facility usage to measure healthcare utilization.

The broad approaches in the provision of healthcare are either egalitarian or libertar-

⁴Originally taken from Starfield B. Basic concepts in population health and health care. Journal of Epidemiology and Community Health 2001;55:452-454

ian. The egalitarian's are advocates of government-financed healthcare provision and libertarian's are inclined towards privately financed healthcare system (Williams, 1988). Usually, a mix of these systems is used in healthcare financing. Healthcare provision in the modern world can be classified based on the incidence of expenditures on healthcare. There are four main models of provision of healthcare based on the principle of healthcare expenditure incidence. The Beveridge model is a pure public model for the provision of healthcare. This model is based on healthcare financing through the public taxation. The Bismarck model is an insurance-based model financed by individuals and employers and deductions are made from the wages of the employees. The national health insurance model is a mix of the Beveridge-Bismarck model. In this type of model, the private sector health providers are financed by the government-insured funds. The last model is the out-of-pocket model in this model healthcare is directly related to the ability to pay for healthcare. The majority of developed countries use Bismarck, Beveridge, or National health insurance models. While in the developing countries, the OPP model is more common due to the lack of a national healthcare financing system (Wallace, 2013). A cross country analysis of OECD countries by Van Doorslaer et al. (2006) uses the utilization of doctors as a measure of equity and shows inequities in the utilization of doctors among different income groups. Balsa et al. (2009) conducted a study on selected South American cities and infers the existence of disparities among these cities based on healthcare service usage by different income groups. Scheil-Adlung (2015) discusses the urban-rural disparities in access to healthcare in 174 countries. A study on healthcare access and infant mortality in the provinces of Thailand by Gruber et al. (2014) shows that infant mortality has declined in the poor provinces of Thailand, where the healthcare reforms were introduced.

Studies related to geographical access to healthcare examine variables like the distance from a medical facility, the time required to reach a medical facility, and equity in the distribution of facilities according to distance. A more specific word "Spatial Access" has been widely used in the discussion related to geographical access. Spatial access is measured by several techniques. These techniques mostly incorporate time and distance from medical facilities within a region. Spatial access is measured using several methods

like the gravity model, composite index, two-step floating catchment area, kernel density method, etc. Studies in this domain largely focus on the spatial differences in healthcare arising from travel time and distance, leading to regional disparities. ([Chan et al., 2006](#); [Guagliardo, 2004](#); [Langford and Higgs, 2006](#); [Wang and Luo, 2005](#)).

Disparities in healthcare are also measured using some composite indices. A few indices worth mentioning here are Universal Health Coverage (UHC) index, Health Access and Quality Index (HAQ), Health Services Infrastructure Index (HSI), Health Workforce Index (HWI), Service Availability Index (SAI). As a part of the sustainable development goal strategy UHC was developed by WHO. The main idea of this index is to rank countries based on three scales, namely equal access to healthcare, quality in healthcare services, and minimizing the financial barriers to healthcare services⁵. The main idea behind the UHC index is to improve the accessibility of healthcare services independent of their ability to pay ([Glassman et al., 2017](#)). The HAQ index is a composite index that employs the data from the global burden of disease, per capita health expenditures, variables related to health coverage, and number of doctors. This index ranks countries from 0 to 100 ([Barber et al., 2017](#)). HHI, HWI, and SAI are used to monitor the healthcare systems. These indexes also evaluate the availability of healthcare resources. HHI is an average measure of the total number of healthcare facilities, HWI is the sum of the healthcare staff and SAI is an average index of HHI and HWI (see ([WHO, 2015a](#))).

The question of the provision of healthcare by the government directly or through insurance has different dimensions. The choice faced by the government to provide healthcare through public or private healthcare providers is a trade-off between efficiency and the quality of health service. If the government provides healthcare through private insurance, it may create a moral hazard through over-use of healthcare services. The adverse selection problem may also arise due to the differences in prices of insurance for the sick and the healthy ([Cutler, 2002](#)).

Certain aspects of healthcare provision can be explained using game theory. The rising demand for healthcare, the role of the physician, and the level of the patient's trust in physician and prescription can constitute a prisoner's dilemma. Monte Carlo simulations

⁵https://www.who.int/health_financing/universal_coverage_definition/en/

reveal that the treatment along with trust has the highest payoff and under treatment along with mistrust has the lowest payoff (Djulbegovic et al., 2015). Game theory is also useful in understanding the price inflation in healthcare (Agee, Mark D and Gates, Zane, 2013). When people select private healthcare providers, the independent or autonomous pricing decision made by the private healthcare providers can lead to a Nash equilibrium, eventually increasing healthcare prices of the private healthcare providers (Wright, 2006). From the above discussion, it is evident that several methods can be employed to measure the disparities in the access and availability of healthcare services. None of the above methods can be viewed as an ultimate solution to measure health accessibility while ensuring equity. The debate in this arena is open. This study is also an attempt to broaden the avenues of understanding the disparities in healthcare, availability, and growth in healthcare services on a sub-national level in Pakistan.

Studies on Pakistan pertaining to healthcare disparities are very few, the majority of studies conducted are either on a country level or a cross-country comparison. Studies on the sub-national or district level are hard to find. We emphasize the supply side factors of public healthcare resources. This study focuses on addressing district-level disparities in healthcare services. The concept of ranking sub-national units in general and specifically for Pakistan has not been carried out.

2.2 Data and Methodology

In this section, we focus on the data, the variable construction, the method of ranking districts, and the construction of an index to evaluate the public healthcare services availability.

2.2.1 Data

Pakistan's administrative unit includes four provinces (Balochistan, Khyber Pakhtunkhwa (KP), Punjab, and Sindh), there are two autonomous territories (Azad Jammu Kashmir and Gilgit-Baltistan), and the federal capital (Islamabad). These units are further divided into districts. There were 122 districts in the provinces of Pakistan⁶. This study is a sub-national analysis of 114 districts. The districts of Gilgit-Baltistan (GB), Azad Jammu Kashmir (AJK), the erstwhile Federally Administered Tribal Areas (FATA) are not included in this analysis due to unavailability of data.

This data set is compiled from secondary data obtained from various sources. The major source of this data is from development statistics. Development statistics is a provincial-level data source that provides data on the district level. Each province publishes its development statistics, and these reports cover several sectors at the district level (including the health sector). These reports are published annually, data on health infrastructure are collected from these reports. These reports are paper-based, data is not retrievable directly from the source's database. The data from these reports were extracted manually and relevant variable series were merged by province and district. For data compilation, unique district identifiers were assigned in an alphabetical order, along with provincial identifiers. The district identification codes assigned to newly formed districts remain the same throughout the data set. However, the data for newly formed districts were included in the data set based on the availability of their respective data after their creation.

The data availability varies across provinces. Some provincial reports were available online. Data for the province of Punjab are made available from 1985 to 2016, while those for Sindh are available only from 2008. This restricts our time period from 2008 to 2016.

⁶The number of districts of KP increased recently after the inclusion of federally administered tribal areas (FATA)

Another source of data is Pakistan Medical and Dental Council (PMDC) Which reports the number of medical staff at the district level (except for the districts of Punjab). Data for medical staff for the districts of Punjab are collected from District Health Information System reports (DHIS). Data on private hospitals were available for the districts of Punjab and Balochistan, but not for Sindh and KP. The data for district area and population were obtained from the Pakistan Bureau of Statistics (PBS) census report ([PBS, 2017](#)). Initially, the population data collected for this research was based on the estimates provided by PBS from 2008 to 2016. These estimates were based on the projections of the census held in 1998. While comparing the projected values with the latest survey available, we found under-reporting bias in the projected populations of the districts. The population data required for this analysis ranges from 2008 to 2016. To resolve the issue of population under-reporting and to obtain data for the relevant years. We interpolated the actual values from 2017 to 1998 for each district. Interpolation is performed using growth rates of the population based on the average growth rate for the inter-census period.

During the considered time period five new districts were created. In 2009 district Chiniot was created from district Jhang, in 2011 Tor Ghar was carved out from district Mansehra, while in 2013 Sujawal was created out of Thatta, Sohbatpur from Jaffarabad, and Lehri from Sibi. The data for the districts of Tor Ghar, Sohbatpur, and Lehri were not reported in their respective development statistic reports. The data for district Sujawal were reported in 2015 and data for district Chiniot were reported in 2010. Karachi is the largest city by population in Pakistan having six districts, but data reported in Sindh development statistics sums data for all the districts of Karachi. Consequently, this data set comprises data from 35 districts of Punjab, 30 districts of Balochistan, 24 districts of Sindh, and 25 districts of Khyber Pakhtunkhwa. These districts account for approximately (88.5%) of the total population of Pakistan.

2.2.2 Variables

To evaluate the physical infrastructure of public healthcare, we constructed a variable of public health institutes at district level. The variable of public health institutes is defined as the sum of the total number of public hospitals, dispensaries, rural health care centers,

maternal and child health care units, sub-health care units, tuberculosis clinics, and basic health units. This variable is calculated using the following equation.

$$ph_{i,t} = \sum_{j=1}^7 x_{j,i,t} \quad (2.1)$$

where $i=1 \dots 114$, $t=2008 \dots 2016$, $j=1 \dots 7$

$ph_{i,t}$ represents the total number of public health facilities. $x_{j,i,t}$ represents public health-care facilities in the i^{th} district at time t and j represent the included public healthcare facilities. It is pertinent to note that the above variable only includes public healthcare institutions functioning under the health departments of the respective provinces. Due to data unavailability institutions affiliated with the federal government, armed forces, and private individuals or groups are not considered in the above definition.

A hospital in the above case is defined as a public sector entity for the provision of health services, a hospital provides health services to all kinds of patients (outpatient, inpatient). A hospital should have a minimum number of 10 inpatient beds (as per the definition used in respective provincial development statistics). Any facility having less than ten inpatient beds is defined as a dispensary. Rural health care centers are medical institutes in rural areas of the districts. Basic health units are the health facilities at a union council level. The maternal and child health care units are health institutions specifically established for the provision of maternal and child healthcare.

The second variable is related to core medical staff or human resource in public healthcare institutions. This variable includes healthcare practitioners (Doctor, Nurses, and Midwives) regardless of their employment status (regular or contractual). Human resource in public health facilities plays a vital role in the provision of healthcare for both inpatients and outpatients. The inclusion of core healthcare staff would allow us to observe the disparities in the distribution of human resources.

This variable is defined as

$$mp_{i,t} = \sum_{j=1}^3 z_{j,i,t} \quad (2.2)$$

where $i=1 \dots 114$, $t=2008 \dots 2016$, $j=1 \dots 3$

Equation 2.2 is the sum of the total number of doctors, nurses, and midwives represented by $mp_{i,t}$. Whereas $z_{j,i,t}$, represents the medical staff in a district i at a given time t . The category of doctors includes general practitioners, specialists, and surgeons. This variable only accounts for medical staff working in public sector. Medical staff working in the private sector, federal institutions, and hospitals of the armed forces are not included.

For the assessment of public healthcare infrastructure for inpatient care $bp_{i,t}$ is used. The inpatient bed is one of the measure used to evaluate the size and capacity of a healthcare institute.

$$bp_{i,t} = \sum_{j=1}^7 y_{j,i,t} \quad (2.3)$$

where $i=1 \dots 114$, $t=2008 \dots 2016$, $j=1 \dots 7$

Equation 2.3 show the total number of inpatient beds in the public healthcare sector at district level. This variable includes the number of beds in all public healthcare institutes (hospitals, dispensaries, rural health care centers, tuberculosis clinics, basic health units, maternal and child health care units, and sub-health care units) and the reported statistics do not differentiate hospital beds on the basis of its type or use. The before-mentioned three variables can be considered as core variables in this research. These variables are used in several ways to find out the disparities in public healthcare provision.

2.2.3 Methods for Ranking Districts

We intend to rank districts on three criteria as heterogeneity among districts can influence rankings of the districts. For instance, the healthcare infrastructure in less and more populous and small and large districts is not comparable. Hence, heterogeneity in the characteristics of the districts are crucial factors while ranking.

The first method used to rank districts is based on the availability of healthcare resources. A district having the highest number of public health institutions $ph_{i,t}$, medical staff $mp_{i,t}$, and inpatient beds $bp_{i,t}$ is ranked highest.

District ranking by institution, medical staff and inpatient beds are shown by $rph_{i,t}$, $rmp_{i,t}$, and $rbp_{i,t}$, respectively. The district are ranked in an ascending order, therefore a district with the lowest rank is represented as 1 at any time t , For example, a district x has the least number of public health institutions in 2016, so x has the lowest rank and a district y with the greatest number of public health institution has the highest rank in 2016. This can be represented as the following.

$$rph_{x,2016} < rph_{y,2016} \quad (2.4)$$

As the individual rankings vary across districts the arithmetic mean is used to unify individual ranking into a single value. Arithmetic mean gives us an average ranking at district level in a respective year.

$$mr_{i,t} = rph_{i,t} + rmp_{i,t} + rbp_{i,t}/3 \quad (2.5)$$

The above measure does not include heterogeneous factors such as population and area. To consider population we include a population-adjusted measure to rank districts. The population-adjusted measure are frequently used in literature and such measures are specifically used in cross-country comparisons (see (WHO, 2015a)). The population-adjusted ranking can be obtained by a simple modification of equation 2.1, 2.2, and 2.3. The first modification is represented in the following equation.

$$dph_{i,t} = (ph_{i,t}/pop_{i,t}) * k \quad (2.6)$$

For a population-adjusted measure of public health institutions, we divided $ph_{i,t}$ with population $pop_{i,t}$ to obtain per capita public health institution ($ph_{i,t}/pop_{i,t}$), the per capita health institution is then multiplied with a constant factor k. This constant factor represents population in ten thousands. $dph_{i,t}$ represents facility density in " i^{th} " district at time t . Similarly, the density of medical staff and the density of inpatient beds are

calculated using the following equations.

$$dmp_{i,t} = (mp_{i,t}/pop_{i,t}) * k \quad (2.7)$$

$$dbp_{i,t} = (bp_{i,t}/pop_{i,t}) * k \quad (2.8)$$

Equations 2.6-2.8 represent the facility density, the density of medical staff, and the density of inpatient beds per ten thousand inhabitants in a district, respectively.

The districts are ranked using $dph_{i,t}$, $dmp_{i,t}$ and $dbp_{i,t}$. For ranking districts, we use a similar method as discussed above. This ranking of variable gives us $rdph_{i,t}$, $rdmp_{i,t}$ and $rbp_{i,t}$. The ranked values of each density variable are further used to calculate population-adjusted average ranking of districts.

$$dmr_{i,t} = rdph_{i,t} + rdmp_{i,t} + rdbp_{i,t}/3 \quad (2.9)$$

The area of a district can also play an important role in determining the access to healthcare facilities. A large-sized district and a small-sized district having the same number of facilities will be ranked the same, but the residents of a large-sized district may find it difficult to access public health services due to its geographical vastness as compared with a small-sized district. We include the surface area of a district to tackle this issue. Equations 2.1, 2.2, and 2.3 are divided by the area of a district to obtain a measure of public healthcare facilities in per square kilometer of a district.

$$aph_{i,t} = (phi, t/area_{i,t}) \quad (2.10)$$

$$amp_{i,t} = (mpi, t/area_{i,t}) \quad (2.11)$$

$$abp_{i,t} = (bpi, t/area_{i,t}) \quad (2.12)$$

Equation 2.10, 2.11 and 2.12 represent public healthcare facilities, medical staff, and inpatient beds in per square kilometer of a district. The above-mentioned variables

in Equations 2.10, 2.11, and 2.12 are used to assign rankings to the district. This ranking enables us to understand the spread of public health facilities in the geographical boundaries of a district. The districts having a relatively lower number of facilities per square kilometers are ranked low and vice versa. The corresponding district rankings are $r_{aph_{i,t}}$, $r_{amp_{i,t}}$, and $r_{abp_{i,t}}$, respectively. The average ranking is calculated using equation 2.13 to get a more vivid picture of public healthcare facilities by the area of a district.

$$amr_{i,t} = (r_{aph_{i,t}} + r_{amp_{i,t}} + r_{abp_{i,t}})/3 \quad (2.13)$$

Further, growth rates for densities (hospitals, medical staff and inpatient beds) are calculated. These growth rates enable us to understand the growth patterns of public healthcare delivery with respect to the rising population.

$$gdph_{i,t} = ((dph_{i,2016} - dph_{i,2008})/dph_{i,2008}) * 100 \quad (2.14)$$

$$gdmp_{i,t} = ((dmp_{i,2016} - dmp_{i,2008})/dmp_{i,2008}) * 100 \quad (2.15)$$

$$gdbp_{i,t} = ((dbp_{i,2016} - dbp_{i,2008})/dbp_{i,2008}) * 100 \quad (2.16)$$

The above equations give us the growth rates of the density of public healthcare institutions, the growth rate of the density of medical staff, and the growth rate of the inpatient beds in the public health institutions, respectively.

2.2.4 Public Healthcare Services Availability Index

An index of public healthcare services availability index $phsai_{i,t}$ is calculated to obtain an overall picture of the distribution of public healthcare resources, both physical and human among the districts of Pakistan. This index is an average of public healthcare infrastructure and medical staff. This index is calculated using the following two equations for each district, equation 2.17 depicts the average of public healthcare infrastructure.

$$phi_{i,t} = (dph_{i,t} + dbp_{i,t})/2 \quad (2.17)$$

$phi_{i,t}$ is the average of public healthcare infrastructure index for district i , at time t . With the addition of the density of medical staff $dmp_{i,t}$ in $phi_{i,t}$ and then taking average we get the following equation. The $phsai_{i,t}$ is calculated using the recommended guidelines of WHO (see (WHO, 2015a)).

$$phsai_{i,t} = (phi_{i,t} + dmp_{i,t})/2 \quad (2.18)$$

This index is useful for the evaluation of gap between the existing public healthcare infrastructure and the recommended standards for healthcare provision as suggested by WHO.

2.2.5 Mean Comparison t-test

The analysis of mean comparisons is used to find out the differences between the mean values of the indicators used in this analysis. We use two criteria for the mean comparisons. First, criterion used for mean comparison analysis is by categorizing districts based on their populations. The districts are divided into two categories: districts having a population above or equal to one million and below and second criterion divides districts into two groups based on urbanization. The t-test for mean comparison is used to find out the differences in the mean values using a two-tailed hypothesis, at a 95% confidence interval.

2.3 Results and Discussion

Choropleth maps are used for comparing districts based on their respective rankings. In this section, after the discussion on the rankings, the growth rates of facility density, the density of medical staff and the density of inpatient beds are discussed. This follows a comprehensive discussion on the public healthcare services availability index and mean comparisons.

2.3.1 Ranking Districts by the Availability of Public Healthcare Facilities

The number of hospitals and other medical facilities like inpatient beds, and the core medical staff can provide some fundamental assertions regarding the overall state of public health care in a district. To observe this, we ranked districts by the availability of these respective facilities. The average rank of these facilities was calculated to evaluate the differences in healthcare facilities among the districts of Pakistan. Table 2.1 shows the ranking of the bottom ten districts of Pakistan from 2008 to 2016.

District rankings

The rankings presented here are average-ranked values of available public healthcare resources at district level. These resources include the total number of hospitals, beds, and medical staff in a district. The bottom ten districts ranked in terms of the absolute numbers of facilities in 2008, are presented in table 2.1. All the ten districts in the bottom ten list are from the province of Balochistan. Sheerani is ranked lowest, having the least number of facilities among all the districts of Pakistan. District Sheerani has a total of 12 public healthcare units: including hospitals, dispensaries, basic healthcare units, rural health care centers, tuberculosis centers, and maternal and child health care units. This was the lowest number of public health institutions in any district of Pakistan in 2008. There were 32 inpatient beds in all public healthcare facilities in Sheerani. In terms of inpatient beds, the situation is worse in district Barkhan, the second lowest-ranked district, with only 10 inpatient beds and only 6 core healthcare workers.

Table 2.1: The List of Bottom Ten Ranked Districts by the Availability of Public Healthcare Resources

Year	District	Rank	Year	District	Rank	Year	District	Rank
	Sheerani	2		Sheerani	2		Sheerani	1.7
	Harnai	3.3		Barkhan	2.7		Barkhan	3
2	Barkhan	3.7	2	Harnai	3.3	2	Harnai	3.7
0	Awaran	6	0	Awaran	6.3	0	Musakhel	4
0	Musakhel	6.7	0	Musakhel	6.7	1	Awaran	5.3
8	Nushki	6.7	9	Nushki	7.7	0	Washuk	12
	Washuk	10		Washuk	10.7		Kharan	13
	Ziarat	11.7		Mastung	11		Jhal Magsi	13
	Mastung	13		Kharan	13		Nushki	13.3
	Jhal Magsi	14		Kohistan	13.3		Kohistan	13.7
	Sheerani	1.7		Sheerani	1.3		Sheerani	1.3
	Harnai	2.7		Barkhan	2.3		Barkhan	2
2	Barkhan	3	2	Awaran	4.3	2	Awaran	4
0	Musakhel	4.3	0	Harnai	5	0	Harnai	5.3
1	Awaran	9.7	1	Washuk	8	1	Nushki	8.7
1	Kharan	10.3	2	Nushki	9	3	Washuk	9
	Nushki	10.7		Ziarat	11		Ziarat	10
	Washuk	11		Nasirabad	11		Nasirabad	10.3
	Ziarat	11.3		Musakhel	12.3		Musakhel	11
	Jhal Magsi	12.3		Kohistan	14.7		Kohistan	14
	Sheerani	1.7		Sheerani	2.3		Sheerani	1.7
	Barkhan	2.7		Barkhan	3.3		Barkhan	2.7
2	Awaran	4.7	2	Awaran	5	2	Awaran	4.7
0	Harnai	5	0	Harnai	5.3	0	Harnai	5.3
1	Nushki	8.7	1	Nushki	9.7	1	Nushki	9.7
4	Kohistan	9	5	Washuk	10	6	Washuk	9.7
	Washuk	9.7		Musakhel	10.3		Ziarat	10
	Ziarat	10.7		Ziarat	11.3		Musakhel	11.3
	Musakhel	11		Nasirabad	12		Nasirabad	11.7
	Nasirabad	12.7		Jhal Magsi	14.7		Jhal Magsi	14

Note: The above mentioned Bottom ten districts are ranked using total number of hospitals, beds, and medical staff. Rankings are based on the Author's calculations using provincial development statistics. Rankings for all districts can be seen in appendix table A2. The list of district is provided in appendix A1.

The rankings of bottom ten districts have not changed by much during this time period, however there are a few changes observed in the rankings of some districts. It is worth noting that in 2010, 2012, and 2013, Kohistan district appears in the list of the bottom 10. Kohistan is the only district in the list that belongs to a province other than Balochistan. The other side of the story is to observe those districts which have better public healthcare resources at their disposal. Table 2.2 depicts the top ten districts by overall public healthcare resources. District Lahore is the top-ranked district in terms of the public healthcare resources in the country. Lahore retained this position throughout the study period. In 2008, the district Lahore had a total number of 286 medical facilities, a total of 12,715 inpatient beds, and 2970 medical staff. Although district Faisalabad reported 385 medical facilities in 2008, but lower number of hospital beds and medical staff kept it below district Lahore. The Faisalabad district is ranked second in this ranking due to its large network of healthcare facilities. A relatively larger public healthcare network in Faisalabad possibly owes to the larger share of the rural area within its boundaries and subsequently, this district possess relatively more establishments for primary healthcare.

Eight out of the ten top-performing districts are from the Punjab province. Peshawar (KP) and Karachi (Sindh) appear in the top ten districts in the year 2008, and both being provincial capitals. Table 2.1 and Table 2.2 also depict that there are none of the districts of Punjab or Sindh in the bottom ten and no district of Balochistan is in the top ten ranked districts. However, Quetta the capital district of Balochistan is an outlier among all the districts of Balochistan, having relatively more public healthcare resources as compared with the other districts of the province. We observe that all the provincial capital districts are relatively better in terms of healthcare services within their respective provinces.

The resource allocations in capital cities of the provinces is not an anomaly. As the provincial capital districts are most populous cities of their respective provinces. Peshawar is the second-highest ranked provincial capital followed by Karachi and Quetta. Peshawar has 131 healthcare facilities, 5,362 inpatient beds, and 1,937 medical staff. Karachi has

Table 2.2: The List of Top Ten Ranked Districts by the Availability of Public Healthcare Resources

Year	District	Rank	Year	District	Rank	Year	District	Rank
	Karachi	102		Karachi	102		Karachi	103
	Gujranwala	102		Gujranwala	102		Gujranwala	104
2	R.Y.Khan	103	2	R.Y.Khan	104	2	Peshawar	105
0	Peshawar	104	0	Peshawar	104	0	R.Y.Khan	105
0	Sargodha	104	0	Bahawalpur	104	1	Bahawalpur	105
8	Bahawalpur	104	9	Sargodha	104	0	Sargodha	106
	Multan	106		Multan	106		Multan	107
	Rawalpindi	108		Rawalpindi	108		Rawalpindi	109
	Faisalabad	110		Faisalabad	110		Faisalabad	111
	Lahore	111		Lahore	111		Lahore	112
	Karachi	103		Karachi	104		Karachi	103
	Gujranwala	105		R.Y.Khan	105		Sargodha	105
2	R.Y.Khan	105	2	Rawalpindi	105	2	Rawalpindi	105
0	Peshawar	105	0	Gujranwala	105	0	Gujranwala	105
1	Sargodha	105	1	Sargodha	105	1	Multan	105
1	Bahawalpur	105	2	Peshawar	105	3	Peshawar	106
	Multan	107		Bahawalpur	106		Bahawalpur	107
	Rawalpindi	108		Multan	107		R.Y.Khan	107
	Faisalabad	111		Faisalabad	111		Faisalabad	111
	Lahore	113		Lahore	113		Lahore	113
	Karachi	102		Peshawar	106		Gujranwala	105
	Multan	105		Rawalpindi	106		Peshawar	105
2	Sargodha	105	2	Multan	106	2	Multan	106
0	Rawalpindi	106	0	Sargodha	106	0	Sargodha	107
1	Gujranwala	106	1	Gujranwala	106	1	Karachi	107
4	Peshawar	106	5	Karachi	107	6	Rawalpindi	107
	R.Y.Khan	106		Rahim Yar Khan	107		Bahawalpur	107
	Bahawalpur	107		Bahawalpur	108		Rahim Yar Khan	107
	Faisalabad	111		Faisalabad	112		Faisalabad	113
	Lahore	113		Lahore	114		Lahore	114

Note: The above mentioned top ten districts are ranked using total number of hospitals, beds, and medical staff. Rankings are based on the Author's calculations using provincial development statistics. Rankings for all districts can be seen in appendix table A2

a slight advantage in the number of healthcare facilities over Peshawar with 148 public healthcare institutions, but the number of inpatient beds is twice in latter. Although Quetta is the best ranked district among the districts of Balochistan, but it does not appear in the nation-wide top ten district list. Quetta has 73 public healthcare institutions, 2,323 inpatient beds, and 1,642 medical staff.

A Spatial Illustration of District Wise Public Healthcare Resources

To illustrate the distribution of public sector healthcare resources across Pakistan, we use choropleth maps. These maps are a useful tool to visualize the distribution of public healthcare resources among the districts of Pakistan. Figure 2.1 shows an overall view of the ranking of the districts based on the availability of the public healthcare resources in 2008.

Differences in the distribution of public healthcare resource between the districts of Pakistan is evident from figure 2.1. The districts are divided into five categories based on the availability of healthcare resources: lowest (red), moderately-low (brown), medium (off-white), moderately-high (light blue), and highest (blue) facilities. Data for Lehri, Sujawal, Sohbatpur, Chiniot, Islamabad, and Tor Ghar districts (shown in white) are not available.

Districts in red include 23 districts out of 112 districts of Pakistan. In 2008 data for the districts of Chiniot and Sujawal were not included, as these districts were carved out from the districts of Jhang and Thatta, respectively after 2008. 17 out of 23 districts with the lowest healthcare facilities are located in Balochistan. There are three districts of KP, namely, Kohistan, Hangu, and Tank in this category, and three districts from the Sindh province (Tando Muhammad Khan, Kashmore, and Tando Allah yar). Tando Allah yar and Tando Muhammad Khan were carved out of Hyderabad district in 2004-05. These two consists of more rural parts of the parent district and rely on the latter's urban healthcare facilities. The district administration of Hyderabad has also shown concern in the utilization of public healthcare services⁷.

⁷<https://www.dawn.com/news/181099>

22 district are ranked moderately-low, out of these districts, nine districts are from Balochistan, nine districts from KP, and four districts belong to the Sindh province. Again, there are no district of Punjab in this category. Khuzdar is the the top district in this category with a mean ranking of 45, while with a mean ranking of 25 Kacchi is the lowest.

There are some common trends in the lowest and moderately-low ranked districts of Balochistan. Out of the total 30 districts of Balochistan 26 districts fall in bottom two quantiles. This implies that (86%) of the districts of Balochistan do not have sufficient healthcare facilities as compared with the other districts of Pakistan. There are clusters of the districts having low levels of public healthcare services. The first cluster includes Awaran, Panjgur, Washuk, Chagai, Kharan, Nushki, and Mastung, these are neighboring districts of Balochistan, and all of them are ranked low.

Khuzdar, Kalat, Kacchi, Sibi, and Kohlu in central Balochistan form another cluster of moderately-low ranked district. Sheerani, Musakhel, Barkhan, Dera Bugti, Nasirabad, and Jhal Magsi form an inverted crescent of the districts located in the east and north-east of Balochistan. The provincial capital of Quetta is surrounded by Mastung, Harnai, Ziarat, Pishin, and Killa Abdullah districts located in the bottom two categories. Healthcare seekers from the surrounding districts may also utilize the healthcare services of the Quetta districts, but individuals from the far-flown districts in the southwest of Quetta like Chagai, Kharan, Washuk, and Panjgur may have to rely on the existing infrastructure due to the huge distance for the capital. For instance, a road trip from Washuk and Panjgur to Quetta takes more than seven hours⁸.

We also observe that the districts of KP: Shangla, Batagram, Buner, Swabi, and Malakand are adjacent and form a cluster of the districts having moderately-low healthcare facilities. This cluster is situated in northern KP. Excluding district Swabi none of these districts has a tertiary public healthcare (category A) hospital.⁹

The districts in off-white color are medium ranked. There are 23 districts in this category, eight districts are from Punjab, six each from Sindh and KP, and three from Balochistan.

⁸The traveling time by road is calculated using the information provided by google maps

⁹<http://www.healthkp.gov.pk/wp-content/uploads/2017/04/Categorization-of-HF.pdf>

The bottom district in this category is Haripur and the top district in this category is Nankana Sahib. Nankana Sahib was created in 2005 from the Sheikhupura district.

The category in the light blue color shows all those districts having a moderately-high ranked districts. This category has 22 districts, out of which ten are from Punjab, four from KP, and eight from Sindh, while there are no districts of Balochistan in this category.

The category of districts depicted by the blue color in figure 2.1 is the top-ranked category of districts based on the availability of public healthcare facilities. In this category there are 22 districts. The Lahore district is at the top with an average rank of 111.3. Out of the total 35 districts from Punjab, 17 districts lie in this category. Most of the districts of Punjab are lie in the moderately-high or highest facility category. There are two districts each from KP and Sindh, respectively. The only district from the Balochistan province in this category is the provincial capital Quetta.

There are a few things worth noting here, by observing districts in the top two categories we can make some assertions. Out of the total 44 districts in these two categories, there are 27 districts of Punjab, ten districts of Sindh, six districts of KP, and only one district of Balochistan. This implies that in these two categories (61%) of the districts are from the province of Punjab. Beside, except for the district of Lodhran, all districts in southern Punjab lie in moderately-high or highest categories. Except for Pakpattan, Hafizabad, Narowal, and Nankana Sahib, all districts of central Punjab are ranked in these two categories. Likewise, excluding Chakwal, districts in the northern Punjab follow the same pattern.

District wise progress in the Availability of Healthcare Resources

To analyze the progress and changes in the rankings of the districts based on the availability of healthcare resources over the years, we compare the rankings of 2008 and 2016. This comparison allows us to observe the changes in these facilities over nine years. Comparisons of the top ten and the bottom ten district rankings over this period are shown in table 2.1 and table 2.2. For this comparative analysis we use figure 2.2.

Figure 2.2 depicts the overtime changes in the rankings of the districts of Pakistan. In

District Ranking by Healthcare Facilities (2016)

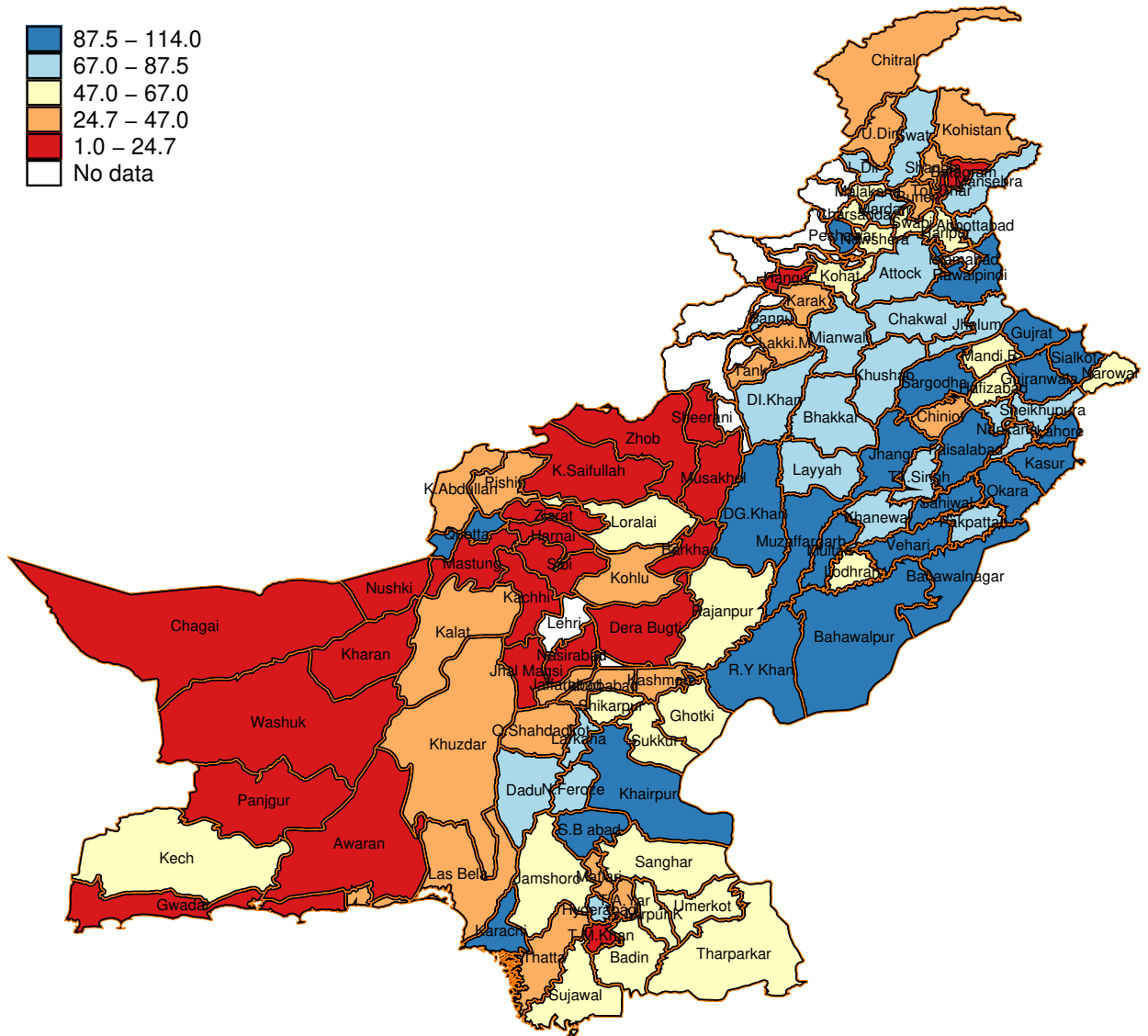


Figure 2.2: Average Ranking of Districts Based on the Availability of Public Healthcare Resources (2016)

2016 there were two additional districts namely, Chiniot and Sujawal. The lowest category of districts include 23 districts, out of which, 20 are from Balochistan, two from KP, and one from Sindh. The rankings of two districts from KP (Kohistan and Tank) increased, while the rankings of (Hangu and Batagram) decreased.

In Sindh rankings of Kashmore and Tando Allah yar show improvement. The number of the districts from Balochistan in this category has increased from 17 to 20. Killa Abdullah is the only district that has graduated out of this category, while Kacchi, Gwadar, Zhob, and Sibi districts have dropped into this category. It is also observed that few districts within this category have shown improvement (Harnai, Musakhel) and a few have fallen behind (Nasirabad, Dera Bugti).

There are 22 moderately-low districts, the lowest-ranked district in this category is district Tank having an average rank of 27. It is worth noting that the district ranking of Tank has improved by seven ranks in nine years. Another worth noting improvement of 12 ranks is observed in the ranking of Killa Abdullah. In 2008 there were no districts of Punjab in this category, while in 2016, district Chiniot appeared in this category. District Chiniot was established in 2009 and was carved from district Jhang. The number of districts of Balochistan has decreased from nine to seven in this category. The two districts of Sindh (Kashmore and Tando Allah yar), previously ranked in the bottom category joined this list. In contrast, the ranking of district Thatta fell substantially by 39 places due to the carving out of Sujawal district.

The third category pertains to medium-ranked districts. Out of 23 districts in this category 10 districts belong to Sindh, 5 each belong to Punjab and KP, and 3 belong to Balochistan. Three districts (Nankana Sahib, Chakwal, and Pakpattan) present earlier in this category have gone up to higher categories, while three other have fallen into lower categories. The ranking of some districts within this category has also improved, e.g. Mandi Bahauddin, Lodhran, and Rajanpur. In contrast the districts of Sindh within this category show a general deterioration.

The number of medium-high ranked districts in 2016 is 24. There are 12 districts of Punjab in this category. There is an overall improvement in the ranking of Bhakkar, Mianwali, Khanewal, Toba Tek Singh, Jhelum, and Attock. We observe that the districts

of Pakpattan, Nankana Sahib, and Chakwal have shown a significant improvement from medium category to medium-high category, however, Sheikhpura district declined from high to medium-high in this time period. The changes in the ranking of these districts of Punjab assert that public healthcare facilities have improved in the province of Punjab. This also implies an overall improvement in the health rankings of the districts of Punjab. As in 2008, there were no districts of Balochistan in this category, similarly, in 2016 none of the districts of Balochistan were found in this category. There are seven districts of KP in medium-high ranked districts, Mardan, Dera Ismail Khan, Swat, and Mansehra districts were also present in 2008. The ranking of the districts of Bannu and Lower Dir has increased from medium to medium-high. There is also a decline in the ranking of Abbottabad from high to medium-high in 2016. The number of districts of Sindh in this category is reduced from eight to four during this period. The ranking of district Dadu and Larkana has improved and the ranking of Hyderabad and Naushahro Feroze have slightly declined, but they remain in the same category.

The districts of Mirpur Khas, Badin, Sanghar have declined from the medium-high ranked districts to the medium ranked districts. District Thatta has declined to the lower-medium-ranked district. The only district which has shown an improvement in its ranking is Shaheed Benazirabad. In the high-ranked districts, there are 23 districts, out of which 18 districts belong to the province of Punjab. A similar pattern was observed earlier. The ranking of the Sheikhpura district has declined from high to the medium-high ranked district. The ranking of district Kasur and district Okara has increased. There is only one district of Balochistan and KP in this category, namely Quetta and Peshawar and three districts of Sindh.

Regional Patterns

From the above discussion on rankings, we see that public healthcare resources are unevenly distributed among the districts of Pakistan. The districts of the province of Punjab have relatively more public healthcare facilities as compared with the districts of the other provinces. The districts of Balochistan have the minimum rankings in terms of the availability of public healthcare resources. We can also assert that the allocations

of resources in public healthcare are more inclined towards the provincial capitals like Lahore, Karachi, Peshawar, and Quetta. By observing the trends of the newly created districts, we do not observe any improvements, neither in their own rankings nor in the rankings of those districts from which these districts have been carved. We might assume that the newly created districts are merely an average of their respective province or parent district.

2.3.2 District Ranking by Population

Pakistan is the 6th most populated country in the world, with an approximate population of 207.7 million (PBS, 2017). Karachi, Lahore, Faisalabad, Rawalpindi, Gujranwala, Peshawar, Multan, Hyderabad, Islamabad, and Quetta are the most populated districts of Pakistan. To include the effects of the population, we ranked all districts based on the availability of public healthcare facilities available for 10,000 inhabitants. Similar indicators are reported in World health statistics (see WHO (2020)) and are frequently used by the researchers to evaluate the capacity of a healthcare system (see (Abdullah et al., 2014; Balarajan et al., 2011)). The results of the district rankings with respect to the population are reported in table 2.3 and table 2.4, respectively. The list of bottom ten districts are shown in table 2.3 and the top ten districts are shown in table 2.4. The results in table 2.3 significantly differ from those in table 2.1. The rankings of the districts have changed with the inclusion of the population. There are six districts of Punjab and two each of Sindh and KP in the bottom ten districts. Kohistan district is the only district that has been placed in the bottom 10 in both rankings. Other than Kohistan, there are no other districts of KP which appear in the bottom 10. Changes in the ranking of the districts are subject to the rising population of the districts, asserting that higher population growth can significantly affect the ranking of districts. We also observe stagnation in the development of public health facilities relative to the rising population.

Another interesting thing to note in table 2.3 is that one of the best districts by availability of public healthcare facilities, Karachi, is being reported in the bottom ten districts in this ranking. Karachi remains in the bottom ten list consecutively from 2013-2016. Low

Table 2.3: The List of Bottom Ten Ranked Districts by the Availability of Public Healthcare Resources with respect to Population

Year	District	Rank	Year	District	Rank	Year	District	Rank
	Kashmore	10.7		Kashmore	11.7		Khanewal	11.3
	Khanewal	13		Khanewal	12.3		Kashmore	11.3
2	Swabi	13	2	Kohistan	15.3	2	Kohistan	14.3
0	Muzaffargarh	17	0	Muzaffargarh	16.3	0	Lodhran	17
0	Lodhran	18	0	Swabi	16.7	1	T.M.Khan	17
8	Kohistan	19.3	9	T.M.Khan	16.7	0	Muzaffargarh	17.3
	Rajapur	19.3		Kasur	19		Swabi	17.7
	Kasur	20.3		Lodhran	19		Kasur	18.7
	Pakpattan	22.7		Rajapur	20.3		Rajapur	21.7
	Q.Shahdakt	24		Q.Shahdakt	24.3		Q.Shahdakt	23
	Kashmore	10		Muzaffargarh	13		Muzaffargarh	8.7
	Khanewal	10.7		Lodhran	14.3		Kasur	14
2	Kohistan	13.7	2	Kohistan	14.7	2	Kohistan	14.7
0	Muzaffargarh	15.7	0	Khanewal	17	0	Lodhran	15.7
1	Lodhran	17.7	1	Kashmore	17.7	1	Khanewal	16
1	T.M.Khan	19	2	Sheikhupura	19.7	3	Ghotki	17
	Kasur	19.3		Q.Shahdakt	20.3		Kashmore	17
	Rajapur	19.7		Ghotki	20.7		Karachi	17.7
	Q.Shahdakt	21.7		Rajapur	21		T.M.Khan	20.3
	Ghotki	22.3		T.M.Khan	21.3		Sheikhupura	20.7
	Muzaffargarh	9.7		Muzaffargarh	11.7		Karachi City	7.7
	Ghotki	14.7		Karachi	12.7		Muzaffargarh	10.3
2	Kohistan	15	2	Ghotki	14	2	Ghotki	12
0	Kasur	15.3	0	Kashmore	14.7	0	T.M.Khan	18.7
1	Karachi	15.3	1	Kasur	16.3	1	Sheikhupura	19.3
4	Lodhran	15.7	5	Khanewal	17	6	Kasur	20.3
	Khanewal	16		Chiniot	22.7		Khanewal	21.3
	Kashmore	17.3		T.M.Khan	24		Q.Shahdakt	22.3
	T.M.Khan	21		Q.Shahdakt	24.7		Rajapur	23
	Rajapur	21		Rajapur	25		Kashmore	24

Note: The above mentioned bottom ten districts are ranked using total number of hospitals, beds, and medical staff per 10,000's population. Rankings are based on the Author's calculations using provincial development statistics and Population data. Rankings for all districts can be seen in appendix table A3

ranking of Karachi is majorly due to its population and lack of concurrent increase in public healthcare facilities.

In 2016 Karachi has the lowest ranking of 7.7. The ranking of the Karachi district has deteriorated over time, before 2013 Karachi district did not appear in the bottom ten lists of districts. However, in just four years, the ranking of Karachi has sharply decreased. For instance, in 2013 the facility density in Karachi was 0.0780, and Karachi was ranked lowest among all districts of Pakistan. The density of medical staff was 1.922 and was ranked at 34th place, implying that in terms of the density of medical staff Karachi was the 79th worst district of Pakistan. In terms of inpatient bed density, Karachi was ranked 18th with an inpatient bed density of 2.302.

It is important to note that Karachi is the most populated district of Pakistan and one of the districts having the largest number of migrants from rural areas. Karachi receives migrants from all over Pakistan. The district's average annual population growth is around (2.60%) (PBS, 2017). Growing population and migration inflows may have also over-burdened the existing public healthcare sector in Karachi. Rural-urban migrations are not only centric to Karachi, but this phenomenon is also observed in districts like Faisalabad, Multan, Gujranwala, Hyderabad, Peshawar, Rawalpindi, Lahore and Quetta¹⁰. It is pertinent to note that this analysis focuses only on the public healthcare sector, it is quite possible that cities like Karachi, Lahore, Faisalabad, and other urban centers may have a sufficient amount of private healthcare facilities, but we cannot make any assertions regarding the provision of private healthcare in this analysis.

In contrast with the results presented in table 2.2, there are significant difference in the rankings of districts presented in table 2.4. It is observed that most of the top-ranked districts are from the province of Balochistan. District Sibi is ranked at the top, followed by Loralai and Jhal Magsi. The population of these districts were 135 thousand, 397 thousand, and 149 thousand respectively (PBS, 2017). For comparison, the mean population of the districts of Pakistan was approximately 1.7 million in 2016. The total number of medical institutions in Sibi, Loralai, and Jhal Magsi districts are 40, 88, and 33, respectively. The total number of beds in these institutions is 130, 276, and 76. The total number of medical

¹⁰<https://www.dawn.com/news/319103>

Table 2.4: The List of Top Ten Ranked Districts by the Availability of Public Healthcare Resources with respect to Population

Year	District	Rank	Year	District	Rank	Year	District	Rank
	Kharan	92.3		Kachhi	92		Jhal Magsi	92
	Kachhi	93.3		Abbottabad	92.7		Abbottabad	92.7
2	Chitral	94.3	2	Zhob	93	2	Kachhi	93.3
0	Jhal Magsi	95	0	Jhal Magsi	94.3	0	Jaffarabad	94.3
0	Gwadar	95	0	Ziarat	95	1	Gwadar	95
8	Ziarat	95.7	9	Gwadar	95.3	0	Ziarat	95.3
	Thatta	98.3		Thatta	97.7		Thatta	98.3
	Chagai	100.3		Loralai	103.7		Chagai	105
	Loralai	104.7		Chagai	104.3		Loralai	106.3
	Sibi	109.7		Sibi	109.7		Sibi	110.7
	Abbottabad	93		Kharan	90.3		Gwadar	89.3
	Ziarat	93.3		Ziarat	91		Kharan	89.3
2	Jaffarabad	93.7	2	Kachhi	91.3	2	Kachhi	92.7
0	Awaran	94	0	Gwadar	91.7	0	Chitral	93.3
1	Gwadar	95	1	Harnai	96	1	Harnai	93.7
1	Jhal Magsi	97.7	2	Thatta	96.3	3	Thatta	96.3
	Thatta	97.7		Chagai	99.7		Chagai	99
	Chagai	103.3		Jhal Magsi	102.7		Jhal Magsi	101
	Loralai	105.7		Loralai	104.7		Loralai	104.7
	Sibi	110.7		Sibi	110.3		Sibi	110.3
	Bannu	91.3		Gwadar	89.7		Tank	89.7
	Kachhi	92.3		Kharan	91.7		Kharan	91
2	Harnai	92.7	2	Abbottabad	93	2	Abbottabad	91
0	Abbottabad	92.7	0	Kachhi	94	0	Chagai	92.3
1	Thatta	94.3	1	Harnai	95	1	Kachhi	93.7
4	Chitral	97.3	5	Chitral	99	6	Harnai	94
	Chagai	99		Chagai	100		Chitral	99
	Jhal Magsi	100.3		Jhal Magsi	100.7		Jhal Magsi	100.3
	Loralai	105		Loralai	107.3		Loralai	106
	Sibi	111		Sibi	112.3		Sibi	112

Note: The above mentioned top ten districts are ranked using total number of hospitals, beds, and medical staff per 10,000's population. Rankings are based on the Author's calculations using provincial development statistics and Population data. Rankings for all districts can be seen in appendix table A3

staff in these districts is 133, 204, and 114, respectively. The healthcare facilities and healthcare staff in these districts is not high as compared with Lahore, Faisalabad, and Karachi, but due to low population these districts perform well as compared to the latter.

A Spatial Illustration of District Wise Public Healthcare Resources with respect to Population

Figures 2.3 and 2.4 show the distribution of public healthcare facilities with respect to the population in 2008 and 2016, respectively. There are 23 districts in red, including ten districts of Punjab, eight districts of Sindh, four districts of KP, and one district of Balochistan. The least ranked district in terms of public healthcare facilities by the population is Kashmore, other than Kashmore, Qambar Shahdadkot, Tando Allah Yar, Ghotki, Tando Muhammad Khan, Tharparkar, and Umerkot districts from Sindh are also ranked in this category. There is only one district of Balochistan, namely, Killa Abdullah, in this category. In this category there are five districts of southern Punjab and five districts of central Punjab. None of the districts of northern Punjab falls in this category. Contrary to the previous analysis of figure 2.1, we observe several differences in the rankings of the districts in figure 2.3. There is just one district of Balochistan in figure 2.3 as compared to 17 districts of Balochistan in figure 2.1. There were no districts from the Punjab province in this category in figure 2.1, but it is visible that there are 10 districts of Punjab in figure 2.3 and similar is the case for the districts of KP. However, there are some common districts found in both figures, namely Kashmore, Killa Abdullah, Kohistan, Tando Allah Yar, and Tando Muhammad Khan.

Interestingly, the common districts found in both of these rankings also share another common characteristic, these districts have high values of the Multidimensional Poverty Index (MPI)¹¹. For instance, MPI for Killa Abdullah is 0.641, being highest among the district of Pakistan. Kohistan has an MPI of 0.581 which is the highest among the districts of KP and Tando Muhammad Khan has the second-highest MPI in Sindh of 0.455 followed

¹¹This index is constructed using 15 indicators. Three indicators for schooling, five indicators of health, and seven indicators of standard of living. Health is weighted (25.7%) of the MPI. An indicator of health is constituted using access to health facilities, Immunization, antenatal care, and assisted delivery using the Pakistan Social and Living Standards Measurement (PSLM) of 2014-15 see <https://www.undp.org/content/dam/pakistan/docs/MPI/MPI%204pager.pdf>

by Kashmore having an MPI of 0.431.

The moderately-low category of the districts is depicted in brown color. This category includes nine districts from Punjab, six districts from KP, five districts from Sindh and two districts from Balochistan. By comparing the moderately-low ranked districts with figure 2.1, we observe that there were nine districts each of Balochistan and KP, four districts of Sindh and no district from Punjab. Upper Dir, Shangla, and Buner are three common districts in both figures 2.1 and 2.3. Based on this ranking there are 24 districts with a medium rank, by comparing figures 2.1 and 2.3, we observe that Nankana Sahib, Chakwal, and Haripur districts are the common districts in this category. Further, we observe after the inclusion of the population as an assessment parameter, the ranking of the populous districts have declined and ranking of less populous districts have improved. Some districts from the Punjab province (Khushab, Faisalabad, Lahore, Sargodha, Jhelum, and Bahawalpur) have shown a decline in their ranking, but these districts are still ranked as the moderately-high. Similarly, in the previous ranking, Lahore and Peshawar were in the category of districts having highest number of healthcare facilities, but in the current ranking these two districts are ranked as moderately-high. We also observe that other major urban centers like Quetta, Faisalabad, and Sargodha are also ranked in this category. This shows that despite the inclusion of the population in this analysis, these districts still have better healthcare facilities as compared to the other districts.

In the highest-ranked districts. There are no districts of Punjab, the absence of the districts of Punjab is not surprising. Punjab has the most densely populated districts as compared with the districts of other provinces, except few exceptions like Karachi. None of the districts of Punjab has a population below one million (PBS, 2017). Balochistan has the highest number of districts in this category due to relatively low population, followed by KP (Malakand, Mansehra, Kohat, Abbottabad, and Chitral) and Sindh (Thatta and Larkana). The top-ranked district in this category is Sibi.

District wise progress in the Healthcare Services by Population

To observe the changes in this rankings over time, we present figure 2.4. This figure depicts the rankings for the year 2016. Change in the rankings of districts during this time

period are subject to the changes in the healthcare facilities in proportion to population. From 2008 to 2016 there has been a little change in the rankings of the districts of Punjab. In 2016, the highest number of districts from Punjab province were ranked lowest. With the inclusion of two new districts (Chiniot and Sujawal), we see that district Chiniot is also ranked in this lowest quantile. The ranking of Nasirabad and Killa Abdullah deteriorated during this time period. The rankings of the three districts (Swabi, Nowshera, and Mardan) from KP improved and there is a decline in the ranking of district Charsadda. There are nine districts of Sindh in this category. An improvement in the rankings of Tando Allah yar, Tharparkar, and Umerkot districts is observed. Whereas there is a decline in the rankings of Sukkur, Badin, Sanghar, and Karachi. Poignantly, Karachi's ranking has declined to the lowest-ranked district in Pakistan. There are 23 districts in the quantile of moderately-low districts, out of which nine are from Punjab. A slight improvement in the rankings of Gujranwala, Toba Tek Singh, and Dera Ghazi Khan districts is observed within this quantile of districts, while Rahim Yar Khan, Bahawalnagar, Bhakkar, and Vehari districts moved to the quantile of medium ranked districts.

Further, a decline is observed in the rankings of the district Jhang and Layyah. The decline in the rankings of district Jhang is also subject to the formation of district Chiniot. During this time period decline in the rankings of Khuzdar, Pishin, and Dera Bugti is noted. We also note that ranking of Mardan, Swabi, Lower Dir, Upper Dir, and Shangla improved (districts from KP).

In 2008 and 2016 Attock, Rawalpindi, and Multan were ranked in the medium category. By looking at their rankings, we can assert that the growth of public health facilities has kept its pace with growing population. For instance, in the district Multan four new establishments for healthcare were added and 600 medical staff were hired.

In Balochistan the district rankings of Lasbela and Kech reduced, pushing these districts into a lower quantile, while there is an improvement in the ranking of Harnai, Nushki, and Musakhel. There are mixed results for the districts of KP in this category. There is an improvements in the ranking of Kohistan, Upper Dir, and Lower Dir and deterioration in the rankings of Dera Ismail Khan, Lakki Marwat, Kohat, and Karak. In Sindh we observe that ranking of Umerkot and Matiari improved, while Mirpur Khas, Sanghar, Khairpur

show a decline in their respective rankings. Naushahro Feroze has kept its pace with growing population and has retained itself in the medium-ranked districts. Naushahro Feroze has managed to increase 28 public healthcare institutions, 28 inpatient beds, and 102 medical staff . There is an increase of approximately 240 thousand in the population, resulting in a slight decline in the average rankings from 58.6 to 54.6, but retaining its position in this category.

There are a total of 24 districts characterized as moderately high-ranked districts. In this category there are eight districts of Punjab, six districts of Balochistan, five districts each of KP and Sindh. It is worthy to mention here that three provincial capital (Lahore, Peshawar, and Quetta) are in this category, along with relatively populated districts of Hyderabad, Faisalabad, Larkana, Bannu, Mansehra, Gujrat, Sargodha, and Sahiwal. All these districts have a population of over a million. In this context, we can assert that some of the populated districts among all districts of Pakistan have a fair amount of public healthcare resources for their respective populations. Although, districts with a population of less than a million (Sujawal, Panjgur, Kalat, Washuk, and Musakhel) are also classified in this ranking.

Districts in Blue color represents the quantile of districts with the highest public healthcare facilities with proportion to their respective populations. The highest number of (14) districts in this quantile belongs to the province of Balochistan, followed by KP (5) and Punjab (3) and there are no districts of Sindh in this category. Interestingly, Bahawalpur district with a population of above three million, Mianwali and Jhelum districts with a population of more than a million are placed in this category along with the districts of Balochistan having relatively low population.

Comparison of the two rankings

The analysis of figure 2.3 and figure 2.4 gives us some assertions. The first assertion is that the districts having a low population, in general, have a better public healthcare ranking. This assertion is not always true, as we observed several districts performing comparatively well with relatively high population in comparison with other districts having a similar demographic profile. The second assertion is that newly created districts

lag behind. We observe that newly created districts are not at parity with the existing districts. For example, parent districts Jhang and Hyderabad are comparatively ranked better as compared to Chiniot, Tando Allah yar, and Tando Muhammad Khan. This gives credence to the reasoning behind carving these districts as these parts of the mother districts are left behind in public healthcare services.

The third assertion is that improvements in the public healthcare provision varies among the districts of Pakistan. Stagnation or few improvements are observed in the districts of Sindh and Balochistan and generally healthcare facilities have increased in the districts of KP.

From the above analysis, we can also assert that increase in the provision of public healthcare resources at districts level is not based on the changes in population, rather an increase in healthcare resources (hospitals, doctors, bed) in any district seems to be random or discretionary. Policy actions excluding the factor of the population adjustments may cause disparities in the allocation of healthcare resources among the districts. The creation of new districts and division of the healthcare resources among the mother and the newly formed district also seems cumbersome. The formation of a new district leads to a decline in the rankings of the mother districts, while the ranking of the newly created districts are often lower in comparison with the mother district, this indicates towards the issues of inequitable resource allocations among both (mother and child) districts.

2.3.3 District Ranking by Area

The districts of Pakistan differ in area, terrain, and landscape. In terms of surface area, the smallest district is Tor Ghar having an area of 454 square kilometers and the largest district is Chagai with an area of 44748 square kilometers. Pakistan is a mosaic of plains, deserts, semi-deserts, mountainous regions, and plateaus. Differences in the areas and terrain of the districts have some implications in terms of the availability of public healthcare services within a district. The spread of public health facilities within a district is an important factor in analyzing how much healthcare infrastructure is required for the needs of the population residing in a particular district. Hospitals (private and public) are often clustered around some specific areas in the districts headquarter. This implies that

distance from district headquarter and periphery becomes a critical factor in healthcare availability.

The area of a district is an important factor to evaluate the average distance for the potential users of the facilities in a district and the time required to reach a facility in a medical condition, as well as the means of transportation and infrastructure available in a district to reach a public healthcare facility. Studies like (Comber et al., 2011; Escamilla et al., 2018) have evaluated disparities in healthcare due to distance. Further, (Mooney, 1983) notes that as the economic cost of travel increases, there are considerable chances that individuals may forgo healthcare consultations.

For this study, we do not have Geo-locations of the healthcare facilities, road distance, and information about transportation facilities at district level. We employ the size of a district in squared kilometers to get a holistic view of this important aspect. To analyze the distribution of public healthcare resources in terms of the area. We have divided the number of public healthcare facilities in a district with its respective area. This method enables us to rank districts on the basis of available healthcare facilities in square kilometers of a district. Table 2.5 shows the bottom ten districts of Pakistan. It is observable that from 2008 to 2016, most of the districts in this ranking are from the province of Balochistan. In different years the lowest-ranked districts are Washuk and Awaran and the bottom 10 districts include the four largest districts of Pakistan, namely Chagai, Khuzdar, Washuk, and Awaran. It is interesting to mention if we compare table 2.1 with table 2.5, we observe that both of these tables show a majority of the districts of Balochistan in the bottom ten list. The common districts in both the tables for the year 2008 are Awaran, Washuk, Musakhel, Nushki, and Sheerani, but none of these districts appear in table 2.3. We observe that the before-mentioned districts are ranked as the bottom ten districts in terms of availability of healthcare resources and availability in their respective geographies. In terms of public healthcare resource distribution based on population, these districts have better rankings due to low population. The only district of another province, appearing in this list is Kohistan. Kohistan is the second largest district of KP. This district appeared in the bottom 10 districts in different years in table 2.1, table 2.2 , and table 2.3, by this we can assert that Kohistan is one of the lowest-ranked

Table 2.5: The List of Bottom Ten Ranked Districts by the Availability of Public Healthcare Resources with respect to Area

Year	District	Rank	Year	District	Rank	Year	District	Rank
	Washuk	1.7		Washuk	1.7		Awaran	1.7
	Awaran	2		Awaran	2		Washuk	2
2	Chagai	3.3	2	Chagai	4.3	2	Chagai	3.7
0	Panjgur	6.3	0	Panjgur	5.3	0	Kharan	6
0	Khuzdar	7	0	Kharan	6.3	1	Panjgur	6
8	Kharan	7.7	9	Khuzdar	8	0	Khuzdar	7
	Sheerani	8		Sheerani	8		Musakhel	8.3
	Nushki	9		Kohistan	10		Sheerani	8.7
	Musakhel	10.3		Zhob	10.7		Kohistan	9.7
	Zhob	10.3		Nushki	11.7		Zhob	10.7
	Washuk	1.7		Washuk	1.7		Awaran	1.7
	Awaran	2		Awaran	2		Washuk	2
2	Chagai	2.7	2	Chagai	3	2	Chagai	3
0	Kharan	5	0	Khuzdar	5.7	0	Panjgur	6
1	Panjgur	5.3	1	Panjgur	6.7	1	Khuzdar	6
1	Khuzdar	6	2	Kharan	7.7	3	Kharan	7.7
	Sheerani	8		Sheerani	8.3		Sheerani	8
	Zhob	10.7		Zhob	9.7		Zhob	9
	Musakhel	10.7		Dera Bugti	10.7		Gwadar	10.7
	Kohistan	12.3		Gwadar	11.7		Dera Bugti	11.3
	Awaran	1.7		Awaran	1.7		Awaran	1.7
	Washuk	2		Washuk	2		Washuk	2
2	Chagai	3.3	2	Chagai	3	2	Chagai	2.3
0	Panjgur	6	0	Panjgur	5	0	Khuzdar	5.7
1	Khuzdar	6.7	1	Khuzdar	6.3	1	Panjgur	6
4	Kharan	7.7	5	Kharan	7.3	6	Kharan	7.7
	Sheerani	8.3		Sheerani	8.3		Sheerani	8.3
	Kohistan	9		Zhob	9.7		Zhob	8.7
	Zhob	9.3		Gwadar	11		Gwadar	11
	Gwadar	11		Dera Bugti	12.3		Dera Bugti	11.3

Note: The above mentioned bottom ten districts are ranked using total number of hospitals, beds, and medical staff with respect to the area of a district. Rankings are based on the Author's calculations using provincial development statistics and Population data. Rankings for all districts can be seen in appendix table A4

districts of Pakistan in terms of all rankings. The problems in the healthcare sector intrigued the people of Kohistan districts to demonstrate a sit-in protest due to shortages of medical staff ¹². The top districts in terms of public healthcare facilities by the area are shown in table 2.6. In this list, seven out of ten districts have an area of less than two thousand square kilometers. This list includes two provincial capital and eighth densely populated districts. Interestingly, there are no districts from the province of Balochistan in the top ten. Top two districts throughout the years are Peshawar and Lahore. Lahore being consistently the top district, followed by Peshawar. These districts have an area of less than two thousand square kilometers.

A Spatial Illustration of District Wise Public Healthcare Resources with respect to Area

To observe district rankings of public healthcare facilities with respect to the area, we use choropleth maps. Figure 2.5 shows the overall rankings of public healthcare facilities by the area of a district in 2008. Besides going into a detailed discussion on the district rankings by area, we can compare districts based on these three rankings.

Comparison of all Rankings

We can compare the results from table 2.2, table 2.4, and table 2.6, to find some commonalities or differences in these rankings. From table 2.2 and table 2.6, we find that the districts of Gujranwala, Peshawar, Multan, Karachi, Faisalabad, and Lahore are common, these districts are major urban centers. Whereas there are no common districts in table 2.4 and table 2.6. This confirms that in terms of the absolute number of available healthcare resources and distribution of resources by areas, the before-mentioned districts are among the top ten districts of Pakistan. Based on the distribution of public healthcare resources by population, the districts of Balochistan have a better ranking as compared to the districts of other provinces.

If we do a comparative analysis of figures 2.1, 2.3, and 2.5, we observe that district Kohistan is the only district that has a lowest ranking in all three ranking criteria. In

¹²http://epaper.dawn.com/DetailImage.php?StoryImage=23_02_2019_182_007

Table 2.6: The List of Top Ten Ranked Districts by the Availability of Public Healthcare Resources with respect to Area

Year	District	Rank	Year	District	Rank	Year	District	Rank
	Bannu	100.3		Sialkot	100.7		Gujranwala	103
	Rawalpindi	102		Rawalpindi	102.3		Rawalpindi	103
2	Gujranwala	103	2	Gujranwala	102.7	2	Bannu	104
0	Abbottabad	103.3	0	Multan	104	0	Charsadda	104.7
0	Multan	104	0	Abbottabad	104	1	Abbottabad	105.3
8	Charsadda	105	9	Charsadda	104.3	0	Multan	105.7
	Hyderabad	106		Hyderabad	106.3		Hyderabad	107
	Faisalabad	107		Faisalabad	107		Faisalabad	107.7
	Peshawar	110.7		Peshawar	111		Peshawar	112
	Lahore	112		Lahore	112		Lahore	113
	Gujranwala	102.3		Faisalabad	101.7		Sialkot	102.7
	Rawalpindi	102.7		Malakand	102		Abbottabad	103
2	Bannu	103.7	2	Gujranwala	103	2	Mardan	103
0	Charsadda	104.3	0	Mardan	103	0	Gujranwala	103.3
1	Abbottabad	105	1	Bannu	104.3	1	Charsadda	103.3
1	Multan	105.3	2	Charsadda	104.7	3	Bannu	104.7
	Hyderabad	107.3		Multan	106.3		Faisalabad	107.3
	Faisalabad	107.7		Hyderabad	108.3		Hyderabad	108
	Peshawar	112		Peshawar	112		Peshawar	112
	Lahore	113		Lahore	113		Lahore	113
	Charsadda	102.7		Sialkot	103		Charsadda	104
	Multan	102.7		Multan	104.3		Multan	104.3
2	Sialkot	103	2	Gujranwala	105.7	2	Sialkot	104.3
0	Abbottabad	103.3	0	Karachi	105.7	0	Abbottabad	104.7
1	Gujranwala	104	1	Abbottabad	105.7	1	Bannu	105
4	Faisalabad	107	5	Bannu	107.7	6	Karachi	105
	Hyderabad	107.3		Faisalabad	108.3		Hyderabad	108
	Bannu	108		Hyderabad	108.7		Faisalabad	109
	Peshawar	112		Peshawar	113.3		Peshawar	113
	Lahore	113		Lahore	114.3		Lahore	114

Note: The above mentioned top ten districts are ranked using total number of hospitals, beds, and medical staff with respect to the area of a district. Rankings are based on the Author's calculations using provincial development statistics and Population data. Rankings for all districts can be seen in appendix table A4

terms of rankings by total public healthcare facilities and population, Kashmore, Rajanpur, Tando Allah Yar, Tando Muhammad Khan, and Killa Abdullah districts are in the lowest category (depicted in red in figure 2.1 and figure 2.3). In terms of the rankings by population and area there are two districts (Rajanpur and Tharparkar), other than Kohistan.

Further, we see that there are 13 districts of Balochistan, four districts of Sindh, one district each of KP, and Punjab in the lowest-ranked category in at least two ranking criteria.

In the quantile of moderately-low ranked districts by area there were five districts from Punjab, nine from Balochistan, and eight from Sindh. The comparison of these districts with earlier ranking criteria reveals that Upper Dir is ranked moderately-low in all three rankings. This district had an urban population of only (4.6%) and an area of 3,699 square kilometers. There were five hospitals, 11 dispensaries, 31 BHUs, three RHCs, a single TB clinic, and 182 medical staff for an estimated population of approximately 920 thousand people.

District Buner, Matiari, and Shangla are moderately-low ranked districts by facilities and population-based rankings. Rankings by the area and number of facilities shows that there are eight common districts in these two rankings (Dadu, Dera Ghazi Khan, Bhakkar, Sibi, Kacchi, Pishin, Umerkot, and Qambar Shahdadkot). It is important to note that in ranking by the population, the district Sibi is ranked as the top district, but in the other two ranking criteria, district Sibi is rank as a moderately-low district.

In medium ranked districts by area there were nine districts of Punjab, seven districts of KP, and six districts of Sindh. In this quantile Chakwal and Haripur are the common districts in rankings by total facilities and population. Similarly in ranking by area and population (Swat, Layyah, Attock, Jhang and Mianwali) are in this quantile.

In the moderately-high ranked districts by areas, there are ten districts of Punjab, seven districts of KP, five districts of Sindh and one district of Balochistan. By all ranking criteria Jhelum and Shaheed Benazirabad were ranked as moderately-high districts.

In 2008 there were 21 districts ranked as top districts by the availability of healthcare resources by their respective areas. All provincial capitals are ranked in this quantile. In

all ranking criteria Abbottabad and Quetta are ranked in the top quantile.

Comparison of all Rankings in 2016

The rankings of the districts in terms of public healthcare resources may change over time, but the area of most of the districts remains the same, except for the newly formed districts. This implies that the ranking of only those districts improves in which the public healthcare resources have increased. There are only two cases in which new districts were established from existing districts. So rather doing a comparison of the changes in district rankings by area (2008 to 2016), we compare these three ranking criteria for the year 2016. Figure 2.6 shows the ranking of districts based on the total number of public healthcare facilities in their respective areas. By the comparing figures 2.2, 2.4, and 2.6 we see that rankings of Tando Allah Yar has increased over time in all three criteria, we also note improvements in the rankings of Kashmore, Rajanpur, Tharparkar, Killa Abdullah, and Nasirabad districts. In contrast, Kohistan is ranked as one of the lowest-ranked districts in all three rankings and several districts of Balochistan are ranked low in terms of the availability of healthcare resources and healthcare availability by surface area.

District Pishin is ranked moderately-low in all three rankings. Tando Allah yar, Buner, and Khuzdar are ranked moderately-low in rankings by population and total facilities. Tharparkar, Dadu, and Khairpur are ranked moderately-low in the rankings by population and area. We also see that Killa Abdullah, Thatta, and Qambar Shahdadkot are ranked moderately-low districts by total facilities and surface area.

Based on rankings by population and total facilities, Kech, Shikarpur, Umerkot, and Kohat are ranked as medium districts and in the rankings by population and area Bahawalnagar, Rahim Yar Khan, Upper Dir, Attock, Lakki Marwat, and Karak are ranked as medium districts. While comparing the rankings of districts by facilities and area, we see that there are only two common districts in this quantile (Hafizabad and Lodhran).

Comparing figure 2.2 and figure 2.4 reveals that seven districts (Pakpattan, Naushahro Feroze, Jhelum, Sheikhpura, Mansehra, Khanewal and Toba Tek Singh) fall in this category. We also observe that Nankana Sahib, Abbottabad, Chakwal, Hyderabad, and Bannu are ranked moderately-high both by population and healthcare resources, while

District Ranking by Area (2016)

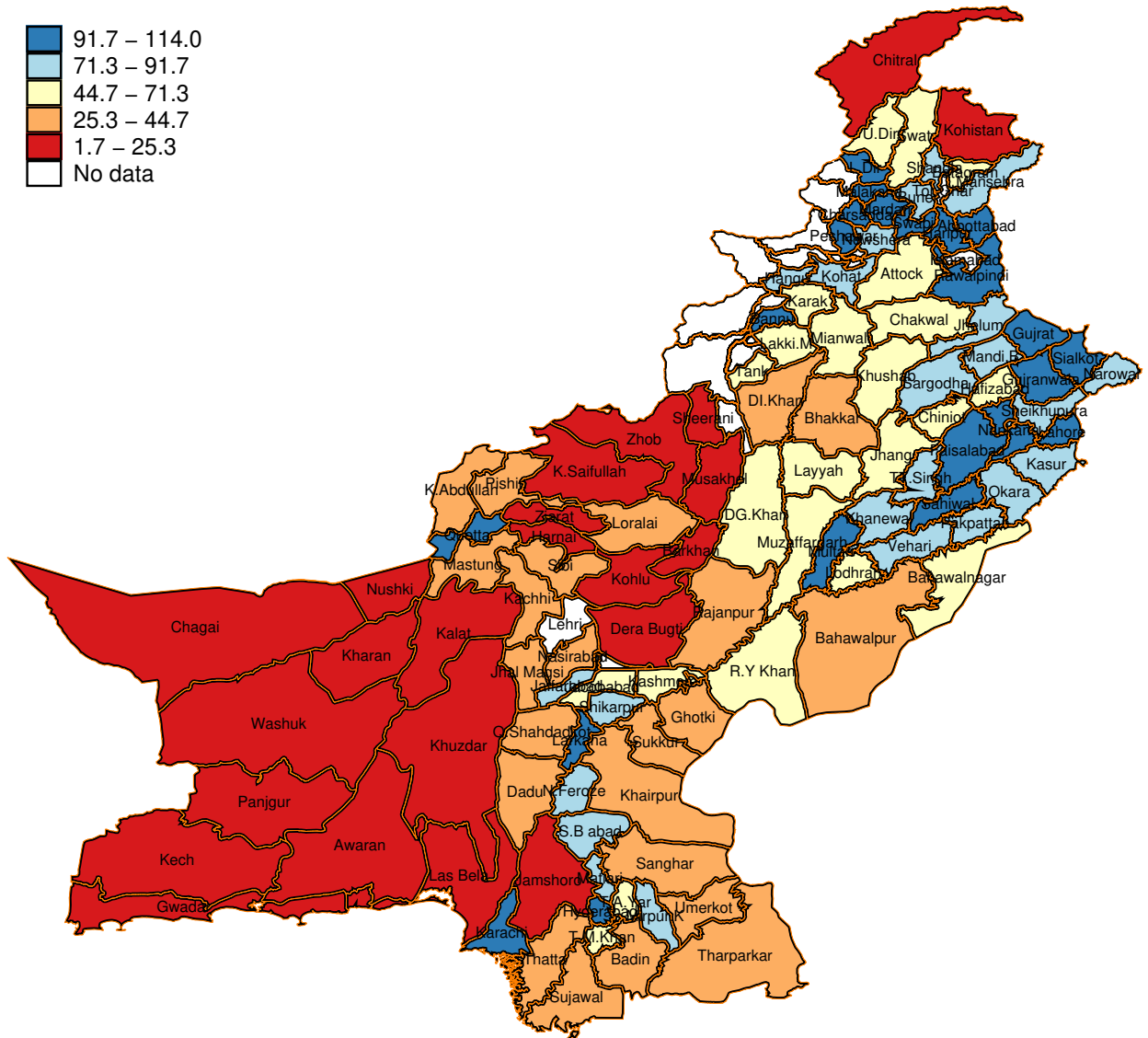


Figure 2.6: Average Ranking of Districts Based on the Availability of Public Healthcare Resources with respect to Geographical Area (2016)

comparing the rankings by population and area we found that Sargodha, Mansehra, and Shaheed Benazirabad fall in this quantile.

22 districts of Pakistan are ranked in the top quantile in terms of the public healthcare facilities available in their respective geographical boundaries. All the provincial capitals are present in this category. Nine districts of KP and Punjab, one district of Balochistan, and three districts of Sindh are ranked in this category. We can observe by comparing figure 2.6 and figure 2.5 that the majority of districts in 2008 and 2016 in this category are the same. There are only a few exceptions, the ranking of district Sargodha has decreased and ranking of district Haripur and district Swabi has increased.

2.3.4 Changes in the District Rankings

From the above discussion, it is important to observe the overall changes in the rankings of districts with respect to each ranking criteria. To analyze the overall changes in the rankings of the districts, we have taken difference between initial ranking of a district (2008) and final ranking of a district (2016). Table 2.7 reports changes in the ranking of districts by availability of healthcare facilities. This table has two categories, at the top, districts with the highest decline are reported and at the bottom, we have those districts where healthcare facilities have significantly increased. By looking at this table we observe that the highest drop is in the ranking of districts from Sindh and Balochistan. Table 2.8 shows the top ten and bottom ten districts in terms of changes in the average rankings of public healthcare resources accounted for ten thousand persons. The bottom 10 list has no district from the province of Punjab, five districts of Balochistan, one district of KP, and four districts of Sindh. This asserts that the number of facilities in these districts has shrunk over time with respect to the increasing population. The districts in the top ten list include four districts of Balochistan, two districts of Punjab, three districts of KP, and one district of Sindh. The comparison of the top ten and bottom ten rankings by the population for the districts of Balochistan strongly indicates inter-provincial disparities. These rankings also reveal that these disparities exist largely in the resource allocations and can be a result of stagnation in the development/increase of public healthcare resources. Ranking of top ten and bottom ten districts with respect

Table 2.7: Changes in the Rankings of Districts by Availability of Healthcare Resources

Districts with Highest drop	
District	Change in Ranking
Thatta	-39.3
Sanghar	-20.7
Badin	-14.7
Kohat	-13.3
Las Bela	-9.7
Shikarpur	-9.3
Sukkur	-9.0
Sheikhupura	-8.3
Charsadda	-8.3
Mirpur Khas	-7.0
Districts with Highest Gain	
District	Change in Ranking
Tando Allah Yar	12.0
Mianwali	12.3
Chakwal	12.3
Sujawal	12.7
Lower Dir	13.7
Kashmore	15.0
Haripur	17.0
Umerkot	17.3
Kohistan	17.7
Swabi	22.0

Note: Author's calculation, changes in the rankings for all districts can be seen in appendix table A5

Table 2.8: Changes in the Rankings of Districts by Availability of Healthcare Resources with respect to Population

Districts with Highest Drop	
District	Change in Ranking
Thatta	-43.7
Karachi City	-34.7
Sanghar	-34.3
Nasirabad	-26.7
Badin	-22.7
Khuzdar	-21.0
Dera Bugti	-19.3
Kech	-19.0
Las Bela	-17.3
Kohat	-16.0
Districts with Highest Gain	
District	Change in Ranking
Haripur	17.7
Musakhel	19.7
Chakwal	19.7
Umerkot	20.7
Mianwali	22.0
Nushki	23.7
Washuk	28.3
Swabi	29.3
Kohistan	33.3
Harnai	35.7

Note: Author's calculation, changes in the rankings for all districts can be seen in appendix table A5

Table 2.9: Changes in the Rankings of Districts by Availability of Healthcare Resources with respect to Area

Districts with Highest Drop	
District	Change in Ranking
Sanghar	-14.7
Badin	-9
Karak	-8.7
Tando Muhammad Khan	-8.3
Shikarpur	-8
Kohat	-8
Nasirabad	-6.3
Sukkur	-6.3
Sheikhupura	-6
Jacobabad	-5.3
Districts with Highest Gain	
District	Change in Ranking
Jhang	8.3
Umerkot	8.7
Harnai	8.7
Vehari	9
Kashmore	9
Toba Tek Singh	9.3
Khanewal	10
Tando Allah Yar	10.3
Tharparkar	11.7
Swabi	15.7

Note: Author's calculation, changes in the rankings for all districts can be seen in appendix table A5

to area are reported in table 2.9. From this table, we can observe significant differences in the distribution of healthcare resources, specifically in the districts of Sindh.

By looking in detail the changes in ranking of districts (see Appendix A5) we can make some assertions. We observe that based on all three rankings, the district rankings of Thatta, Sanghar, and Badin have declined significantly. The scale of this decline in the rankings of these districts is highest. District Thatta has lost its ranking the most, the healthcare services in Thatta declined due to the bifurcation of this district. The rankings of district Sanghar also decreased and probable cause of this decline is stagnation in the growth of public healthcare services and rising population. The population of this district has increased by around 400 thousand, while only six new dispensaries were established in this district.

32 districts of Punjab, 18, districts of KP, 16 districts of Balochistan, and 14 districts of Sindh show improvement in the number of healthcare facilities. By this, we can establish the proposition that growth of public healthcare resources in the districts of Punjab and KP is better than the districts of Balochistan and Sindh.

Ranking of districts by the availability of public healthcare resources proportionate to population show that the rankings of 28 districts of Punjab, 14 districts each of KP and Balochistan and 9 districts of Sindh improved. It is important to note that change in this ranking is subject to the rising population, therefore, an increase in the population of a district can significantly change these rankings. This emphasizes the need for policy making to be in accordance with growing population.

The changes in districts ranking by area is affected either if there is a decline in the number of facilities or new districts are carved out. District Chiniot, Sujawal, Tando Allah yar and Tando Muhammad Khan were carved out from Jhang, Thatta, and Hyderabad respectively. After the inception of Chiniot we observe a slight decline in the rankings of Jhang, but we observe a significant decline in the rankings of Thatta as an aftermath of division.

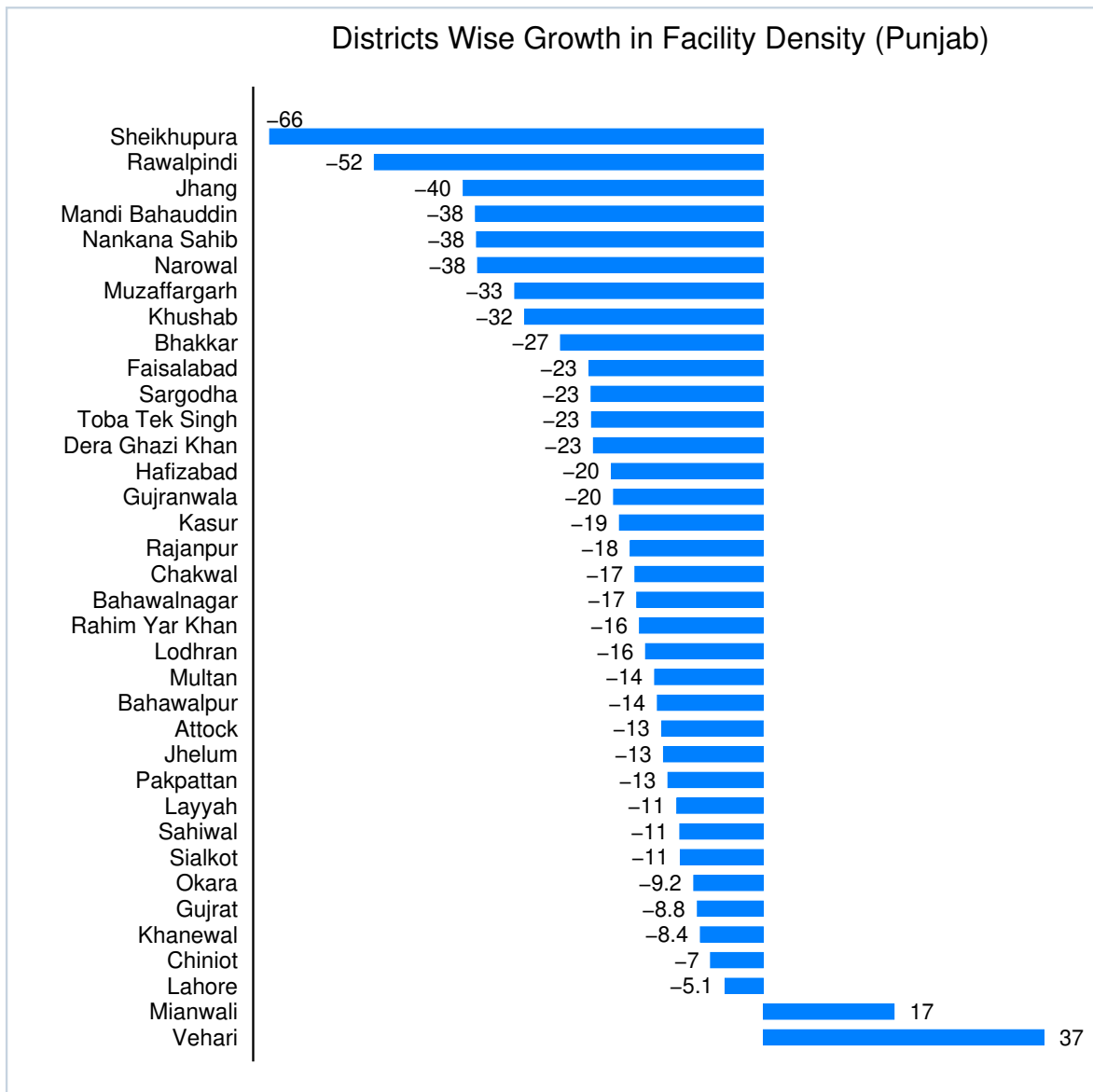


Figure 2.7: Over time growth in facility density in the districts of Punjab

2.3.5 Growth in Healthcare Services

To analyze the pattern of growth in public healthcare provision with respect to the growing population, we calculated the growth rates of facility density, the density of medical staff, and the density of inpatient beds by districts. These growth rates will elaborate the overtime trends of increase or decrease in the public healthcare services corresponding to population growth in districts of Pakistan.

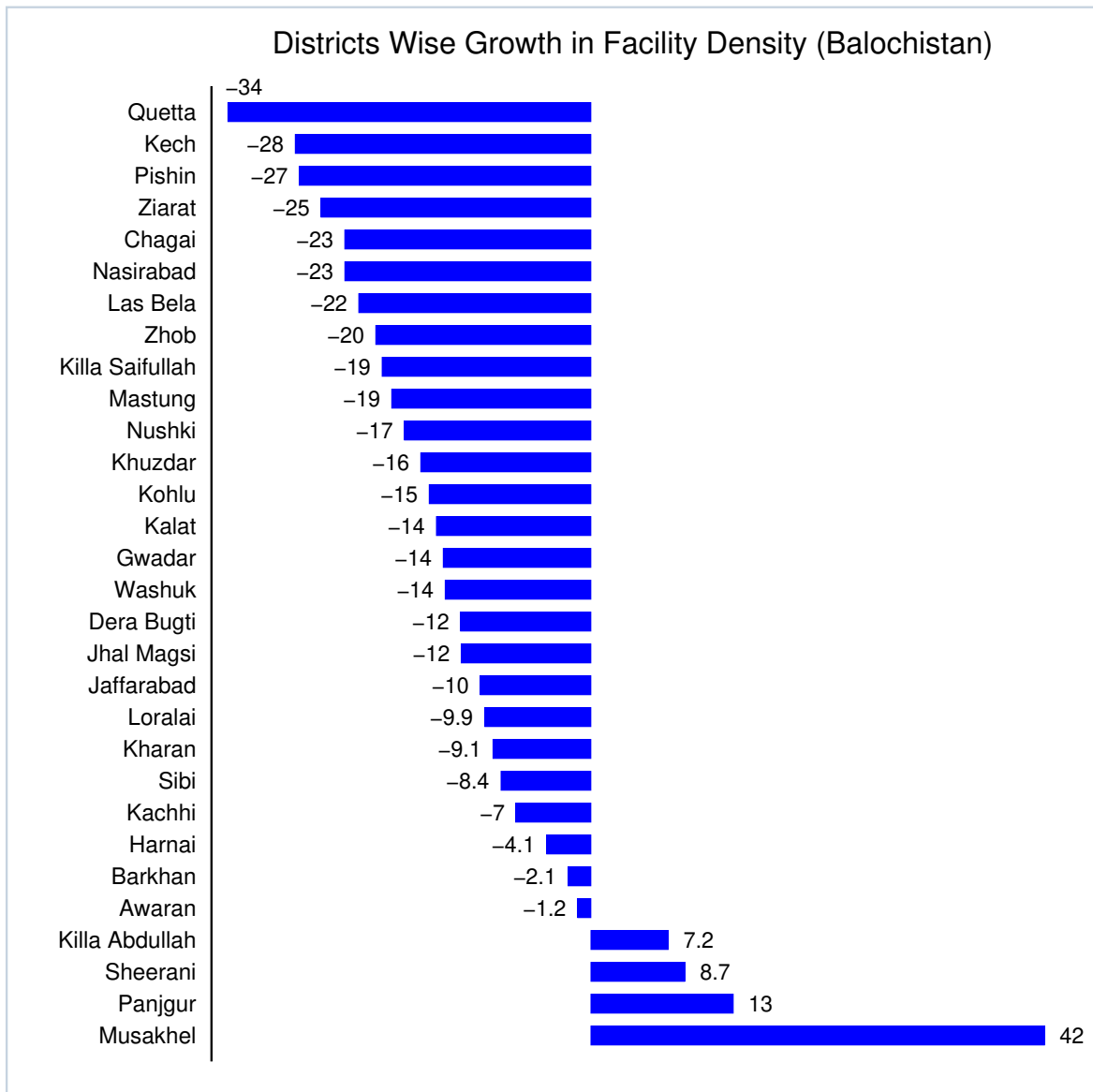


Figure 2.8: Over time growth in facility density in the districts of Balochistan

Growth trends in Facility Density

Figure 2.7 shows the growth rate of facility density by districts in the province of Punjab. We can observe that the facility density of public healthcare institutions has decreased in 34 districts of Punjab. The only exceptions are Mianwali and Vehari, where we observe an increase of (17%) and (37%), respectively. We observe that in both of these districts there is a rise in healthcare institutions, inpatient beds, and the number of medical staff has almost doubled. Decline in facility density in districts of Punjab can be attributed to relatively high population growth rates.

Figure 2.8 depicts the growth rate of facility density of public healthcare institutions in Balochistan. We observe that there is a decrease in facility density in the majority of the districts of Balochistan, except for Killa Abdullah, Sheerani, Panjgur, and Musakhel. The number of public healthcare institutions added in Killa Abdullah were 20, 5 in Sheerani, 10 in Panjgur and 14 in Musakhel. The growth rate of facility density for the capital Quetta has decreased the highest (34%). In district Quetta three healthcare institutions were created during this period. In 2008, district Quetta had 70 healthcare facilities for approximately 1.3 million people. In 2016, 73 healthcare facilities were suppose to accommodate healthcare needs of approximately 2.1 million people.

In the districts of KP, we can observe that except for Bannu, all other districts have a negative growth rate of facility density. In capital Peshawar only one public healthcare institute was established. The facility density in Abbottabad has decreased by (16%). Abbottabad is one of the districts of KP where major domestic migration has occurred in recent years. The first migration wave took place as an aftermath of 2005's earthquake. The second migration took place in 2009 due to the internally displaced people (IDPs) of Swat and third migration of IDPs from North Waziristan¹³. These migrations have considerably changed the demographic profile of this district. The rising population due to migration may have over-burdened the existing healthcare infrastructure.

The facility density of district Bannu shows a growth of (40%). This rise seems adequate if we consider the population and area of this district, but the reason embedded in such huge growth is due to the migration of IDPs. Improvement in the facility density was inevitable due to the IDPs crisis of North Waziristan as district Bannu had a caseload of (80%) of the IDPs in its geographical boundaries¹⁴. The data depicts two episodes of a rise in the number of public healthcare facilities once in 2010, when the number of facilities was increased from 55 to 67, and then in 2014 when 24 more public healthcare institutes were established.

Figure 2.10 depicts the situation of the growth rate of facility density in the districts of Sindh. The growth rate of facility density in the districts of Sindh is relatively better

¹³<https://www.thenews.com.pk/print/56525-mass-migration-affecting-abbottabads-demographic-balance>

¹⁴https://www.who.int/hac/donorinfo/donoralert_pakistan180714.pdf

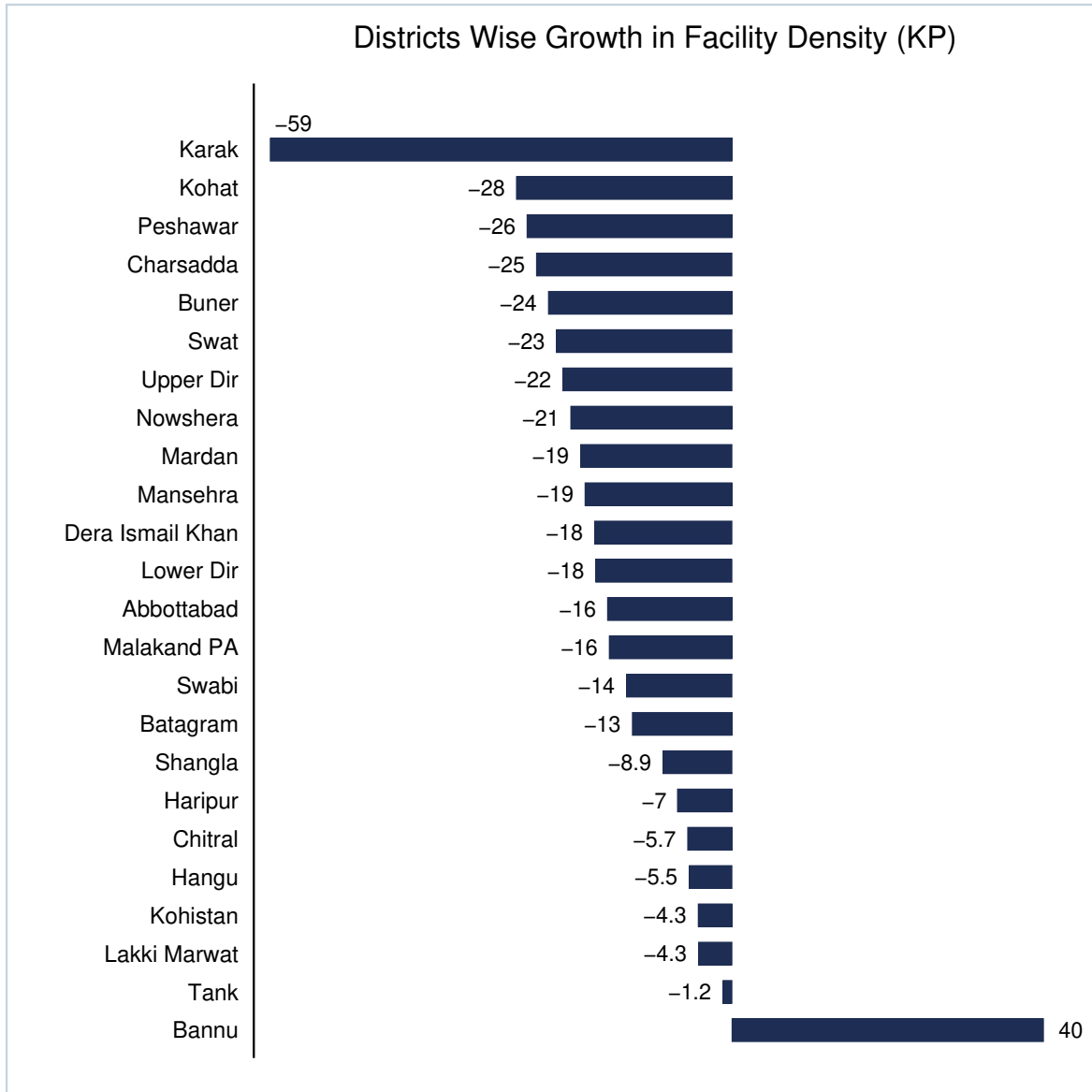


Figure 2.9: Over time growth in facility density in the districts of Khyber Pakhtunkhwa

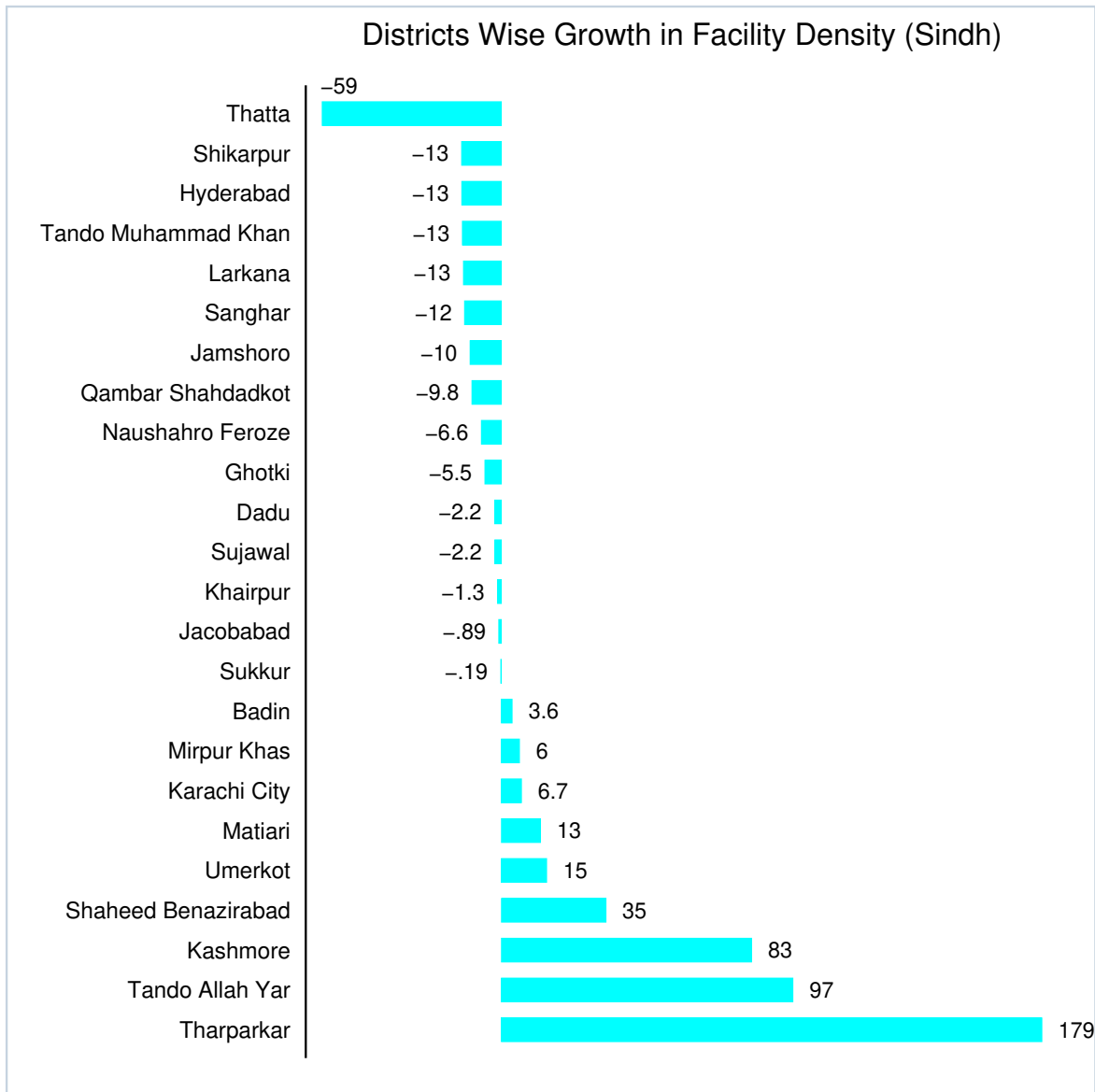


Figure 2.10: Over time growth in facility density in the districts of Sindh

as compared with the districts from other provinces. There are nine districts with a positive growth rate of facility density, with an exceptional growth of medical facilities in Tharparkar, Tando Allah Yar, and Kashmore.

During 2014-2016 Tharparkar had a severe crisis of drought and high infant mortality. The district also faced issues like malnutrition, inaccessibility to clean water, and sanitation¹⁵. [Rana and Naim \(2014\)](#) notes that Tharparkar has been neglected in terms of healthcare provision by the government. The healthcare facilities in the district are very few, and available public healthcare facilities are distant to reach. Facing drought, malnutrition, and inaccessibility to healthcare and clean water, the government initiated a plan to increase the number of public healthcare institutions from 85 in 2011 to 236 in 2015. In the same period, the number of medical staff was also increased from 176 to 253, hence increasing the overall public healthcare services in the district.

Overall growth in facility density show that only 16 districts out of the 114 districts have a positive growth rate. By this, it is evident that in the majority of the districts of Pakistan healthcare facilities have contracted due to the rising population.

Growth trends in the Density of Inpatient Beds

The results for the districts of Punjab are presented in figure 2.11. Dera Ghazi Khan has the highest growth rate (48%) of the density of inpatient beds. The number of inpatient beds were increased from 815 to 1524. Gujrat has a growth rate of (41%) in inpatient beds with an addition of 554 inpatient beds and the establishment of six healthcare institutions. Out of 36 districts of Punjab, 16 districts show positive growth in the density of inpatient beds.

For the districts of Balochistan, figure 2.12 shows an exceptional increase in the density of inpatient beds in the district of Nushki. A rise of (288%) is recorded, this growth rate might seem large in terms of percentage, but in actual terms, the number of inpatient beds has only increased from 10 to 50 in the time span of nine years. Except for Nushki, Mastung, Jaffarabad, Kacchi, and Washuk, all other districts of Balochistan show a

¹⁵<https://www.aljazeera.com/indepth/features/2016/06/tharparkar-pakistan-ongoing-catastrophe-160629111410198.html>

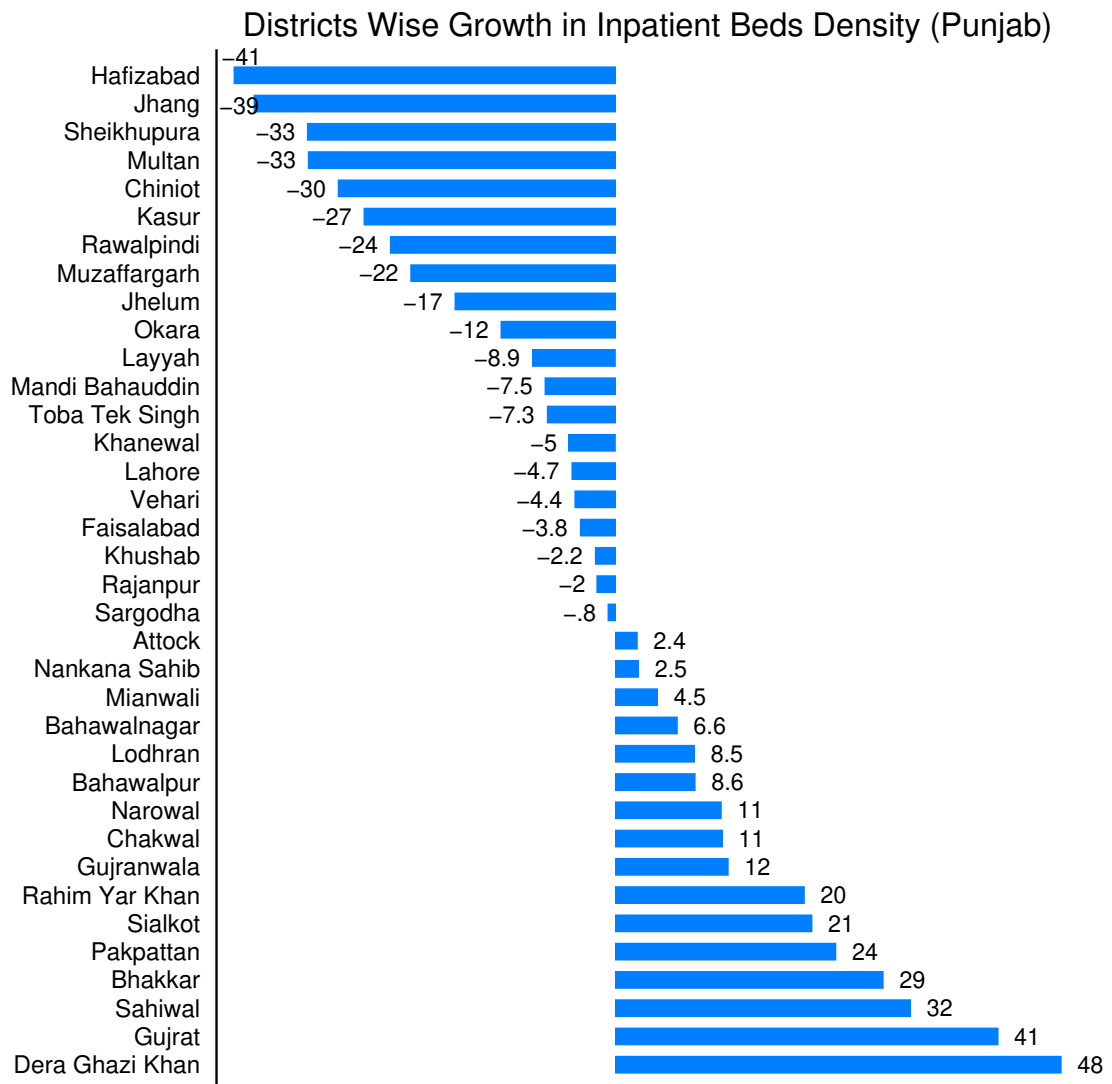


Figure 2.11: Over time growth in the density of inpatient beds in the districts of Punjab

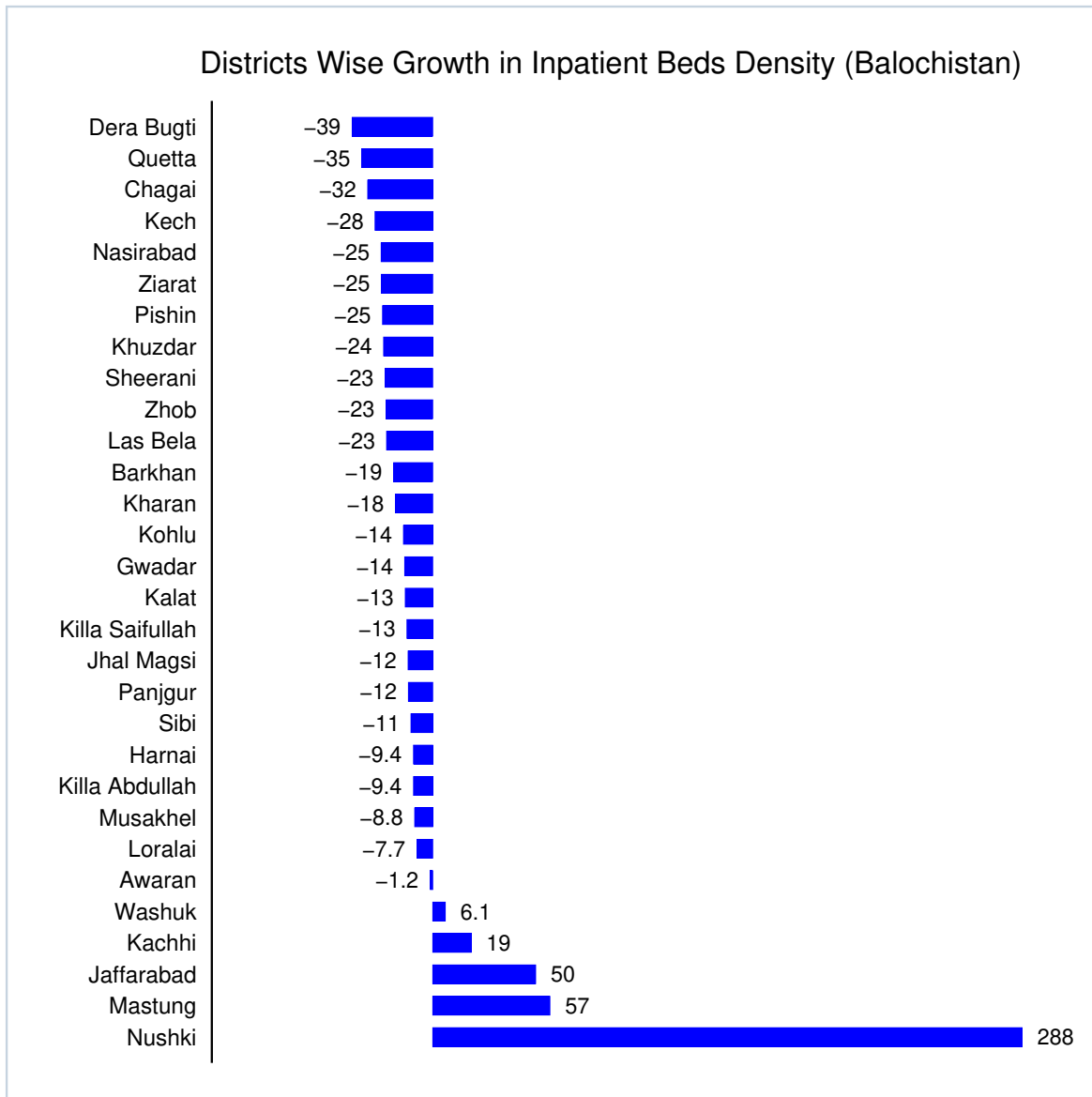


Figure 2.12: Over time growth in the density of inpatient beds in the districts of Balochistan

negative growth in the density of inpatient beds.

Figure 2.13 depicts the growth rate of inpatient beds in the districts of KP. 14 districts of KP show a positive growth rate in the density of inpatient beds. District Kohistan has the highest growth rate of (832%). In Kohistan, the growth rate of inpatient beds is significantly high, the number of beds in Kohistan was increased from 52 (2008) to 600 (2016). This rise in number of inpatient beds is accompanied by the establishment of seven healthcare institutions, but the changes in the number of healthcare staff remain negative in this district. This intrigues to a public policy issue in this district.

From figure 2.14 we can see that out of 24 districts of Sindh only six districts show improvement in the density of inpatient beds. Thatta has the highest negative growth rate of (56%). Followed by Karachi and Hyderabad. Interestingly, the number of inpatient beds was reduced in Karachi by almost (27%) and around (19%) in the Hyderabad district.

Growth trends in the Density of Medical staff

The growth rates of the density of medical staff are reported in figures 2.15 to 2.18. Figure 2.15 represents the growth rate of the density of medical staff in the districts of Punjab. All districts of Punjab have a positive growth rate in the density of medical staff. The highest growth rate of the density of medical staff is in Toba Tek Singh followed by Mandi Bahauddin and Khanewal. The lowest growth in the density of medical staff is recorded in the district Faisalabad. We observe that the density of the medical staff has increased relatively more in districts having larger rural settlements like Toba Tek Singh, Mandi Bahauddin, Khanewal, Sheikhpura, Chakwal, Kasur, Okara, Narowal, and Okara.

The density of medical staff in the districts of Balochistan are shown in figure 2.16. District Harnai has the highest growth rate of the density of medical staff among the districts of Balochistan. The number of medical staff in this district was increased from five (2008) to 68 (2016). A (351%) rise has been recorded in the density of medical staff in district Washuk. In Washuk the number of medical staff was increased from 10 to 55. District Sheerani has a growth rate of (220%) in the density of medical staff, in district Sheerani the number of medical staff was increased from 6 to 25. Sixteen districts of Balochistan have a negative growth rate of the density of medical staff, including Quetta. Figures

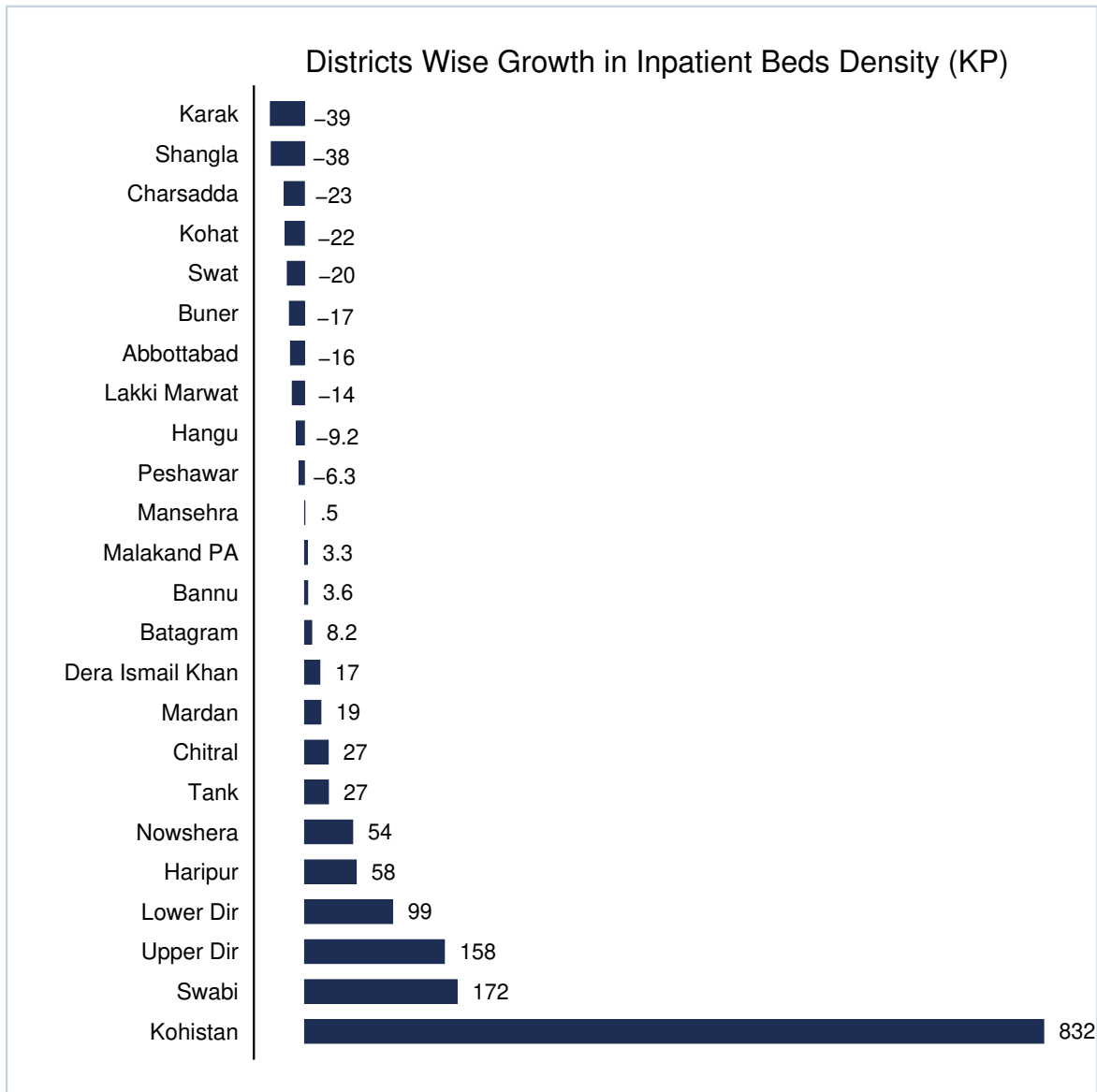


Figure 2.13: Over time growth in the density of inpatient beds in the districts of Khyber Pakhtunkhwa

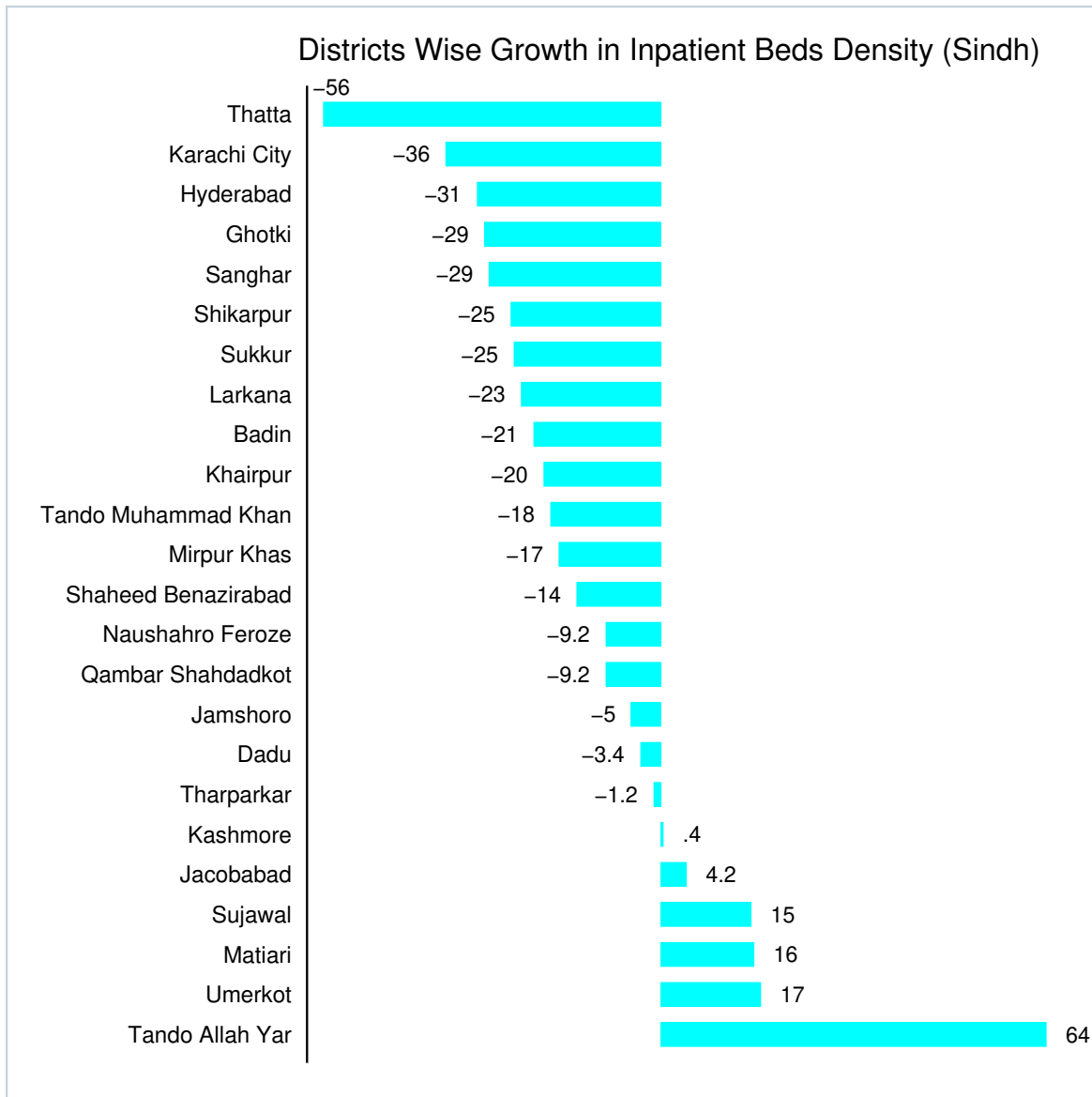


Figure 2.14: Over time growth in the density of inpatient beds in the districts of Sindh

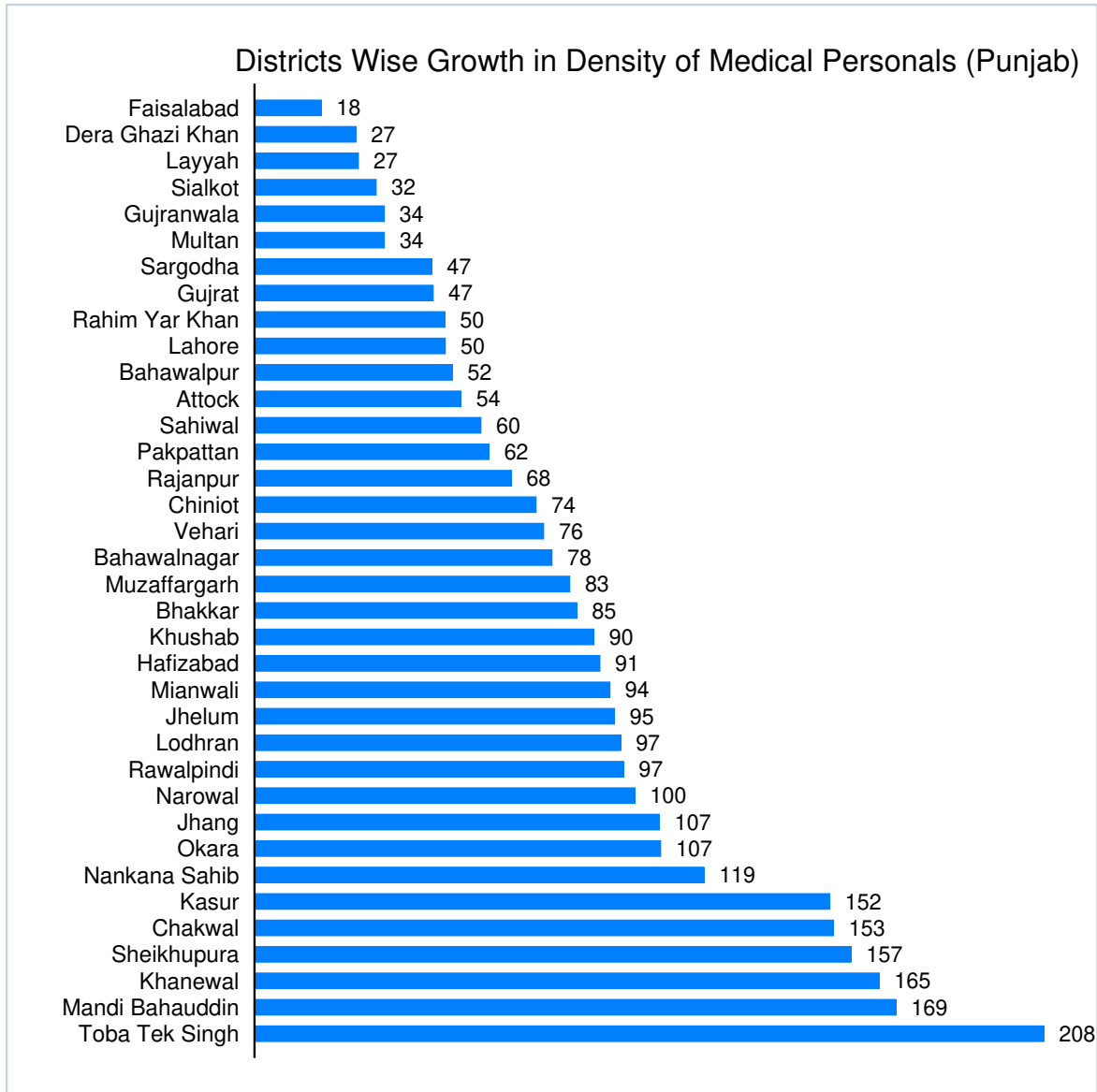


Figure 2.15: Over time growth in the density of medical staff in the districts of Punjab

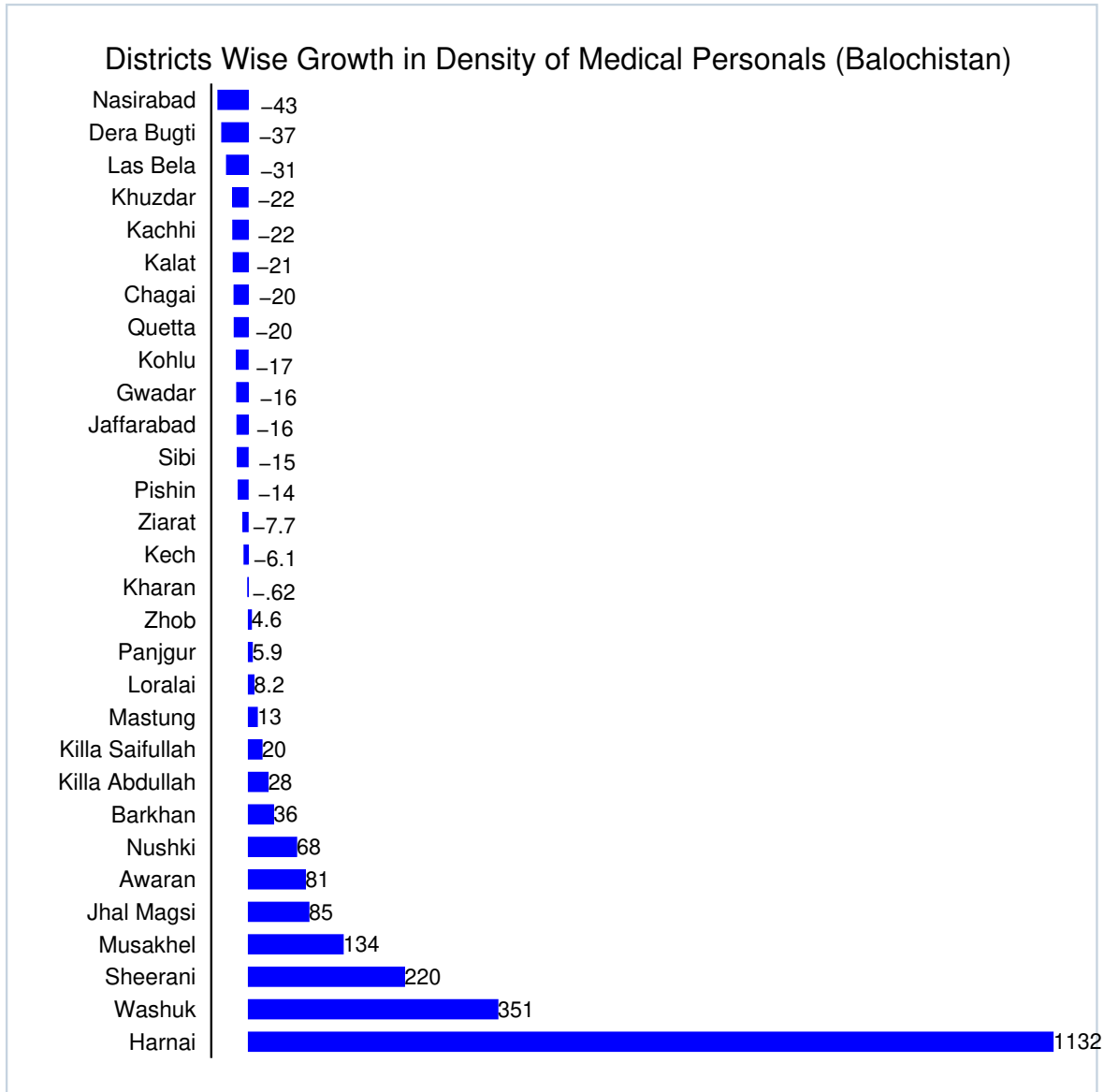


Figure 2.16: Over time growth in the density of medical staff in the districts of Balochistan

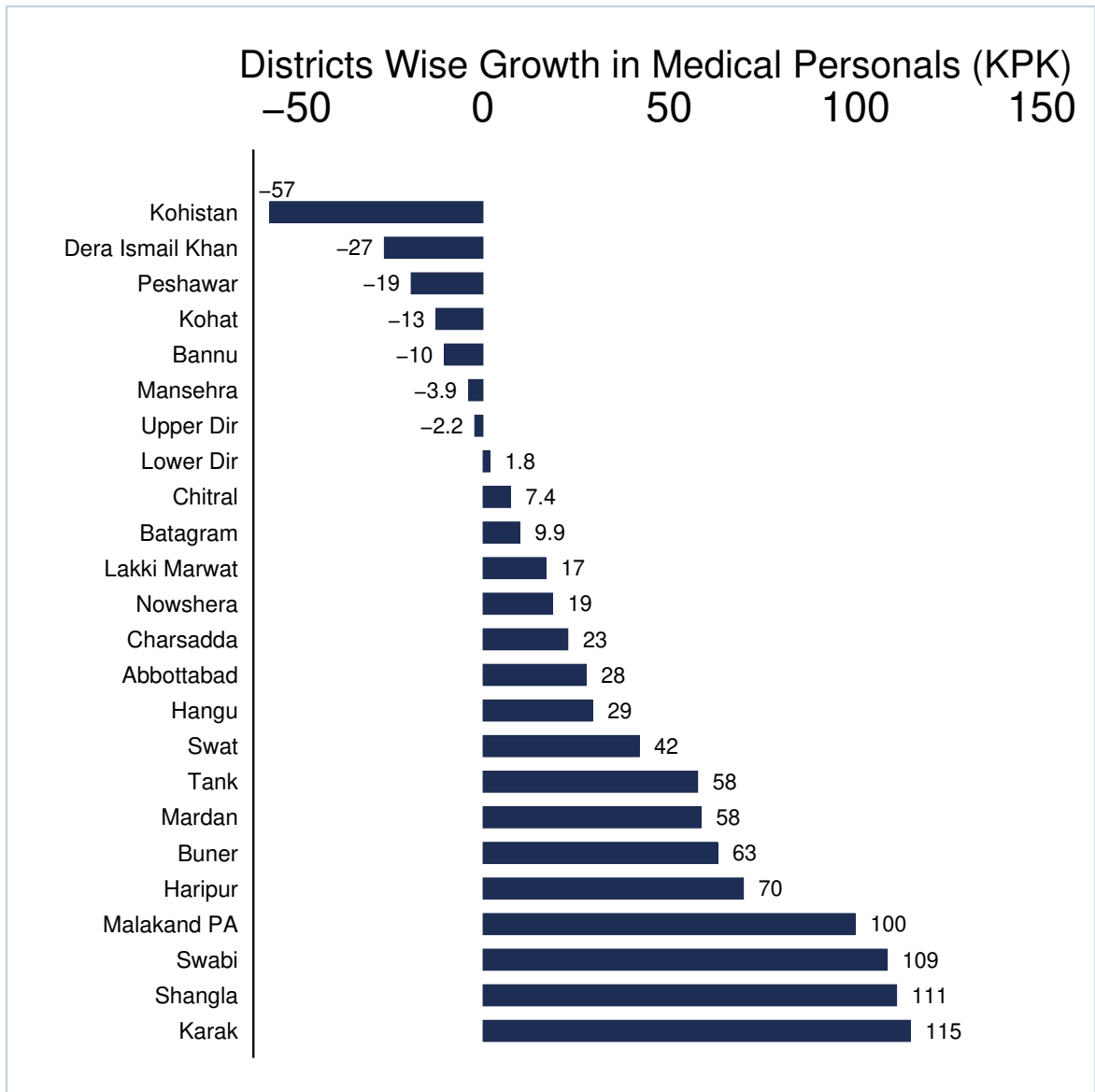


Figure 2.17: Over time growth in the density of medical staff in the districts of Khyber Pakhtunkhwa

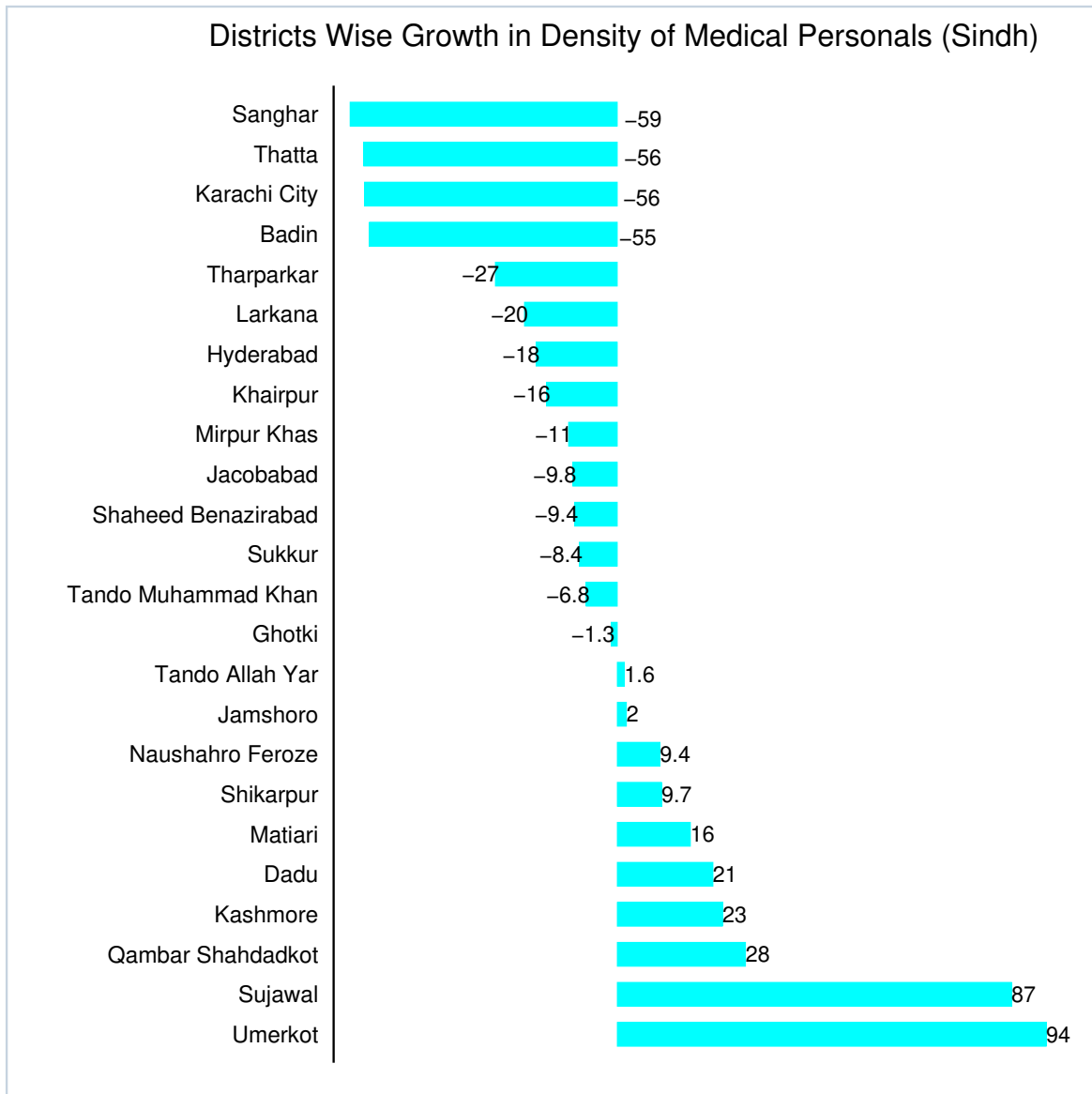


Figure 2.18: Over time growth in the density of medical staff in the districts of Sindh

2.17 and 2.18 represent the growth rates in the density of medical staff in KP and Sindh, respectively. From figure 2.17, it is observable that in terms of growth in the density of medical staff, only seven districts show a negative growth rate in KP, from figure 2.18 it is evident that in the districts of Sindh only 10 districts have a positive growth rate.

By considering the changes in facility density, the density of inpatient beds, and the density of medical staff. We can assert that from 2008 to 2016 only 16 districts show growth in facility density, 41 districts show growth in the density of inpatient beds, and 77 districts show growth in the density of medical staff. Further, we see growth in all densities in the districts of Matiari, Umerkot, Bannu, Kashmore, and Tando Allah Yar. Furthermore, districts having low medical facilities like Nushki, Washuk, Harnai, and Kohistan show high growth rates in these densities. We can also assert that the patterns of the growth in these densities do not follow a particular pattern (based on population or need). It seems that the growth in densities follow random patterns or are a result of discretionary decision making.

2.3.6 Public Healthcare Services Availability Index (PHSAI)

After discussions on the rankings of districts, changes in the rankings of the districts, and growth rates. We now explain the results of the public healthcare services availability index. Table 2.10 shows the top ten and bottom 10 districts based on the public healthcare services availability index. In the bottom 10 districts, there are no districts from the province of KP, there are seven districts of Sindh, two districts of Balochistan, and one of Punjab.

In the list of top ten districts by PHSAI, there is only one district from Punjab (Lahore). There are two districts of KP (Peshawar and Chitral), one district of Sindh (Hyderabad) and six districts of Balochistan, including Quetta. In the top 10 districts there are four districts with relatively high Population, including three provincial capitals, although the other districts in the top ten have relatively low population (Sibi, Harnai, Loralai, Kharan, and Chitral). For more comprehensive view of PHSAI at district level we present province wise plots in this section. We can observe from figure 2.19 that three major urban centers of Punjab: Lahore, Rawalpindi, and Faisalabad have comparatively better availability of

Table 2.10: Bottom Ten and Top Ten Districts by Public Healthcare Services Availability Index

Bottom Ten Districts	
District	PHSAI
Qambar Shahdadkot	1.24
Kashmore	1.29
Badin	1.34
Karachi City	1.35
Nasirabad	1.37
Ghotki	1.38
Sanghar	1.38
Tharparkar	1.39
Muzaffargarh	1.45
Killa Abdullah	1.49

Top Ten Districts	
District	PHSAI
Chitral	4.59
Harnai	5.06
Hyderabad	5.09
Jhal Magsi	5.16
Loralai	5.17
Kharan	5.58
Peshawar	5.70
Lahore	6.25
Quetta	6.60
Sibi	8.45

Note: Author's calculation, PHSAI rankings for all districts can be seen in appendix table A6

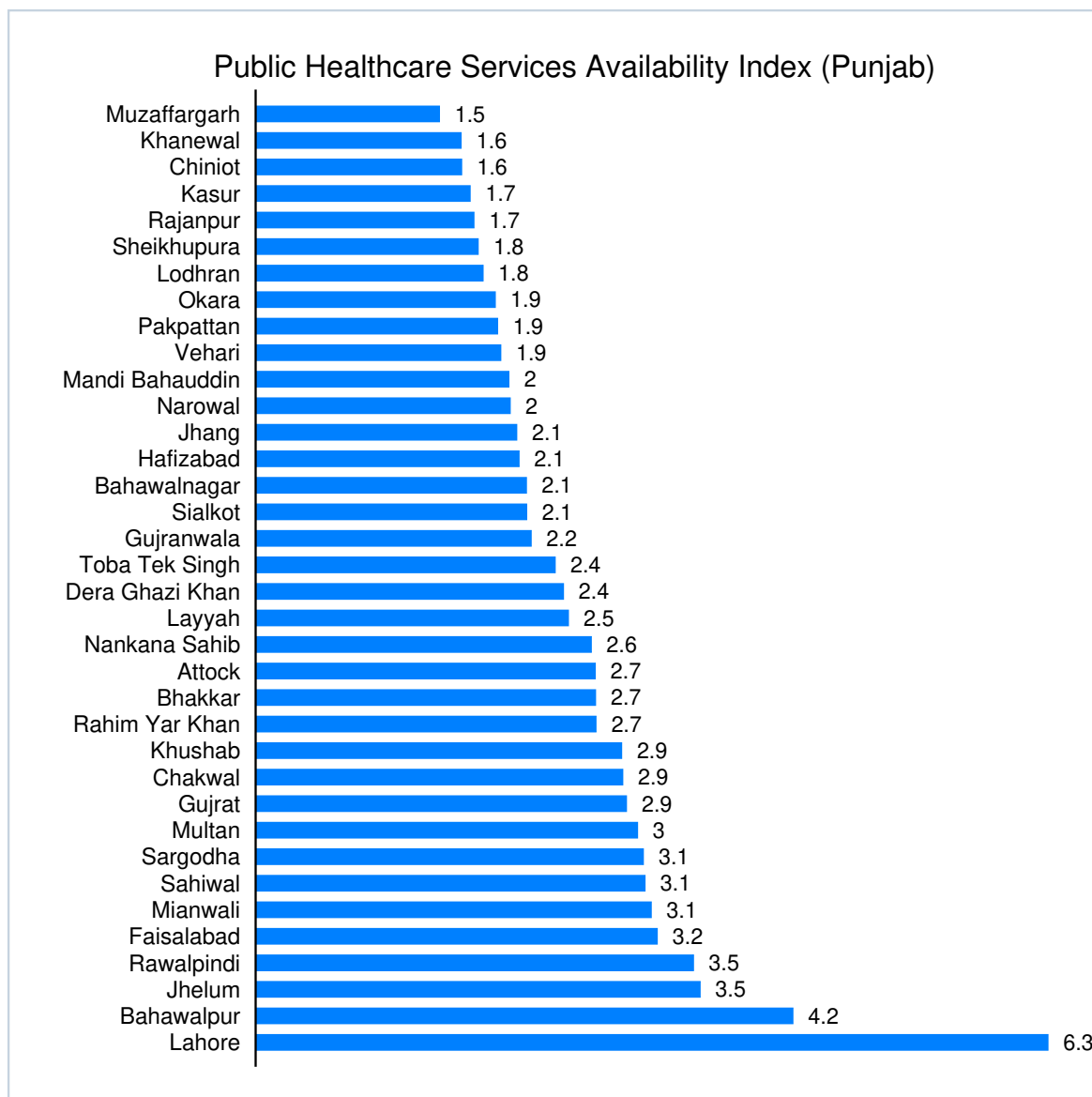


Figure 2.19: PHSAI index for the districts of Punjab (2016)

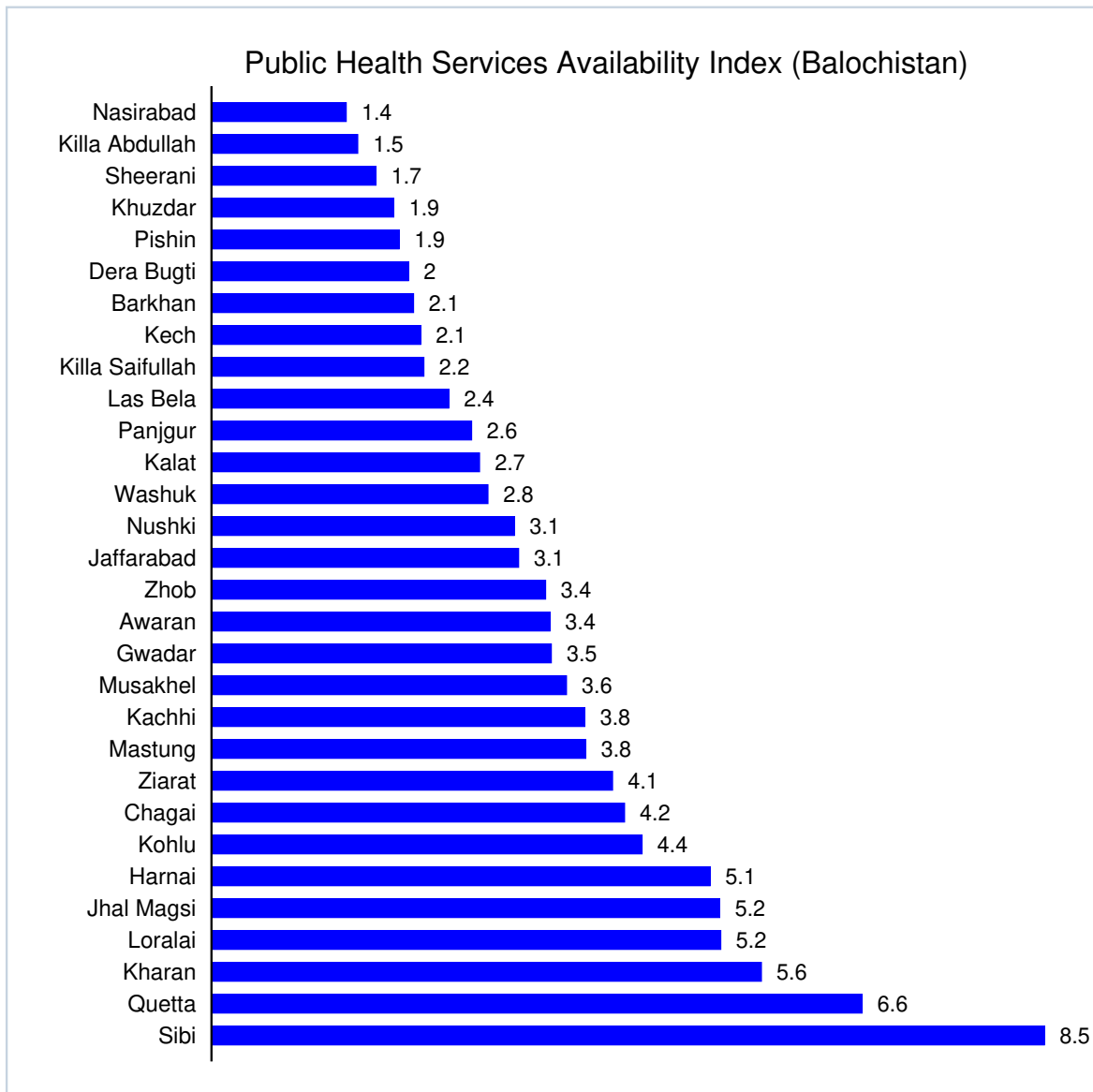


Figure 2.20: PHSAI index for the districts of Balochistan (2016)

public healthcare resources. The bottom five district (Muzaffargarh, Khanewal, Chiniot, Kasur, and Rajanpur) are majorly rural. This leads to an interesting assertion that the availability of public healthcare resources is skewed towards the urban districts and there are inequalities in the distribution of healthcare resources with in Punjab. Three out of these (bottom) five belong to the southern part of Punjab, the southern Punjab is relatively rural and less developed as compared to the districts in central and northern Punjab.

In the province of Balochistan there are significant variations in PHSAI. Quetta and Sibi

districts have a promising PHSAI, while Nasirabad and Killa Abdullah districts have one of the lowest PHSAI in Pakistan. Excluding Quetta, the top five districts based on PHSAI have a relatively low population. PHSAI of Quetta district is exceptionally high and the most likely reason is because of being an urban center (largest by population in Balochistan) and capital of the province. The lowest five districts by PHSAI from Balochistan have relatively large proportions of rural population. Nasirabad, Killa Abdullah, and Pishin have an urban population of around (20%). Sheerani has no urban settlements and Khuzdar has an urban population of approximately (32%). The national average for the urban population is around (36%).

Public healthcare facilities are usually concentrated in the district headquarters (as PHSAI is suggesting in case of Quetta). The distant residents of these districts and residents of other districts may encounter limited availability to public healthcare institutions, especially in Balochistan due to its vast geographical area. A few districts of Balochistan perform relatively good in PHSAI as compared with the districts of other provinces, but it is equally true that the most of districts of Balochistan have low levels of development and infrastructure.

Figure 2.21 shows PHSAI for KP, the lowest PHSAI index value is for Charsadda 1.9, followed by Nowshera, Mardan, Hangu, and Swabi. The top five districts in terms of PHSAI are Karak, Malakand, Abbottabad, Chitral, and Peshawar. Peshawar being indexed as the top district in KP with an index value of 5.7.

PHSAI for the districts of Sindh is presented in figure 2.21. The top districts of Sindh by PHSAI index is Hyderabad, this district is the smallest district in terms of the area in Sindh and is majorly urban. Hyderabad has a population of approximately 1.7 million and an area of 993 square kilometers. Contrary to the other three provincial capital districts, Karachi is in the bottom five lists of districts by PHSAI. This is due to the increasing population, migration, and as well as due to depleting public healthcare resources. The bottom five districts are Qambar Shahdadkot, Kashmore, Badin, Karachi, and Ghotki.

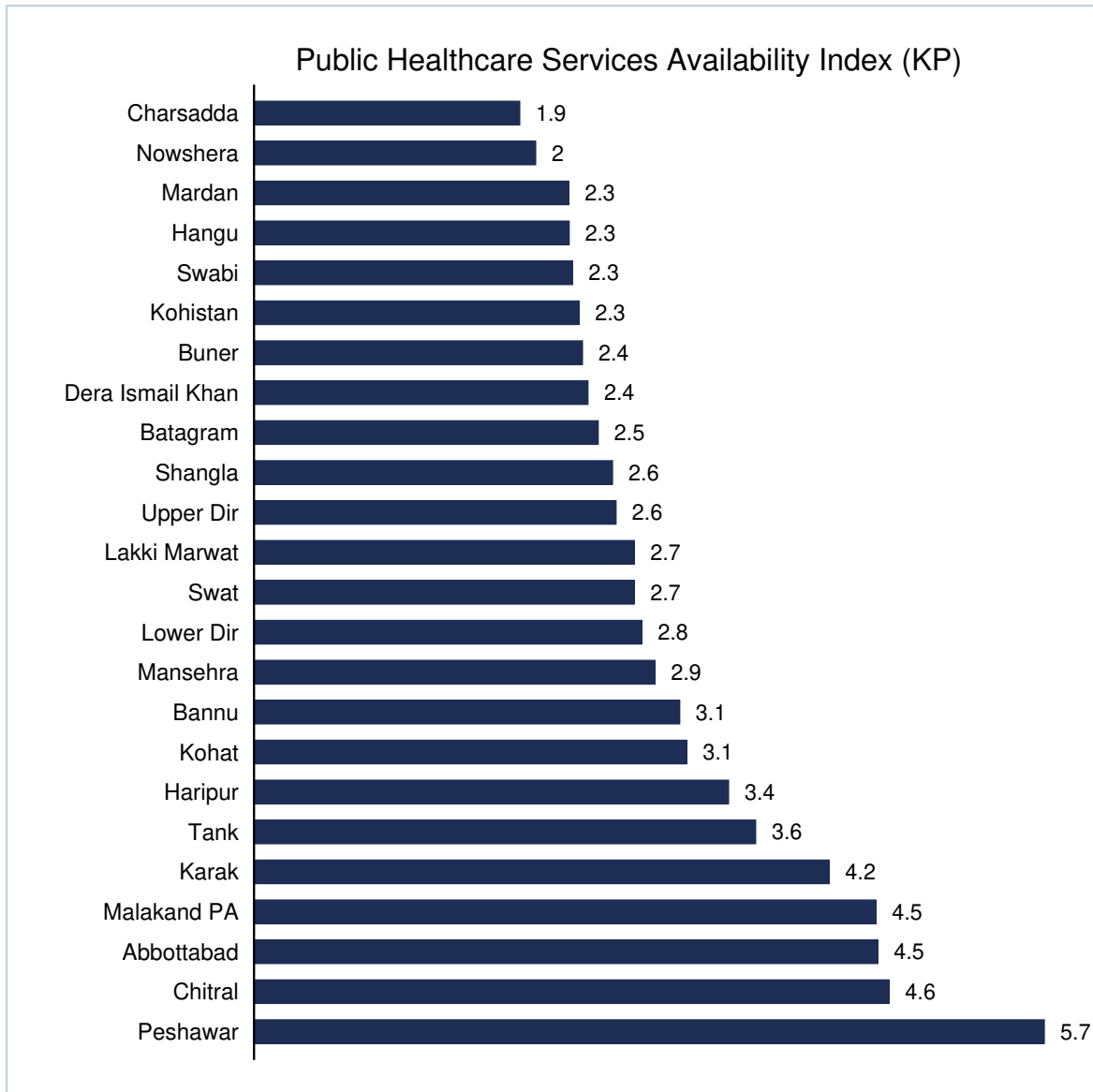


Figure 2.21: PHSAI index for the districts of Khyber Pakhtunkhwa (2016)

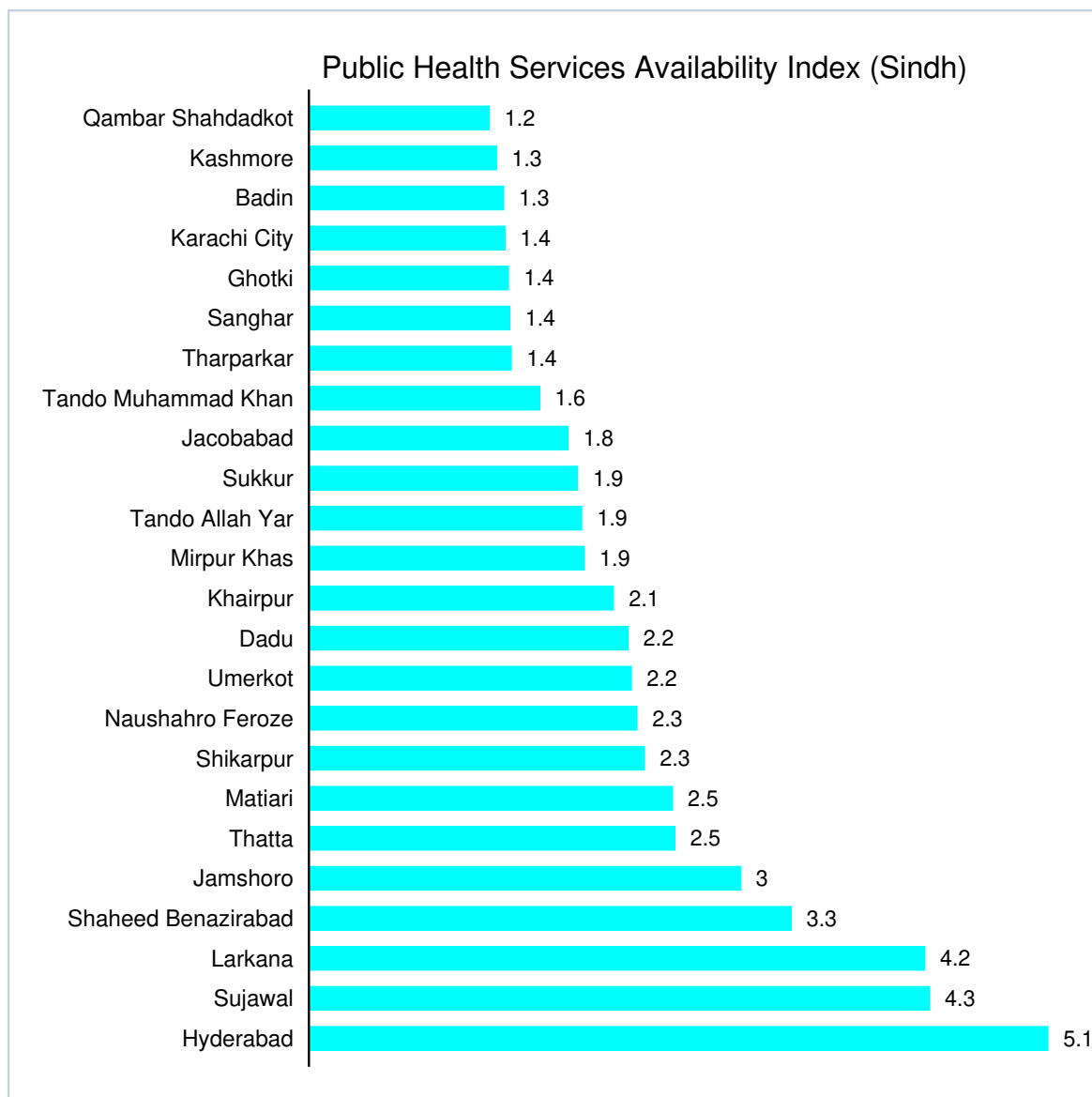


Figure 2.22: PHSAI index for the districts of Sindh (2016)

Overall trends in PHSAI scores

The average value for the PHSAI index for the districts of Pakistan is 2.82 and the median for PHSAI is 2.30. We observe that there are 70 districts below the average value of the PHSAI (24 districts of Punjab, 13 districts of Balochistan, 14 districts of KP, and 19 districts of Sindh). The average values of PHSAI uncover that only 44 districts of Pakistan are above average in terms of PHSAI. This shows significant disparities in the distribution of public healthcare infrastructure and medical staff among districts of Pakistan. Further, if we compare PHSAI for the districts of Pakistan with the minimum recommended standards set by WHO (as discussed earlier) for healthcare provision, we find that all districts significantly lag in the healthcare facilities.

2.3.7 Healthcare, Migration and Terrorism

There are two tales in this canvas that are left untold. The first tale is about healthcare, terrorism, and migrations and the second is about districts with a population of two million and above. Pakistan witnessed a lot of issues in the recent past, devastating earthquakes in KP and Balochistan, droughts in Tharparkar, floods in all of its provinces, and terrorism. Amid terrorism, migrations have occurred towards safer districts, and issue of Afghan refugees is also of great importance. Pakistan hosts around 1.4 million (registered) Afghan refugees in addition to hundreds of thousand unregistered. Migrations, natural disaster and terrorism are some crucial factors that can directly impact the provision of healthcare at district level.

Due to internal migrations (as an aftermath of terrorism) and Afghan refugees, Peshawar, Quetta, Pishin, Karachi, Swat, Abbottabad, D.I. Khan, Bannu, Awaran, Dera Bugti, Tank, and Nowshera had a high population growth. For instance, Quetta district has an annual population growth rate of (5.83%), Peshawar has a population growth rate of (3.99%), Karachi has a population growth rate of (2.60%) and Abbottabad has a population growth rate of (2.20%) from 1998-2017 ([PBS, 2017](#)). According to [Economics and Peace \(2020\)](#) Peshawar, Quetta, Karachi, Swat, D.I. Khan, Bannu, Awaran, and Tank are some of those districts which had the greatest number of casualties and injuries

due to terrorism, the highest number of casualties and injuries are recorded in 2013. By observing our data set for 2013 and 2014, we observe no changes in the number of healthcare institutions in Karachi, Quetta, Peshawar, and Awaran and only few healthcare facilities were established in Dera Bugti, D.I.Khan and Swat.

Public healthcare provision in districts affected by terrorism and internal migrations are mostly dependent upon the existing healthcare infrastructure. The current data on healthcare and population does not reflect any step by the government to address these issues in healthcare provision. By looking at this trend we can make a proposition that in these districts public healthcare services become more stretched or overburdened.

In the drought hit district of Tharparkar healthcare provision had improved but the quality of public healthcare provision is unknown, as this district still faces issue like high infant mortality, maternal mortality and malnutrition ¹⁶.

2.3.8 A Tale of Healthcare Facilities for Two Million and above.

The population density differs among the districts of Pakistan. The most densely populated districts are from the province of Punjab. There are 22 districts in Punjab having a population of two million or above. Quetta is the only district of Balochistan exceeding two million. Three districts of KP and four districts of Sindh have a population above two million (PBS, 2017). We selected the five most populated districts of Punjab, Quetta from Balochistan, three districts of KP, and four districts of Sindh. These districts represent around 70 million people, around (33%) of the total population of Pakistan. Karachi, Quetta, Lahore, Peshawar, Faisalabad, Rawalpindi, Gujranwala, Mardan, and Hyderabad are urban centers, this list also includes all the provincial capital districts.

Table 2.11 elaborates more on the state of healthcare services and disparities among these selected districts. The districts in the table 2.11 are in ascending order by population. The first district in this list is Sanghar with a population of two million and 57 thousand and is the 4th most populated district of Sindh. At the bottom of the table is district Karachi with a population of around 16 million. The average rankings based on the availability of healthcare resources show that the top four districts are from Punjab. Further if we

¹⁶<https://www.thenews.com.pk/print/98357-Field-notes-from-Tharparkar>

Table 2.11: A Comparison of Public Healthcare Resources in Selected Districts having a Population above 2 Million

District	Mean Ranking			Growth			PHSAI
	Facilities	Population	Area	Facilities	Beds	Medics	
Sanghar	64.7	24.3	31.0	-12.2	-28.7	-58.8	1.4
Hyderabad	79.3	73.0	108.0	-13.1	-30.7	-17.9	5.1
Quetta	90.7	77.7	93.0	-33.8	-34.7	-19.9	6.6
Swat	86.0	52.0	68.0	-22.6	-19.5	41.9	2.7
Mardan	82.3	40.0	102.0	-19.5	18.5	58.5	2.3
Khairpur	88.0	48.7	35.0	-1.3	-19.6	-15.6	2.1
Peshawar	105.3	73.0	113.0	-26.4	-6.3	-19.3	5.7
Rahim Yar Khan	107.3	53.0	69.7	-16.5	20.3	50.2	2.7
Gujranwala	105.0	38.0	103.7	-19.9	12.1	34.3	2.2
Rawalpindi	107.0	62.3	97.0	-51.6	-24.1	97.4	3.5
Faisalabad	112.7	66.3	109.0	-23.1	-3.8	17.6	3.2
Lahore	113.7	74.3	114.0	-5.1	-4.7	50.3	6.3
Karachi	106.7	7.7	105.0	6.7	-35.9	-55.7	1.4

Note: Columns 1-3 compare districts based on the rankings used in this analysis column 4-6 show respective growth rate and last column shows the estimates for PHSAI.

compare top four with bottom four we observe significant difference in the ranking of these districts.

By the second method used for ranking districts (population-adjusted), Quetta district emerges as the best performing district, as discussed earlier Quetta is an above-average in terms of the existing healthcare facilities and as well as in human development. Quetta district is the only district of Balochistan which is ranked as a medium in (Human Development Index) HDI (UNDP, 2017).

The average rankings by area reveal that in two million clubs the districts having a relatively small area and better healthcare facilities outperform districts having large geographical areas. For instance, Rahim yar khan and Rawalpindi have an average rank of 107 by facilities, but due to the large area of Rahim Yar Khan (around 12000 square kilometers), the average ranking by the area for Rahim yar Khan is 69.7, whereas Rawalpindi with a smaller surface area (5286 square kilometers) has an average rank by the area of 97.

PHSAI for the top four districts shows that there are three provincial capital districts and one urban district of Sindh (Hyderabad). In the bottom four, there are three districts of Sindh (Karachi, Sanghar, and Khairpur). If we look at the growth rate of facility density, we can observe that except for Karachi all districts in this list have a negative growth rate. In Karachi, the number of hospitals declined but the number of dispensaries increased (from 37 to 55), similarly maternal and child healthcare units increased (from 5 to 27) contributing to this growth rate. The density of inpatient beds decreased by (35.9%) and the density of medical staff decreased by (55.7%). The number of inpatient beds reduced by around 600. The decrease in the number of medical staff is alarming, during 2008 to 2012 nearly half of the medical staff were reduced. This drop in healthcare staff data is subsequent to the devolution of healthcare. The events related to downsizing and delays in the work schedule of construction and purchasing of equipment were also reported in this period¹⁷.

¹⁷<https://tribune.com.pk/story/202391/devolution-3-federally-run-hospitals-turned-over-to-sindh/>

2.3.9 Comparison of Below and Above Million Districts

In this section, the districts of Pakistan are divided into a broad category based on the number of inhabitants. The districts are categorized into two categories. The basis of this categorization is to evaluate disparities in the provision of healthcare facilities in populous and less populous districts. Out of 114 districts 65 districts are categorized as million plus by population. The mean population of the above-million districts is approximately 2.63 million and the mean population of below-million is around 0.502 million. We observe that districts of Punjab dominate the top 10 million-plus list, along with relatively urban districts. For instance, Lahore has no rural population, Karachi has a rural population of around 6%, in Rawalpindi, Gujranwala, and Hyderabad urban to rural proportion is high. The list of districts with a population of less than a million is dominated by the districts of Balochistan, along with relatively rural districts. For example, Batagram, Tor Ghar, Kohistan, Buner, Shangla, and Sheerani districts do not have any urban population. In general majority of districts of Pakistan possess a relatively higher proportion of the rural population¹⁸.

To compare the million-plus and below-million districts we use two methods, the first method compares the average value and standard deviations of the key indicators. The averages calculated for each category are then tested using a t-test for comparing the means of two independent samples. We assume that the availability of healthcare services in all districts is independent of each other. The null hypothesis of no significant difference was tested to check if there are significant differences in the average values of indicators in million-plus and below-million districts.

In table 2.12 columns 1-4 report the mean and standard deviation for the indicators used in this research. Column 1-2 show the values of mean and standard deviation for districts with a population of less than a million, column 3-4 represents districts having more than a million inhabitants. Column 5 reports the values of t statistics for comparing means. The test is conducted for both equal variance and non-equal variance based on the test of equality of variance using F-stat. The P-values are reported in the last column of this

¹⁸The mentioned values are reported in the district census report of 2017 published by the Pakistan Bureau of Statistics

Table 2.12: Results of Mean comparison t-test For Above and Below Million Population Districts

Variables	Below Million Districts		Above Million Districts		t-stat	p-value
	Mean	SD	Mean	SD		
Medical facilities	47.3	19.9	123.21	66.07	-8.75	0
Inpatient beds	204.87	178.16	1306.6	2036.05	-4.34	0.001
Core Medical Staff	159.48	96.8	727.12	820.37	-5.52	0
Facility Density	1.277	0.752	0.5514	0.2442	6.5	0
Density of Inpatient Beds	3.9411	2.08	4.4775	2.743	-1.141	0.256
Density of Health-care staff	3.728	1.899	2.6464	1.08	3.842	0.0002

Source: Author's calculation using t-test for comparing means.

table based on a two-tailed hypothesis at the 95 % confidence interval.

The mean value for the availability of healthcare institutions show significant difference among below-million and above-million districts. This is not an anomaly as more healthcare institutes are required to cater for the needs of relatively more population, however the variations in the available healthcare institutes is high in populous districts. This leads to an assertion that there are more disparities in availability of healthcare institutes in populous districts, as compared to less populous districts.

The mean values for inpatient beds and core medical staff also suggest disparities in the distribution of these resources, both between and among the populated and less populated districts. Interestingly, for districts having a population below million the standard deviation for both of these variables is high. Depicting that between these districts, there are substantial differences in the provision of these resources. In populous districts disparities in resource distribution (inpatient beds and medical staff) becomes more pronounced.

The mean value for facility density and the density of medical staff is higher in less populated districts, but the mean value for the density of inpatient beds is higher in populated districts. If we closely observe the mean and standard deviations for these indicators we can conclude that there are evident patterns of unequal distribution, both among and within, the categories of districts with a population of below and above million. Mean comparison t-test show that other than the density of inpatient beds all other indicators show significant differences between these two categories of districts, confirming the existence of disparities in the provision of healthcare services at district-level.

2.3.10 Comparing Urban Centers and Other Districts

In this section, we try to find out the difference in the distribution of healthcare resources between the major urban centers and the rest of the districts. The top ten urban centers (Karachi, Lahore, Peshawar, Quetta, Islamabad, Faisalabad, Rawalpindi, Gujranwala, Multan, and Hyderabad) have a mean population of around 6.44 million, the mean population of all other districts is 1.315 million. The above table depicts the mean and standard deviations for the indicators used in this research for both urban center and the

Table 2.13: Results of Mean comparison t-test For Urban centers and other Districts

Variables	Urban Centers		Others Districts		t-stat	p-value
	Mean	SD	Mean	SD		
Medical facilities	182.22	104.989	82.733	52.7354	-4.9345	0
Inpatient beds	4433.5	4269.4	524.47	521.26	-9.0276	0.001
Core Medical Staff	2239.7	1407.04	332.57	250.64	-12.286	0
Facility density	0.3175	0.109	0.9103	0.6409	2.76	0.0067
Density of in-patient beds	7.789	4.245	3.943	2.037	-4.882	0
Density of health-care staff	4.128	1.879	3.024	1.5264	-2.0456	0.0431

Author's calculation using t-test for comparing means.

rest of the districts. This table also provides t-stat and p-values for the mean comparisons to validate the existence of differences in the means of both samples.

We observe that the mean value of most of the indicators for urban centers is significantly high. Difference between the mean value of 5 out of 6 indicators shows that there are huge disparities in the distribution of healthcare resources between urban centers and the rest of the districts. While discussing rankings of the districts we had observed a similar phenomenon but the magnitude of such inequitable distribution of resources towards urban centers becomes more evident from this comparison.

2.4 Conclusion

We started our research with the quotation of “Hippocrates 460-370 BC” and conclude it with the quotation of “US senator, Bernie Sanders”. *“Health care must be recognized as a right, not a privilege. Every man, woman, and child in our country should be able to access the health care they need regardless of their income”*. Healthcare is indeed the most important aspect of a healthy life. The consequences of no or restricted availability of healthcare services should not be overlooked. Such consequences can mark irrecoverable losses on the individual’s life and the life of his/her family. Improvement in the healthcare services can increase life expectancy, infant mortality and years of quality life. In Pakistan, the average life expectancy has increased over the years and infant mortality has reduced. But several challenges like eradication of Polio, controlling tuberculosis, Covid 19, and Malaria need conscious efforts. The increasing number of HIV and hepatitis cases are issues yet to be pondered upon seriously.

This study used certain measures to evaluate the regional disparities in the distribution of public healthcare resources among the districts of Pakistan. The three ranking methods utilized uncover the existence of uneven distribution of healthcare resources. Significant differences were observed based on all three ranking criteria: by the availability of healthcare resources, availability in terms of population and as well as by the area. The disparities in the availability of healthcare resources show that most of the districts of Punjab have a relatively higher number of healthcare facilities as compared to the other

provinces. The districts of Balochistan have less availability of healthcare resources. The distribution of healthcare resources based on population show that less populated districts perform better than more populated districts. Even though the latter often possess large number of healthcare facilities. Area also plays a role with many smaller districts out performing the larger districts. In all three-ranking criteria, we found disparities in the distribution of healthcare resources. We also found that the provincial capitals perform comparatively well. This finding asserts that provincial capitals have better public healthcare facilities as compared with the other districts of the province and is suggestive towards concentration of healthcare facilities in these districts. This also affirms that there are disparities in the distribution of public healthcare resources within the province. This analysis has tried to look at the growth rate of facility density, the density of inpatient beds, and the density of medical staff. We found that there were no evident patterns in the growth rate of these indicators. The growth patterns of these indicators seem random as they do not seem to follow either changes in population or availability of existing resources. The rankings of the districts and uneven patterns of growth steered this analysis to deliberate on some standards for the measurement of healthcare resources. We use PHSAI to compare the district healthcare resources with international standards set by WHO. No district in the country meets the WHO's minimum healthcare facility criterion.

The comparison of district means revealed that more populous districts (districts with one million population) have more healthcare facilities compared to less populous districts. Mean comparison of districts based on facility density and healthcare staff in below million districts were higher and while there is little difference in the distribution of inpatient beds. The comparison between urban centers and the rest provides evidence of high disparities among the districts of Pakistan. The allocation of healthcare resources in the urban centers is found to be higher, implying concentration of public healthcare facilities in major urban centers.

From the findings of this study we draw the following conclusions: First healthcare policies need to emphasis the establishment of an efficient and monitored district level healthcare system. Second, the disparities among the districts based on the urban-rural

and more-less populated divide need to be addressed. A reliable healthcare resource allocation mechanism need to be introduced, that is based on the degree of deprivation, population size, and area. Third, the districts with less resources need to be prioritized in the healthcare resources allocations, ensuring equitable distribution. Finally, increase in the healthcare resources of the districts need to be adjusted with the changing profile of the district.

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Chapter 3

Impact of Devolution on Public Healthcare Utilization

Abstract

Public healthcare services delivery is subject to the influence of the policy making process. Empowering local governments can considerably improve the healthcare services as local governments can better understand the local needs for healthcare. The role of local governments in healthcare provision is important as the local demand for healthcare can be heterogeneous among districts or counties. Empowering the local government through devolution of power can enable the local policymakers to address the prevailing issues in healthcare provision more efficiently and effectively as compared to the central government. The debate on the impact of devolution on healthcare in developing and developed nations is not conclusive, but there is a widely accepted view that devolution can improve management, governance, and policy making. This research tries to find out the impact of devolution of healthcare services on public healthcare utilization in Pakistan. Increase or decrease in the utilization of the public healthcare sector can be viewed as a measure of improvement or deterioration in the local public healthcare system. The aim of this research is to evaluate the impact of devolution that took place subsequent to the promulgation of the 18th constitutional amendment on utilization of public facilities at district level. The impact of devolution is observed in the primary healthcare services, maternal healthcare services, and hospital consultations. Using four PSLM district wise representative household surveys from 2008-09 to 2014-15, we create a panel data for 107 districts of Pakistan. Fixed effects model is used as a baseline estimation technique, along with the pooled OLS and the random effects model for comparison. Hausman test and the results of this study suggest the appropriateness of the fixed effects model over the other mentioned techniques. Our results suggest that the impact of devolution on healthcare utilization differ by the type of public healthcare facility. There is a negative impact of devolution on healthcare utilization in primary healthcare and hospital consultations, (7.5%) and (13%) respectively. While in the domain of maternal healthcare utilization there is a positive impact of devolution. It is observed that after devolution there is a rise of (5.5%) in prenatal, (6.4%) in childbirth, and (7.4%) in postnatal consultations. This

research also incorporates important variables like development, terrorism, and natural disasters. By including these variables, this research tries to evaluate the impact of devolution on public healthcare utilization in terrorism-affected districts, disaster-affected districts, and variations in utilization based on the urban-rural profile and development of the districts. We observe that the impact of devolution remains mostly negative in the less developed and rural districts of Pakistan. The devolution has failed to increase the demand for public healthcare services, especially in the primary healthcare, which may be a consequence of the local healthcare services being unable to improve their quality post devolution.

JEL Codes: H70, H75, I18, I19

Keywords: Devolution, Public sector, Healthcare Consultations, Pakistan.

3.1 Introduction

“The people have the right and duty to participate individually and collectively in the planning and implementation of their health care.”

Alma-Ata Declaration of 1978, WHO

Economic and political systems have evolved over time. For centuries, the authority and decision making rested in the hands of a single or a few decision makers. Overtime, notions like the sovereignty of people through legislative bodies changed the structure of governance in most of the world. In the last few decades, a further leap in this debate has articulated the concept of devolution of power. This distribution of power through legislation can empower the sub-national governments to make public sector delivery more efficient, through policy formulation, administrative decision making, and better responsiveness on the local needs based on their respective local scenarios ([Giannoni and Hitiris, 2002](#)). The devolution of power embodies the concepts of financial and administrative authority over local infrastructure and resources. It is also dependent upon financial support from the central and provincial governments, along with their own resources ([Uchimura and Jütting, 2009](#)). The devolution of power within a country can potentially benefit the welfare of individuals. The rationale behind devolution is to increase local autonomy, increase public participation in response to their respective local needs. The local need can often be heterogeneous and can be effectively addressed by local governments rather than by the central government ([Gelormino et al., 2011](#)).

The decentralization theorem proposed by [Oates \(1972\)](#) suggests that improvements in healthcare services can be obtained through decentralization. Decentralization can be an effective tool to increase the quality of healthcare services by improving health inputs and making necessary adjustment in these inputs based on the preferences of the local population. Over the recent few decades, international organizations like UNICEF and WHO have emphasized on the importance of community participation in improving healthcare services. The declaration of Alma Ata (see ([WHO, 1978](#))) explicitly highlights that the local participation in planning and provision of healthcare services can be very

effective, especially for better outcomes in the primary healthcare services.

This emphasis of international organizations about improvements in healthcare through devolution has developed around the world. The underline reasoning behind healthcare decentralization is to improve the efficiency of the healthcare provision, to ensure equity, accessibility, responsiveness to the local healthcare needs, capacity building, and accountability in healthcare provision (Lieberman et al., 2005; WHO, 2008). Both developed and developing nations have opted for devolution, considering it to be an effective approach to increase public good provision in general, and healthcare specifically.

In the past few decades, devolution was implemented in several developing countries where the issues in the public services delivery were prominent. In some of the developing nations, devolution in healthcare was implemented to resolve the widespread dissatisfaction of the public with centralized policy and planning, in some others, devolution was a part of their respective development plans (Rondinelli et al., 1983, 1989). Developing countries with a relatively high population like China, India, Kenya, and recently Pakistan have also devolved to improve public services delivery. The impact of devolution on the provision of healthcare services is not limited to the developing world. There is a substantial evidence of devolution of healthcare in developed countries like UK, Italy, Spain, and OECD.

In the existing literature, the impact of decentralization on healthcare outcomes is still a matter of debate. Devolution in developed countries have considerably improved health outcomes like improvements in life expectancy and reduction in child mortality (Cavaliere and Ferrante, 2016; Cylus et al., 2015; Rubio, 2011), while on the other side, devolution raised further questions pertinent to inequalities, degree of autonomy, and income-based disparities in the distribution of healthcare services among regions (Costa-i Font, 2005; Nay et al., 2016).

In the case of developing countries, the empirical evidence on the impact of devolution on healthcare is limited. Available studies from the developing world have found mixed effects of devolution on their respective healthcare system. For instance, a study on India (Asfaw et al., 2007), china (Uchimura and Jütting, 2009), and Bolivia (Faguet, 2012) show a positive impact of devolution/decentralization on the healthcare outcomes, while study on Uganda by (Akin et al., 2005), on Mexico by (Bustamante, 2010), and on Bangladesh

by (Ahmad et al., 2007) show that devolution was unable to considerably change their respective healthcare systems. Major issues affecting the desired outcomes of healthcare devolution in the developing countries include: lack of capacity at a local level, budget allocations to other public services instead of healthcare, deficiency of healthcare infrastructure and medical personnel (Ahmad et al., 2007; Akin et al., 2005; Hasnain, 2008). Despite this disagreement, we cannot underestimate the intention behind devolution, which is to improve the governance and policy making at the local level and could better serve the public interest (WHO, 2008).

The literature on this topic mostly considered fiscal decentralization and a single healthcare outcome such as infant mortality to capture the effects of decentralization or devolution (see for example Asfaw et al. (2007); Cavalieri and Ferrante (2016)). Although financial decentralization can be viewed as a good proxy for healthcare devolution, but it does not suffice as an optimal measure for devolution. As noted by (Saltman et al., 2007) devolution is a broader phenomenon that comprises the decentralization of both administrative and financial powers. The empirical evidence in this area is also limited to a specific type of healthcare outcome. Most of the authors have used infant mortality which indeed is an important healthcare outcome, but may not be considered as the best measure to observe the overall changes in the performance of healthcare institutions after devolution.

This research tries to fill the gap in the existing literature by looking at devolution as a matter of policy shift paradigm, using a pre-and post-devolution variable. The impact of devolution is measured using the utilization of public healthcare institutes. The utilization of public healthcare institutions is an important healthcare outcome, as the utilization of public healthcare service signifies the trust of people in their respective public healthcare system. The post-devolution increase/decrease in public healthcare service utilization can significantly reveal if significant improvements/deterioration in public healthcare delivery has taken place. Rather than using a single health outcome, this research examines the impact of devolution on utilization in three different public facilities at the district level. We try to find out the impact of devolution on the utilization of public hospitals, primary healthcare institutes known as Basic Health Units (BHU's) and maternal care. The first type of health consultations is from government hospitals, the second type of consultation

is from primary healthcare centers, which are mostly found in the rural areas, and the third type of consultation is specifically for pregnant females. Post devolution assessment of these healthcare facilities is based on their respective utilization, as an indicator for improvement, each type of healthcare utilization employed in this research tries to unfold the changes in utilization after devolution in the public healthcare sector. The impact of devolution on the utilization of these services may vary. On one hand, improvements in all types of utilization can portray the significance of devolution and on the other, if utilization of the public healthcare increases in few sectors, this can lead to some doubts regarding the outcomes of devolution.

Another important contribution of this study is to observe the impacts of devolution based on need for healthcare and heterogeneity among districts. This research includes controls like terrorism, natural disasters and level of development of the district. The sub-sample estimates obtained by using these variables can differentiate districts that require relatively higher efforts from their respective local governments to improve the healthcare provision. Districts with higher rates of incidents due to acts of terrorism and disasters are compared with districts having no recent disasters or terrorism. This comparison helps us to understand the role of devolution in such extraordinary circumstances. This research also tries to find the impact of devolution at the district level by using measures of development and location. The division of districts based on development and urbanization enables us to observe the pattern and changes in public healthcare utilization as a result of devolution.

We use the fixed effects model for the empirical analysis of the data, the data set covers public healthcare provision in 107 districts of Pakistan, covering around 163 million¹ out of the country's 220 million population (around 75%). The results of the random effects model and pooled OLS are reported along with the fixed effects model. Four sets of district-wise Pakistan Social and Living standards Measurement (PSLM) survey data set are used in this research. The PSLM data sets included in the research range from the year 2008-09 to 2014-15. Out of the four data sets used, two surveys took place before the devolution and two after.

¹Based on the estimates of PSLM 2014-15.

The literature on the utilization of healthcare services and devolution is scant and in the case of Pakistan. The few existing studies are mostly descriptive or are conducted on a single province. By considering the impact of devolution on the utilization of public hospitals, primary healthcare, and maternal healthcare, we intend to give an insight into the existing body of literature in general and specifically, in the case of Pakistan.

The impact of devolution on the utilization of primary healthcare and public hospital consultation is found to be negative and the impact of devolution on the maternal healthcare service utilization is positive. The next section of this research gives an overview of devolution in Pakistan. The 3rd section of this research discusses the existing literature on devolution and healthcare, including evidence from both developed and developing economies. After the review of the literature, the data and methodology for this research is discussed. Followed by the results and discussion section. In the last section we conclude this research and give some policy recommendations.

3.1.1 Devolution in Pakistan

According to the [World Bank \(2019\)](#), Pakistan is one of the most populated countries in the world. The estimated population of Pakistan is around 216 million. Being densely populated, the delegation of power from the federal government to the provincial government in Pakistan has been a center of debate for decades. The devolution plan of 2001 carried out under the military dictatorship of General Pervez Musharraf was one of the most ambitious devolution programs in the history of Pakistan. [Aslam and Yilmaz \(2011\)](#) observed that the devolution plan of 2001 significantly increased the role of local government in public services delivery, but the assessment of this program revealed that autonomy of local representatives over fiscal and managerial powers was limited. The fiscal power remained a prerogative of provincial governments and managerial controls remained with the civil services.

It is pertinent to note that the devolution plan of 2001 was a significant milestone in the devolution of healthcare. The local government ordinance of 2001 devolved all healthcare institutions (except teaching hospitals) to the local government ([Stone, 2006](#)). After the return of parliamentary democracy in 2008, the debate over local autonomy in the national

assembly resulted in the 18th amendment of the constitution. The 18th amendment of the constitution took place in 2010-11. This amendment devolved several ministries from the federal government to the provincial governments. The devolved ministries include: the ministry of health, the ministry of local government, and the ministry of rural development.

The system of governance and administration in Pakistan has three tiers, federal, provincial, and local. The provinces and autonomous regions have their own legislature. The relationship between the province and federation is defined under the part five of the constitution (articles 141-144). Authority between the federal and provincial government is distributed through a legislative list.

The provincial legislature through the act of parliament defines the powers and responsibilities of local governments. The local government's function based on this legislation may require local governments to perform several public service delivery functions which also includes healthcare. For instance, the local government act of Balochistan fifth schedule defines provision of public health as a function of local governments, this includes prevention and cure of infectious disease, maintenance, management, and establishment of health units for primary, maternal, and child healthcare. ([Government of Balochistan, 2010](#)). The local government act of Punjab defined the role of local governments in the provision, monitoring and prevention of healthcare in its III,IV, and V schedule (clause d, e and ee), respectively ([Government of Punjab, 2012](#)). Similarly, the healthcare functions of local government are defined in the province of Sindh under the local government act of 2013 (See ([Government of Sindh, 2013](#))) and in KP under the local Government act of 2012, (see [Government of Khyber Pakhtunkhwa \(2012\)](#)).

The financial disbursements from federal to provincial governments take place via the national financial commission (NFC) awards. In the total divisible pool of the taxes collected by the Federal Bureau of Revenue (FBR), the share of provincial governments is (57.5%). The share of a province is decided based on population, development/backwardness, its share in revenue generation, and inverse population². In principle, the provincial governments are required to transfer funds to the local government via the Provincial

²<https://tribune.com.pk/story/1936990/explainer-nfc-award>

Financial Commission (PFC) awards for the smooth functioning of local governments. Provincial governments also have a prerogative to change the financial allocation of any local governments through their own PFC awards ³

3.1.2 Implementation of Devolution in Pakistan

Devolution is a constitutional/legislative process, but its success largely depends upon its implementation. The federal legislative assembly approved the 18th amendment in April 2010, but the devolution of the ministry of health took place in June 2011. There was a 14-month delay in this process due to the administrative or procedural difficulties. After the devolution of the ministry of health, the provision of healthcare became a responsibility of the respective provincial governments. The post-devolution budgetary allocations in the healthcare sector have significantly increased by the respective provincial governments, at the provincial level the financial share of healthcare was revisited by constituting a parliamentary committee for health (Zaidi et al., 2019). Despite these steps taken by the provincial governments, the process of devolution of healthcare from the provincial governments to local governments was further delayed. The local government elections started to take place in 2013 and in the province of Punjab and Sindh the local government elections took place on the orders of the Supreme court of Pakistan ⁴. It is worth noting here that, there is no evidence of the (PFC) awards by the province. This implies that the implementation of devolution faced delays and the process of financial decentralization is still incomplete.

3.2 Theoretical Linkage

To develop a theoretical link between improvements in public services delivery and choice of local representatives, we postulate that if local policymakers wish to get elected in the next election, they need to improve the public services delivery in their respective constituencies. Although, the choice of the local representative is dependent upon several

³<https://www.thenews.com.pk/print/741120-lg-funds-to-be-increased-in-punjab>

⁴<https://blogs.lse.ac.uk/southasia/2017/03/16/local-governments-and-pakistans-reluctant-political-elite/>

factors like political affiliation, ethnicity, religion, and others, but for simplicity we assume that the choice of local representative is associated with the improvements brought in the provision of the public sector delivery. Further, we also assume that the probability of getting votes in the next election is dependent upon the improvements in the public healthcare services, keeping other public sector deliverable as constant. This implies that voters assess the performance of the local representatives based on the public provision of healthcare services. To increase the probability of selection by the voters the local policymakers will tend to maximize the utility of the community. In a traditional utility framework, the voter's utility is dependent upon the consumption of the public and private good. The usual utility function is used to show the behavior of a voter.

$$U_{i,j} = U(h_{i,j}, X_{i,j}) \quad (3.1)$$

$U_{i,j}$ is the expected utility of the individual "i" from utilizing a healthcare service "j". An improvement in the health status can contribute to an increase in the overall utility. $X_{i,j}$ is the consumption of the other goods excluding healthcare. The choice of healthcare facility "j" (if private) is likely to alter consumption due to monetary costs. $H_{i,j}$ is not directly observable, we use a (Grossman, 1974) type healthcare production function to capture its effects.

$$H_{i,j} = H(\gamma_i, \delta_i) \quad (3.2)$$

γ_i is the vector of observable characteristics of individuals like age, need, gender, education, and other enabling factors. δ_i is the vector of the characteristics of the healthcare service provider like distance, quality, cost, etc. It is important to mention that Aday and Andersen (1974); Andersen (1995, 2008) have conceptualized a behavioral model of healthcare use. Health policy and financing are regarded as the enabling factors for healthcare utilization as part of the contextual characteristics. The availability of healthcare resources and financing mechanism can enable individuals to use a particular healthcare service. Individual's characteristics like ability to finance, healthcare need, and preference for a specific healthcare facility can also influence the healthcare utilization. The dimensions of contextual characteristics are further extended by Hillemeier et al. (2003),

they have included the functioning of the local government in the provision of healthcare, as well as the local health policies being a dimension of contextual characteristics. Based on the above discussion we incorporate the contextual characteristics of healthcare use in δ_i and γ_i incorporate all individual characteristics enabling healthcare utilization. The individual faces the following resource constraint.

$$I_i = P_h H_{i,j} + P_x X_{i,j} \quad (3.3)$$

The income constraint of the individual shows the respective prices for healthcare services and other goods. By substituting the health production function in the utility function and optimizing the utility function with respect to the budget constraint, we obtain the healthcare demand function

$$D_{i,j} = D(Y_i, Z_{i,j}) \quad (3.4)$$

$D_{i,j}$ is the healthcare demand for individual "i", from a healthcare provider "j". Y_i is a vector of individual-specific characteristics and enabling factor and $Z_{i,j}$ is a vector of choice specific variables an individual "i" makes while choosing a healthcare provider. This includes cost, quality, availability, distance, and waiting time. The demand function includes income in Y_i and prices of healthcare providers in $Z_{i,j}$. From the above model we can propose that in a district if δ_i for private healthcare is higher than the public sector, individuals will tend to use private healthcare relatively more compared to the public sector, hence increasing the demand for the private healthcare or vice versa. After devolution, if voters observe improvements in the public healthcare service in their respective district, they can pivot their preferences by increasing the utilization of public healthcare service, hence increasing the demand for the public healthcare. In case of a decline in the public healthcare service delivery the demand for public healthcare also decreases. In case of no improvement or stagnation, households' preferences should remain as before, if and only if their income remains the same.

The local policymaker will try to improve the healthcare service delivery in his/her constituency, as improvements in the public healthcare services delivery will considerably increase his or her probability of selection. In case of no improvements or decline in public

healthcare facilities, it is likely that the healthcare utilization in the public healthcare sector either remains stagnant or decrease, this can significantly decrease the probability of selection of the local policy maker in coming elections.

3.3 Literature Review

The Alma-Ata Declaration of 1978 laid the foundation of devolution in healthcare, clause IV of this declaration emphasize on the participation of individuals to establish an effective healthcare system. For the last five decades there is an ongoing debate on healthcare decentralization. Researchers have tried to answer several questions related to devolution and decentralization. The existing evidence describes both positive and negative impacts of devolution. Evidence from some countries show promising results of devolution and evidence from some others have led to skepticism. We will briefly discuss both point of views in this section.

Devolution of power and decentralization are politically motivated phenomena. To define these concepts, we will use an interdisciplinary approach that focuses on the views from both political science and economics. Political scientists view decentralization and devolution as the delegation of power to the local administration. Decentralization is more focused on achieving some set of objectives at the local level through a public management strategy, whereas, devolution is a politically motivated response for more regional autonomy which may require significant structural and managerial changes ([Bresser-Pereira et al., 2004](#)). By this definition, the 18th amendment in the constitution of Pakistan can be referred as devolution, rather than decentralization.

There is no consensus on the definition of decentralization in the healthcare literature. One of the definition based on the types of decentralization was given by [Rondinelli et al. \(1983\)](#). They divide decentralization into four sub-categories, namely deconcentration, delegation, devolution, and privatization. According to them, devolution is the transfer of power from the center to the sub-national administration through a legal reform. Devolution also gives legitimacy to the sub-national administration to exercise authority in its geographical boundaries.

Devolution is sometimes referred as political decentralization, as devolution helps to increase the participation of locals in policy making and gives authority to local representatives to administer their local institutions. [Saltman et al. \(2007\)](#) are of the view that devolution is a more comprehensive procedure, as devolution not only decentralizes the administrative and financial powers to the local government, but is also backed by the formation of new administrative divisions or bureaucracies.

The other type of decentralization includes fiscal and market decentralization. Fiscal decentralization is associated with the transfer of funds to the sub-national governments. The market decentralization refers to the involvement of the private sector in healthcare provision. The private sector can directly or through a public-private partnership provide healthcare services. The healthcare provision by the private sector can be based on either profit or non-profit motive ⁵. [Weingast \(2009\)](#) is of the view that a decentralized system of governance should demonstrate better performance and it should improve the healthcare services at the local level. The local healthcare systems can be improved by decreasing the asymmetry of information, increasing the participation of the community in the decision-making process, and ensuring that the local policy makers are accountable. For the last few decades, there is an ongoing debate on the importance and objectives of a decentralized healthcare system. [Conyers \(1983\)](#) highlighted some important aspects of decentralization in the healthcare sector. His research shows that decentralization is helpful to ease access to public healthcare facilities, by addressing the issue of accessibility, healthcare services become more accessible for less advantaged or marginalized individuals. Further, decentralization is helpful to increase the responsiveness of the local healthcare systems to address local healthcare needs. Decentralization in healthcare can create a mechanism of coordination among different sectors to increase the efficiency in the healthcare provision. [Collins and Green \(1994\)](#) argue that the fundamental objective of a devolved healthcare system is to fill the existing gaps in the healthcare provision. Devolution can be helpful in increasing the accessibility for all by overcoming the issues related to distant or remote decision making. The [World Bank \(1987\)](#) view decentralization as an effective tool to fulfill the local demands for healthcare as it increases the accessibility to

⁵<https://www.who.int/health-laws/topics/governance-decentralisation/en>

healthcare services and reduces the inequities in the healthcare system, especially in the developing world.

In contrast, [Gravelle \(2003\)](#) is an advocate of centralized healthcare system. He argues that the marginal benefits of a centralized healthcare system are greater than a decentralized healthcare system. He explains that local policymakers often appease their supporters by establishing healthcare units in locations where such healthcare facilities are underutilized, leading to inefficiencies. On the other hand, a centralized healthcare system is based on the principle of economies of scale. An efficiently located healthcare facility might require travelling for some patients, but its marginal benefit is greater than its marginal cost.

It is worth mentioning here that in this research the word devolution refers to political decentralization rather than fiscal decentralization. Our interest is to find out the impact of devolution of power on healthcare outcomes subsequent to the constitutional amendment of 2010-11. The constitutional amendment of 2010-11 is a political reform which intends to increase autonomy at the district level. The devolution of the healthcare systems occurred in both developed and developing nations. In the following paragraphs we present some evidence from both the developed and the developing world.

3.3.1 Selected Literature from Developed Countries

The process of healthcare devolution in the United Kingdom's started around 1997. [Cylus et al. \(2015\)](#) observe that devolution brought promising changes in the UK's healthcare system. A rise in life expectancy, expansions in the healthcare infrastructure, and increase in the capacity building of healthcare professionals are the most prominent effects of devolution. The efficient allocation of healthcare resources in UK led to a financially efficient system. Yet, devolution was unable to reduce health inequalities among different socioeconomic groups and regions.

The impact of fiscal decentralization on infant mortality in the Italian regions was studied by [Cavalieri and Ferrante \(2016\)](#). They suggest that decentralization significantly reduced infant mortality over time. The effects of fiscal decentralization in the selected regions of Italy are heterogeneous based on regional incomes. The decentralization policy is found to be more effective in regions having autonomy of decision making, accountability, and

higher income as compared to the other regions. [Costa-i Font \(2005\)](#) asserts that by observing the trends in the life expectancy of Spain, the Spanish healthcare system can be considered as one of the world's most efficient healthcare system. The devolution of the health services in Spain led to improvements in health outcomes. The devolution of the Spanish healthcare system has not led to large disparities in healthcare provision among regions, except for those regions where the share of private healthcare utilization is higher. Another study on Spain by [Jiménez-Rubio and García-Gómez \(2017\)](#) observe that decentralization has proven to be an effective method to improve health outcomes in the fully decentralized provinces of Spain. The essence of full decentralization refers to the autonomy of both political decision making and financial powers. They conclude that wealthier and fully decentralized regions have gained long-lasting benefits from decentralization. Similarly, decentralization in Canada shows a positive relationship in improving health outcomes like infant mortality ([Rubio, 2011](#)). The analysis of the 22 OECD countries shows that decentralization improved the health outcomes in these countries. Improvements in healthcare due to the decentralization move to a threshold point and beyond that point this relationship becomes negative. The potential cause of this decline is due to income and health inequalities. These inequalities arise due to the differences in institutional settings of the respective countries through which the healthcare provision is managed ([Kang et al., 2012](#)).

3.3.2 Selected Literature from Developing Countries

Chinese fiscal decentralization experience show that healthcare decentralization through a fiscal channel can affect infant mortality [Uchimura and Jütting \(2009\)](#). The impact of fiscal decentralization on infant mortality is subject to several conditions: what is the region's own financial capacity and how much transfer payments are received from the central government. If there is an increase in the fiscal transfer from the central government and region's own fiscal capacity, reduction in infant mortality is observed. The key to the desired health outcome post decentralization in Chinese regions lie in the fiscal autonomy of the regions and intergovernmental fiscal transfers.

There are several research contributions on the devolution of healthcare in Kenya. A

recent contribution based on a systematic review by [Masaba et al. \(2020\)](#) shows that the devolution of healthcare in Kenya resulted in increasing local participation in decision making process. The healthcare delivery system improved, along with an increase in the physical healthcare infrastructure. The financial allocations for the healthcare services have increased in relatively deprived counties. The post-devolution problems encountered in Kenya include: the lack of staff and healthcare resources, the prevalence of inequalities, and management related issues.

Using a decentralization index [Asfaw et al. \(2007\)](#) observes a negative relationship between infant mortality and decentralization in fourteen Indian states. The decentralization index used in this research is based on the share of the local governments in total public expenditures, the total revenue of the local government, and the expenditures of the local government on the rural population. This analysis associates the decline in infant mortality with a higher value of the decentralization index. The regions with an above-average decentralization index have relatively lower infant mortality rates as compared with the states which have below-average decentralization index.

Decentralization in Bolivia shows that the investment in the health sector increased over time, signaling towards the responsiveness of the local governments to increase access to healthcare. Access to healthcare services increased in the regions where households had fewer healthcare facilities and there is a positive impact of decentralization on investments in healthcare ([Faguet, 2012](#)). Likewise [Faguet and Sánchez \(2014\)](#) found that in the Colombian districts where the local revenues are the major proportion of the healthcare financing, the healthcare coverage increased over time. The access to healthcare either declined or remained stagnant in all those districts which rely more on the fiscal transfers from the central government.

In the provinces of Turkey family medicine reforms were introduced to strengthen the primary healthcare sector and increase the utilization of healthcare services [Hone et al. \(2017\)](#), subsequent to this reform healthcare utilization increased considerably, along with satisfaction of patients from the primary healthcare sector.

There is also some evidence that shows either a negative or insignificant effect of devolution on healthcare outcomes. [Bustamante \(2010\)](#) compares utilization of preventive healthcare

among rural households of Mexico. The provision of preventive healthcare in some of the regions of Mexico is administered by the central government and in others the preventive healthcare is provided by the regional healthcare providers. The researcher notes that in comparison with the regional healthcare providers, the utilization of the preventive care from the centralized healthcare provider is (3.6 %) higher and the out-of-pocket payments is (32%) lower. Based on the higher percentage of healthcare utilization and lower percentage of the out-of-pocket payments, the researcher is of the view that the Mexican rural households utilizing the preventive healthcare services from centralized healthcare providers are better off as compared to the households utilizing the healthcare services from the decentralized healthcare institutions.

[Ghuman and Singh \(2013\)](#) argues that the impact of decentralization on public services delivery in Asia varies between regions. For Bangladesh, [Ahmad et al. \(2007\)](#) observes that access and utilization of public healthcare facilities after decentralization have remained poor. People tend to prefer other healthcare services, like traditional healers over public healthcare services. The main reason behind this choice is the lack of healthcare resources in the public healthcare sector and affordability.

The district-level analysis of Uganda by [Akin et al., 2005](#) shows that there is a negative impact of decentralization on healthcare. After devolution in Uganda, the fiscal share of the healthcare significantly decreased in comparison with other public goods. The budget allocations by the local authorities for the healthcare sector kept declining, especially in the primary healthcare sector. The devolved governments diverted more resources to civil works and other public sector deliverable, ignoring the primary healthcare sector. Bolivian decentralization experience is analyzed by [Inchauste \(2009\)](#), researcher explains the relationship between the changes in healthcare expenditures and the share of unattended illness. Healthcare expenditures have increased in the sub-national regions of Bolivia, but the share of the latter also increased over time. Resulting in a significantly negative relationship of unattended illness with decentralization.

The only study in the context of Pakistan is by [Hasnain \(2008\)](#). This study focuses on the local government reforms post-2001 and this study is limited to the districts of Punjab. The services delivery by the local administration in this era shows that the

local administration prioritized physical infrastructure development over healthcare and education.

From the above literature, it is evident that devolution can influence healthcare systems and healthcare provision. Although this impact varies across developed and developing economies and among developing nations. In most of the developed countries, the impact of devolution is positive on the healthcare outcomes, with some concerns related to the inequalities in healthcare provision. In developing countries, the literature shows that there are mixed results of devolution on healthcare outcomes. In developing nations, the resource allocations, lack of healthcare infrastructure, and decline in the utilization of the healthcare services are some of the prominent factors impacting the efficacy of devolution.

3.4 Variables, Data, and Empirical Strategy

The aim of this study is to find out the impact of devolution on healthcare utilization using district-level data. Healthcare utilization across districts can be influenced by several observable and unobservable factors, these factors can vary across districts and some factors are district specific. Time-invariant factors such as the area of a district, ethnicity, and healthcare practices significantly influence healthcare utilization. In the presence of unobservable district heterogeneity and time-invariant characteristics, a fixed effects technique is assumed to be feasible as it caters for the before mentioned issues by using within district variations. We can define a district fixed effects model for this study as follows:

$$Y_{i,t} = \alpha + \beta D_{i,t} + \gamma F_i + \delta T_t + \sum_{k=1}^k X_{i,t} + \mu_{i,t} \quad (3.5)$$

In the above equation, the healthcare utilization at the district level is represented by $Y_{i,t}$, where "i" represents a district and year is represented by "t". The healthcare utilization at the district level is regressed on the devolution effect which takes a value "0" before the devolution and "1" on wards. F_i is the vector of district fixed effects and T_t stands for year fixed effects. The time fixed effects in this model allow for the variations in healthcare utilization occurring due to any countrywide shocks. $X_{i,t}$ is the vector of control variables influencing healthcare utilization. $\mu_{i,t}$ is the idiosyncratic error over time and district.

3.4.1 Variables

Dependent Variables

In this research, we try to observe the impact of devolution on three types of healthcare utilization variables. We define these dependent variables as follows:

- 1) Public hospital utilization/consultations: This variable is the district average of the utilization of public hospitals by individuals. The responses of individuals are based on the recall period of the past 15 days. This variable is based on responses of the individuals who have made consultations from a public hospital in case of getting ill or injured.
- 2) Primary healthcare utilization: This variable is based on the utilization of basic healthcare units by the households at the district level. To construct this variable, the responses of the households were averaged at a district level. This variable shows the average utilization of BHU by all the respondent households in their respective districts.
- 3) Prenatal healthcare utilization: This variable is a part of maternal consultation. This variable illustrates the utilization of public healthcare services by women for prenatal care at the district level. Responses are accounted for all the women who have consulted a public healthcare institute for prenatal care.
- 4) Utilization of Public healthcare for childbirth: This variable is created using the data on childbirth/ delivery taken place at a public healthcare institute. This data is then aggregated using average at the district level.
- 5) Postnatal healthcare utilization: This variable is also a district average for postnatal care availed by the females from a public healthcare institute after childbirth/ delivery. The variables for prenatal, childbirth, and postnatal care are the sub-categories of the maternal healthcare utilization and are used individually in this research to find out the overall impact of devolution on maternal healthcare.

Variable of Interest

Devolution Effect: The variable of interest for this research is defined as a binary variable to capture the effect of devolution on the healthcare utilization. This variable takes a value "0" for a pre-devolution period and "1" for the post-devolution period.

Control Variables

As discussed in the econometric specification section we used time and district fixed effects along with the following control variables.

Distance: Mean distance from the nearest healthcare facility is included as a control variable. This variable shows the distance from the healthcare facility measured in terms of time to reach the nearest healthcare facility.

Population: Population of the districts (in ten thousand's) is used as a control variable to see the healthcare utilization pattern with respect to the population. The data for the population are taken from Pakistan Bureau of Statistics (PBS). We interpolated the actual values of the last two census for each district. Interpolation is performed using growth rates of the population based on the average growth rate for the inter-censal period.

Income: The average income of the households at the district level is based on the yearly income reported at the household level. The unit of district income is ten thousand rupees.

Education: This variable is generated as a count variable for all the individuals in a district who can read and write. The average of this variable is taken at a district level to observe the average education in each district.

Dependency Ratio: This variable is the district average of the ratio of dependents. This variable includes all children below working-age and elderly over the working-age population.

Household Size: The average household size at the district is the mean of the total number of individuals living together aggregated at a district level.

Luminosity/Development: The development of a district is measured using night light data at district level. The data used in this paper were obtained using the harmonization proposed by (Li et al., 2020). The data obtained from the Defense Meteorological Satellite Program and Visible Infrared Imaging Radiometer Suite are harmonized to obtain a time series of night light data. The data are extracted from the tiff files using geographical boundaries of the districts using the shapefile⁶ polygon. The raster and polygon are

⁶The shapefile polygon is obtained from the <https://data.humdata.org/dataset/pakistan-administrative-level-0-1-2-and-3-boundary-polygons-lines-and-central-places>.

layered together to obtain the average night light for each district. The data processing is done using QGIS version 3.16.2.

Terrorism: This variable represents districts affected by the acts of terrorism. The data for this variable are obtained from Global Terrorism Database (GTD). GTD reports location, date, number of injured and number of casualties occurred because of an act of terrorism. The data on the district level was aggregated using a binary variable. The districts prone to an incident of terrorism are assigned a value "1", if any casualties or injury is reported. We use the data on terrorism before the collection of PSLM data to incorporate the lag effects of terrorism, as it is likely that an event that occurred previously may increase healthcare utilization.

Natural Disaster: This is a binary variable that takes a value "1" if a district gets affected by a natural disaster during the year prior to the survey. Natural disasters include all hydro-logical and meteorological disaster such as floods, earthquakes, and storms. The data for natural disasters are obtained from the EM-DAT database. The EM-DAT is a database that reports the occurrence, casualties, injuries, and loss of resources due to a disaster. The disasters that occurred before the commencement of data collection were included as an aggregation at the district level. Districts not prone to disasters were assigned "0".

3.4.2 Data and Data Description

As described earlier, this research is a sub-national or district level analysis of public healthcare utilization and devolution. The devolution of the healthcare services subsequent to the 18th amendment of the constitution of Pakistan is referred as "the devolution effect" in this research. The data on the district level is constructed using four rounds of the Pakistan Social and Living-Standards Measurement Survey (PSLM). These rounds of PSLM were conducted between 2008-09 to 2014-15. PSLM is a country-wide household representative survey data, the sampling scheme used for the collection of data is two-step stratified random. This method enables to sample the households through stratification on a district and regional basis. The district PSLM data set includes data on household income, education, consumption, savings, and healthcare. The details related to each

round of the PSLM are provided in appendix table B1. Each round of PSLM survey includes responses from around five hundred thousand individuals, 75,000 to 78,000 households, and 110 to 114 districts. In 2008-09, the data coverage of PSLM was from 110 districts of Pakistan, the latest PSLM survey covers 114 districts of Pakistan.

Out of total sampled individuals in districts, the public hospital utilization based on the recall period remains around (25%). BHU utilization patterns show the highest utilization of (68.46%) in 2008-09 and the lowest BHU utilization of (52.28%) in 2012-13. The public sector healthcare utilization for prenatal health care services remains between (28%) to (33%). The utilization for childbirth is observed to be the lowest among all the public healthcare utilization. The utilization of public healthcare services for childbirth also increased around (4%). Increase in the postnatal consultations during this period is also observable.

This study includes 107 districts. As mentioned earlier, the total number of districts in the latest survey is 114 and was 110 in the earliest. The districts of Harnai, Umerkot, Sujjawal, Chiniot and Tor Ghar were dropped from this analysis due to unavailability of data in the PSLM survey of 2008-09. The data for the districts of Panjgur and Kech were not collected in 2014-15 due to prevailing security concerns in these two districts. District Musakhel was dropped due to a probable reporting bias as no healthcare consultations and postnatal consultations were reported in this district. After excluding these districts, we obtained a balanced panel of 107 districts. These districts represent around 163 million (approximately 75%) of the total population. Table 3.1 reports the mean and standard deviation of the variables used in this analysis. The average public hospital utilization during 2008-2015 remained around 0.30 or approximately (30%). This implies that (30%) of individuals across all districts during this period have consulted a public healthcare hospital for healthcare consultations. The average value for the primary healthcare consultations is (65%). Among all public healthcare utilization, childbirth has the lowest average of (14%). The average consultation for prenatal care is (36%) and in the case of post-natal care the average consultation is (30%). The highest number of terrorism-related incidents occurred in 2013 and the lowest in 2007. In 2007, there were 40 districts where acts of terrorism resulted in injuries or casualties. Whereas in 2013, the number of districts

Table 3.1: Descriptive Summary Statistics, 2008-09 - 2014-15

Variables	(2) Mean	(3) STD
Public Healthcare utilization	0.30	0.18
Basic Healthcare unit utilization	0.65	0.22
Public Healthcare utilization for Prenatal care	0.36	0.19
Public Healthcare utilization for childbirth	0.14	0.11
Public Healthcare utilization for Postnatal care	0.30	0.21
Devolution Effect	0.50	0.50
Distance	1.31	0.22
Population	159.95	184.17
Income	4.88	2.89
Education	0.41	0.12
Dependency ratio	1.14	0.16
Household Size	7.99	1.16
luminosity/Development	6.25	6.45
Terrorism related incidents	0.43	0.50
Natural Disasters	0.16	0.37

Notes: The table presents the mean and standard deviation of all variables used in this analysis. The above statistics are for the full sample. The variable distance is measured as mean distance of all households from the nearest public healthcare provider, population and income of a district is measured in ten thousands. Development of a district is measured using luminosity data. Data on terrorism is obtained from Global terrorism data base and data on natural disasters is obtained from EM-DAT. List of districts for this analysis is given in appendix B2.

where terrorism-related incidents took place was 58. In 2010, the data on the natural disasters reveals that around (40%) of districts were under the severe floods which resulted in a public health crisis⁷. The average values for terrorism-related incidents and natural disasters are 0.43 and 0.16, respectively. These values imply that on average (43%) of the districts in our sample were prone to terrorism and (16%) to the natural disasters. The luminosity data is used as a proxy of development. The average night light data for the districts of Pakistan is 6.25 DN⁸ with a relatively high standard deviation of 6.45 DN. This suggests that there are huge differences of development among the districts of Pakistan.

Table B3 (see appendix) reports the decomposition of variables based on between and within variations. Within effects represents variations by years and districts, while between effect reports within-district variation. For instance, the variation in the average primary healthcare utilization across districts and years ranges between 0.09 to 1. Among the districts, this variation is 0.20 to 0.93 and variations within a district is 0.13 to 1. The standard deviations are also indicative of the overall, between and within variations in primary healthcare utilization between 2008 to 2015.

Furthermore, we use choropleth maps to portray healthcare utilization patterns and post devolution changes in the public healthcare utilization. These maps are very useful in presenting an overall view of healthcare utilization at the district level. For instance, the pre-devolution average of BHU utilization is presented in figure 3.1. The lowest values for BHU utilization can be observed in red color. The lowest values of this utilization are mostly attributed to mainly urban districts like Gujranwala (24%), Sialkot (26%), Karachi (29%), Faisalabad (33%), and others. The highest average values are represented in blue color. The highest average BHU utilization is in the districts of Awaran (97%), Mastung (97%), Washuk (96%), Buner (95%), Badin (92%) and other rural districts.

The patterns in figure 3.1 confirms that rural areas have a relatively higher utilization of basic healthcare units as compared with the urban districts. The utilization of BHU's in the rural districts also illustrates towards the higher dependence of rural population

⁷<https://www.who.int/bulletin/volumes/89/3/10-083386/en/>

⁸Digital Number where each pixel is converted into a number using GIS Software it ranges between 0 to 63.

Post Devolution trends in Utilization: Primary Healthcare

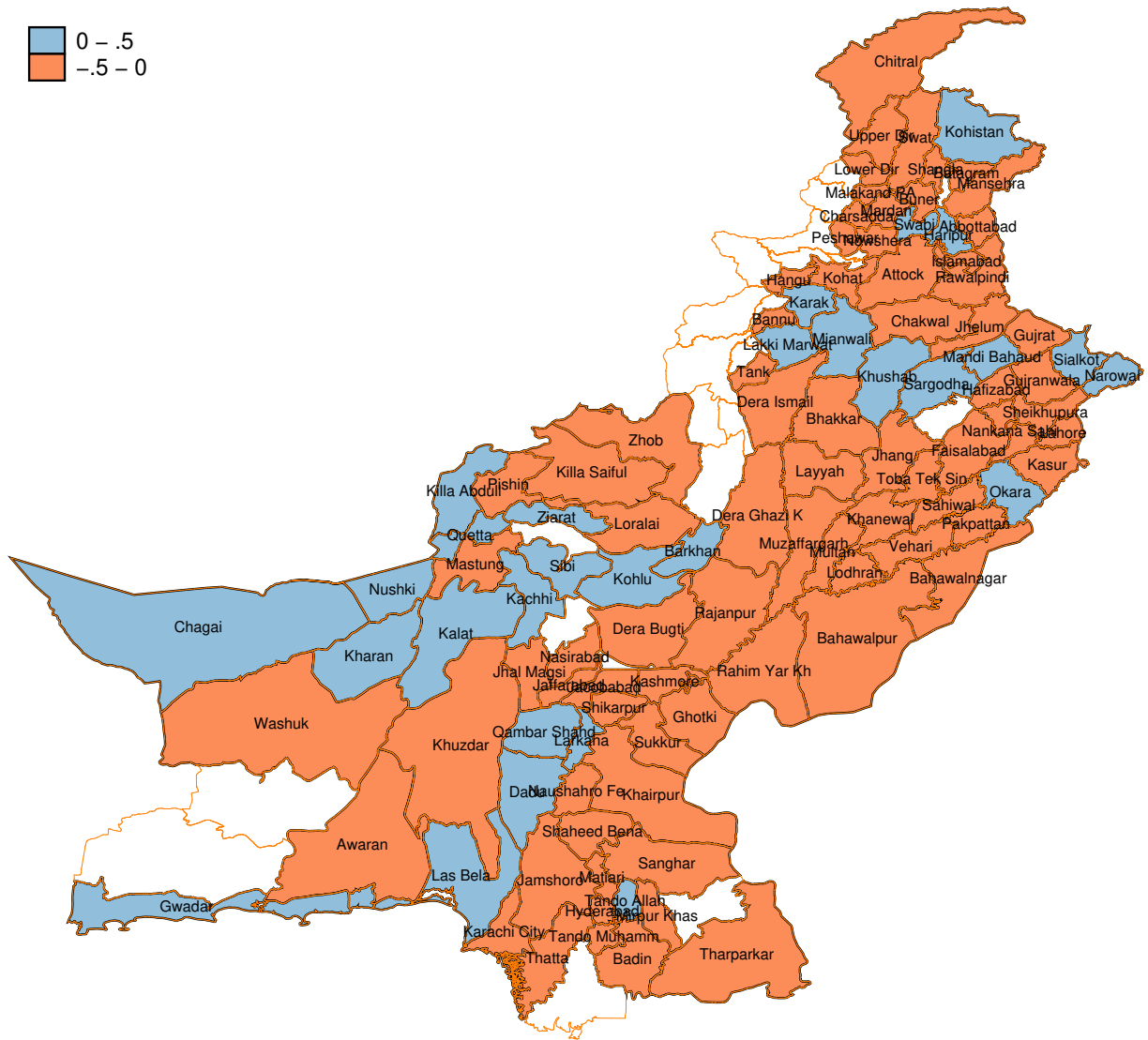


Figure 3.3: Post-Devolution changes in Primary healthcare

the highest BHU utilization is mostly in the rural districts of Balochistan and Sindh. Among provincial capitals the BHU utilization is highest in Quetta district. Figure 3.3 compares pre and post devolution patterns of BHU utilization at district level. For this comparison we took difference in utilization between pre and post devolution era. This figure comprehensively explains changes in the patterns of BHU utilization. We see that after devolution there is a decline in BHU consultations in the 78 districts of Pakistan or (73%) of the districts. Out of 24 districts of Khyber Pakhtunkhwa (KP), BHU utilization decreased in 19 districts. Similarly, in Punjab 28 out of 35 districts report

Post Devolution trends in Utilization: Pre Natal Care

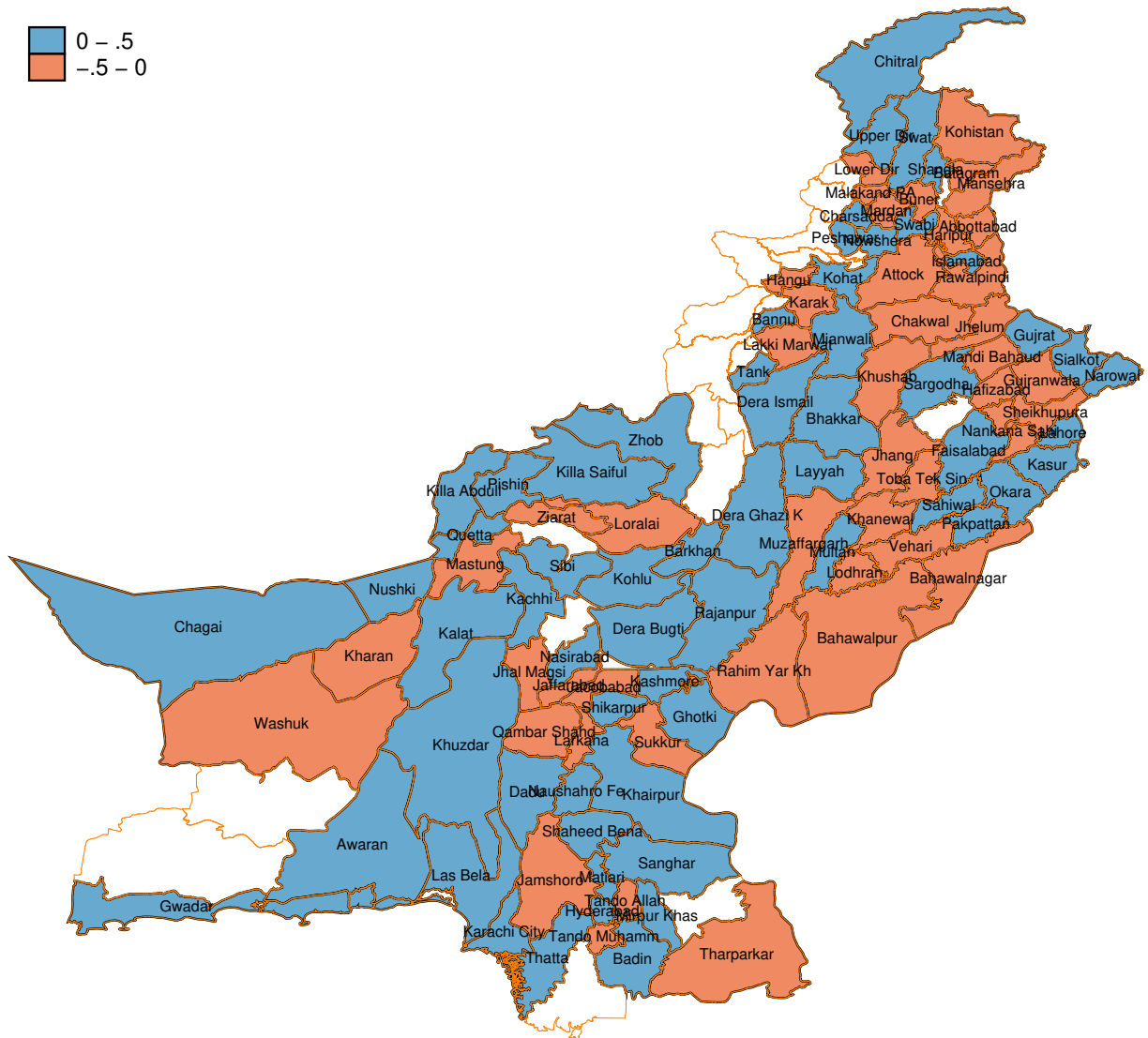


Figure 3.5: Post-Devolution changes in Pre-natal Care

districts of Pakistan. Post devolution hospital consultation declined (70%) in the districts of KP, (64%) in the districts of Balochistan, (60%) in the districts of Punjab, and (41%) in the districts of Sindh. District Kharan reports the highest decline of (44%) among the districts of Pakistan and Barkhan district reports the highest increase in the hospital consultations of around (30%).

In the domain of the maternal healthcare utilization, we observe that the pre-natal healthcare consultation increased in (57%) of the districts. The half of the districts of KP show an increase in pre-natal consultations. Post devolution improvements in pre-natal

districts of Balochistan, (72%) districts of Sindh, (71%) districts of Punjab and (37%) districts of KP show improvements in the postnatal consultations. After devolution Kohistan records the highest decline of (27%) in postnatal consultation and district Chagai shows the highest increase of (55%) in postnatal consultations.

In the sample of 107 districts there are only ten districts in which all types of utilization have improved. These ten districts include seven districts of Balochistan, (Quetta, Kalat, Gwadar, Nushki, Bolan, Kech, and Lasbela) two districts of Punjab, (Mianwali and Sargodha) and one district of Sindh, (Dadu). There are 29 districts of Pakistan where utilization improved in four out of five measures, these districts include six districts of KP, ten districts of Punjab, seven districts of Sindh, and six districts of Balochistan. From this observation we can infer that in (36%) districts of Pakistan devolution had a positive impact on at least four types of utilization's.

On the other side, the districts of Hangu, Abbottabad, Loralai, and Lower Dir show no improvement. There are 15 districts where just one type of utilization improved subsequent to devolution. These districts include four districts of KP, seven of Punjab and two districts each of Balochistan and Sindh. This implies that in at least (18%) of the districts there is a post-devolution decline in healthcare utilization in four and above types of public healthcare utilization. The remaining (46%) of the districts have a decline in the utilization of healthcare services in at least two, but not more than three types of healthcare utilization's.

3.4.3 Empirical strategy

The empirical analysis for this study is conducted using linear panel data estimation techniques. These techniques include pooled OLS, fixed effects, and random effects models. The appropriate technique for this type of data set is fixed effects as this technique is useful in removing the unobserved heterogeneity in districts ([Cameron and Trivedi, 2005](#)). By effectively controlling the unobserved heterogeneity this technique can yield more reliable results ([Cavalieri and Ferrante, 2016](#)). The appropriateness of the fixed effects model was also tested using Hausman's test of model selection between random and fixed effects. The test statistics of the Hausman test favors the use of the fixed effects model

over the random effects model.

The pooled OLS and random effects models are used to highlight the appropriateness of the fixed effects model. The pooled OLS and random effects models may not be adequate in comparison with the fixed effects model. Pooled OLS is inconsistent because the error terms obtained are likely to be correlated over time (Cameron and Trivedi, 2005). However, both random effect and pooled OLS can be viewed as an alternate way to check for the association of variables, hence corroborating the estimate of fixed effects model.

Fixed effects includes both years fixed effects and district fixed effects. To control the heteroskedasticity, the standard errors are clustered at a district level. This is an efficient method because it controls correlation among district-specific unobserved effects, further, in the case of a short panel like ours (where $t = 4$ and $n = 107$) district-specific unobserved effects could be captured efficiently by clustering the standard errors at district-level (see(Cameron and Trivedi, 2005)). Besides the main models estimated, we also estimate models based on the sub-sample as a robustness check. These models divide districts based on region and development⁹.

3.5 Results and Discussion

Tables 3.2 and 3.3 present descriptive statistics of the variables used in this research. A comparative analysis of variables at this stage is helpful to provide an insight into the pre-and post-devolution scenarios. We observe a slight decrease in the mean value of public healthcare utilization based on the recall period, along with changes in their respective standard deviations in pre and post devolution eras. After devolution, the BHU utilization declined around (9%) in the districts of Pakistan. There is an increase of (2%) in the public healthcare utilization for prenatal healthcare, the utilization of public healthcare for childbirth increased by around (5%), and there is an increase of (6%) in the postnatal healthcare utilization after devolution. Observing these patterns, we can assert that the utilization of public hospitals and BHU's declined in the post-devolution era and public healthcare utilization related to maternal healthcare increased.

⁹The sub-samples were made based on median values of region and development

Table 3.2: Summary Statistics: Pre-devolution

VARIABLES	(2) Mean	(3) STD
Public Healthcare utilization	0.30	0.19
Basic Healthcare unit utilization	0.70	0.21
Public Healthcare utilization for Prenatal care	0.35	0.20
Public Healthcare utilization for childbirth	0.11	0.09
Public Healthcare utilization for Postnatal care	0.27	0.21
Devolution Effect	0.00	0.00
Distance	1.34	0.22
Population	152.31	174.87
Income	4.06	2.12
Education	0.41	0.12
Dependency ratio	1.13	0.15
Household Size	7.98	1.11
luminosity/Development	5.99	6.54
Terrorism related incidents	0.38	0.49
Natural Disasters	0.23	0.42

Notes: The table presents the mean and standard deviation of all variables used in this analysis. The above statistics are for the pre-devolution era.

Table 3.3: Summary Statistics: Post-devolution

VARIABLES	(2) Mean	(3) STD
Public Healthcare utilization	0.29	0.16
Basic Healthcare unit utilization	0.61	0.23
Public Healthcare utilization for Prenatal care	0.37	0.19
Public Healthcare utilization for childbirth	0.17	0.11
Public Healthcare utilization for Postnatal care	0.33	0.20
Devolution Effect	1.00	0.00
Distance	1.27	0.21
Population	167.60	193.13
Income	5.70	3.30
Education	0.41	0.12
Dependency ratio	1.16	0.17
Household Size	7.99	1.21
luminosity/Development	6.50	6.36
Terrorism related incidents	0.49	0.50
Natural Disasters	0.08	0.28

Notes: The table presents the mean and standard deviation of all variables used in this analysis. The above statistics are for the post-devolution era.

We also observe variations in variables like distance, population, and income. For instance, the average distance from a healthcare facility decreased in the post-devolution period. This may be an indicator of growth in the healthcare infrastructure, leading to a decrease in travelling time to a healthcare center. The increase in the population of the district could indicate that the burden on the existing public healthcare infrastructure might have increased, this can influence public healthcare utilization both positively and negatively. A greater number of patients can induce long waiting time and an overall decline in quality of services, this can result in the higher utilization of healthcare from other healthcare providers, thereby decreasing public healthcare utilization. Another possibility is that increase in population compels the district administration to open new healthcare facilities to cater to the needs of the growing population, hence increasing public sector healthcare utilization. The rise in the average income at the district level can also act as a stimulus for overall healthcare consultation by reducing the affordability issues related to healthcare visits. The rise in income can also decrease public healthcare utilization if individuals prefer private healthcare over public healthcare.

The variations in control variables like education, dependency ratio, and household size are negligible in pre-and post-devolution scenarios. The average education remains the same in both periods. There is a change of 0.01 in the mean value of the household size and an increase of 0.03 in the mean value of the dependency ratio. The average development in the districts of Pakistan increased by 0.51 after devolution, this increase is indicative in terms of better infrastructure for accessing the public healthcare facilities.

3.5.1 Utilization of Public Hospitals

We present the results of the public hospital utilization in table 3.4. Column (2) reports the estimates for fixed effects, estimates for pooled OLS are presented in the column (1) and random effects in column (3), respectively. The F-stat for fixed effects and pooled OLS, and Wald test for random effects are reported at the bottom of the table, along with the values of R-square and number of observations. The results of the fixed effects show a decline of 0.13 or (13%) in the utilization of public hospitals. The decline in utilization of public healthcare is a multi-fold phenomenon, this can be a result of increasing private

Table 3.4: Main Results: Devolution and Healthcare Utilization-Baseline Model

VARIABLES	(1) Pooled OLS	(2) Fixed Effects	(3) Random Effects
Devolution Effect	0.006 (0.016)	-0.131*** (0.033)	-0.036* (0.021)
Distance	0.082 (0.058)	-0.173** (0.078)	-0.014 (0.051)
Population	-0.0002*** (0.0004)	0.0011** (0.0004)	-0.0002*** (0.0001)
Income	-0.009*** (0.003)	0.018*** (0.006)	-0.00051 (0.003)
Education	-0.163 (0.109)	-0.181 (0.291)	-0.165 (0.124)
Dependency ratio	-0.128 (0.083)	0.024 (0.121)	-0.073 (0.065)
Household Size	-0.003 (0.008)	-0.01898 (0.011)	-0.003 (0.0085)
luminosity/Development	-0.002 (0.001)	0.004 (0.0038)	-0.002 (0.0023)
Terrorism related incidents	0.069*** (0.017)	0.002 (0.021)	0.051*** (0.017)
Natural Disasters	0.010 (0.023)	-0.005 (0.021)	0.011 (0.022)
Constant	0.486*** (0.154)	0.505* (0.269)	0.547*** (0.145)
Observations	428	428	428
R-squared	0.188	0.128	0.182
District FE	No	Yes	No
Year FE	No	Yes	No
F stat/Wald	13.70***	2.14***	47.06***

Notes: The table presents the results of pooled OLS, fixed and random effects in which the dependent variable is healthcare utilization for general consultations. In column 2 Year fixed effects and district fixed effects are used. The results for Hausman test are reported in appendix table B4. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

healthcare facilities in the districts of Pakistan or another possibility is that in response to the devolution, the district healthcare management was unable to increase the quality of the healthcare provision. Even there is a possibility that the quality of the healthcare services would have declined, and as a consequence of this the public healthcare utilization decreased.

We will observe in the next chapter that Pakistani households have a higher preference for private healthcare. The devolution effect being negative points out that most of the district governments were unable to increase the healthcare standards in their respective districts. Literature on devolution/decentralization shows both positive and negative effects of devolution. In the case of Pakistan a provincial level study by (Hasnain, 2008) discloses that the local governments prioritized infrastructure over healthcare. In our study the decline in public healthcare utilization also suggests the failure of local governments in improving healthcare service delivery.

Distance takes a negative value, suggesting that public healthcare utilization is negatively affected by travelling time. Positive sign for the coefficient of population shows that a rise in the population of the districts will lead to higher public healthcare utilization. Similarly, income at the district level increases the public healthcare utilization by around 0.018. Increase in utilization due to income is an interesting result, although a nominal fee is charged at public healthcare facilities in Pakistan, for example, an X-ray at public healthcare facility can cost Rs 60 or 0.40 USD ¹⁰, but income can be a significant factor while making healthcare consultations as income act as an enabling factor ¹¹.

3.5.2 Primary Healthcare Utilization

Basic healthcare units play a vital role in the provision of primary healthcare in Pakistan. The estimated number of BHUs in Pakistan is around 5000¹². Basic health units provide healthcare to the people residing mostly in rural areas of Pakistan. Our analysis shows

¹⁰<https://www.thenews.com.pk/print/514123-new-rates-of-services-tests-at-healthcare-facilities-notified>

¹¹Income can ease miscellaneous expenditures related to consultations, such as transportation, lodging, and meals

¹²<http://www.emro.who.int/pak/programmes/primary-a-secondary-health-care.html>

Table 3.5: Results: Devolution and Healthcare utilization -Primary Healthcare

VARIABLES	(1) Pooled OLS	(2) Fixed Effects	(3) Random Effects
Devolution Effect	-0.092*** (0.019)	-0.075** (0.037)	-0.105*** (0.025)
Distance	0.0016 (0.056)	-0.119* (0.070)	-0.068 (0.061)
Population	-0.0002*** (0.0001)	-0.0017* (0.001)	-0.0003*** (0.001)
Income	0.002 (0.003)	-0.0026 (0.004)	-0.0006 (0.003)
Education	-0.179 (0.123)	0.308 (0.285)	-0.072 (0.152)
Dependency ratio	0.195** (0.08793)	0.378*** (0.10103)	0.314*** (0.09065)
Household Size	-0.007 (0.008)	-0.027** (0.012)	-0.019* (0.009)
luminosity/Development	-0.008*** (0.001)	-0.003 (0.006)	-0.008*** (0.002)
Terrorism related incidents	0.043** (0.018)	0.024 (0.018)	0.037** (0.016)
Natural Disasters	0.003 (0.023)	0.002 (0.023)	0.012 (0.020)
Constant	0.674*** (0.178)	0.820*** (0.276)	0.727*** (0.190)
Observations	428	428	428
R-squared	0.359	0.259	0.375
District FE	No	Yes	No
Year FE	No	Yes	No
F stat/Wald	29.06***	6.83***	233.06***

Notes: The table presents the results of pooled OLS, fixed and random effects in which the dependent variable is utilization of primary healthcare services from a BHU. The results for Hausman test are reported in appendix table B4. In column 2 Year fixed effects and district fixed effects are used. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

that in comparison to the utilization of public hospitals (30%), the healthcare utilization of the BHU's is considerably high (65%). Considering this type of utilization can help in two ways: first, to compare our results with the earlier findings and second, to explore the impact of devolution in a rural and primary healthcare setting.

As noted earlier in figure 3.3 most of the districts of Pakistan show a decline trend in BHU utilization. Post devolution the average BHU utilization decreased in (73%) districts of Pakistan. We further explore this relationship by examining table 3.5. This table represents the impact of devolution on BHU utilization. The coefficients for the devolution effect in pooled OLS, fixed effects, and random effects models are negative and significant. The coefficient for devolution effect in column (2) shows a decline of around (7.5%) in BHU utilization.

The coefficient of distance also turns out to be negative, leading to a lower utilization of the BHUs for healthcare purposes. BHUs provide primary healthcare to the individuals and distance from a BHU can significantly influence its utilization. A distant BHU is less likely to be used by the individuals if an alternative such as: a private practitioner or traditional healer, is available in the vicinity of a household.

Interestingly, the coefficient of the population in the case of BHU utilization is negative. The possible answer is that as BHUs are intended to provide healthcare to a specific segment of population and area, any increase in the population in the vicinity may lead to more waiting time, lesser resources, and overall burden on the existing healthcare infrastructure, hence decreasing the healthcare utilization from BHU. Coefficient for the dependency ratio is positive, this shows that with a greater number of elderly and children in a household consultation from BHUs increases.

By comparing the results of table 3.4 and 3.5, column (2). We observe that in these two types of healthcare utilization the devolution effect is significantly negative. There is a decline of (13%) in public sector hospital utilization and a decline of (7.53%) in the BHU utilization. Apparently, the decline in hospital utilization is higher as compared with BHU utilization, but if we compare these results in accordance with their respective utilization reported in table 3.1, we can clearly see that there is a higher decline in the BHU utilization (4.55%) as compared to the public hospital consultations (3.9%). By

observing this decline, we suggest that devolution in healthcare led to a greater decline in the healthcare utilization of primary healthcare services.

3.5.3 Utilization of Public Healthcare Facilities for Maternal Care

In this section, we will discuss the results of public healthcare utilization for maternal care. First, we present the results obtained for the prenatal care, followed by the results of childbirth and at last we discuss the public healthcare utilization for postnatal care. Public healthcare utilization for prenatal care refers to the medical consultations made by women before childbirth at a public healthcare institute. The results of the prenatal public healthcare utilization are reported in table 3.6. In prenatal healthcare utilization, the coefficients for the devolution effect are positively significant for all the three models. Considering the fixed effects model reported in the column (2), we observe that after devolution the prenatal healthcare utilization increased by around (5.5%). This post-devolution increase in prenatal healthcare utilization is encouraging keeping in mind the sustainable development goals. [Bhutta et al. \(2011\)](#) shows that as part of a randomized trial study, the prenatal care increased in the selected districts of rural Sindh, this increase in the prenatal care consultations were due to the awareness programs held by the lady health workers. This implies that interventions at local level can also increase the maternal healthcare consultations. The coefficient of distance is negative, suggesting that prenatal care utilization is negatively affected by the distance from healthcare facility. The average prenatal healthcare utilization from public healthcare institutions is around (36%). From the above result, we can assert that on average post-devolution it has increased by around (2%). Another aspect of maternal healthcare is childbirth/ delivery. The results presented in table 3.6 describe the effect of devolution on the childbirth. The coefficients of pooled OLS and random effects models show a positive association between devolution and childbirth. The coefficient of the fixed effects model takes a value of 0.064. This value shows that after devolution there is an increase of (6.4%) in childbirth or deliveries at public healthcare institutions. This implies that after devolution the average number of

Table 3.6: Results: Devolution and Healthcare utilization -Pre-Natal Care

VARIABLES	(1) Pooled OLS	(2) Fixed Effects	(3) Random Effects
Devolution Effect	0.040** (0.018)	0.055** (0.026)	0.088*** (0.021)
Distance	0.021 (0.061)	-0.145* (0.075)	-0.069 (0.066)
Population	-0.0002*** (0.0001)	-0.0001 (0.004)	-0.0002* (0.001)
Income	-0.009** (0.003)	0.001 (0.004)	-0.007 (0.004)
Education	0.094 (0.128)	-0.016 (0.345)	0.092 (0.180)
Dependency ratio	-0.044 (0.095)	0.287*** (0.105)	0.157 (0.103)
Household Size	0.012 (0.008)	0.002 (0.011)	0.013* (0.008)
luminosity/Development	-0.0026 (0.0020)	-0.0028 (0.0047)	-0.0031 (0.0035)
Terrorism related incidents	0.076*** (0.020)	-0.024 (0.021)	0.021 (0.019)
Natural Disasters	0.018 (0.023)	-0.016 (0.022)	-0.008 (0.021)
Constant	0.250 (0.166)	0.205 (0.249)	0.152 (0.183)
Observations	428	428	428
R-squared	0.138	0.0195	0.140
District FE	No	Yes	No
Year FE	No	Yes	No
F stat/Wald	9.93***	3.40***	54.93***

Notes: The table presents the results of pooled OLS, fixed and random effects in which the dependent variable is utilization of pre-natal healthcare services from a public healthcare institute. In column 2 Year fixed effects and district fixed effects are used. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

deliveries in the public healthcare sector increased. This corroborates the results obtained in prenatal care, where the prenatal care utilization increased by (5.5%).

Appendix B1 shows that public healthcare utilization is lowest for childbirth in all types of utilization considered in this research. The overall average of utilization for childbirth is (14%), being lowest in the domain of maternal healthcare utilization. The increase in this type of maternal care is promising since it reflects the efforts of the respective administration in reducing maternal mortality and a step towards achieving the sustainable development goal 3.1. The rise in healthcare utilization for prenatal care and childbirth can significantly reduce maternal mortality and in case of Pakistan it is reduced from 205 to 154 per 100,000 live births from 2008 to 2015 (WHO, 2019). The last result related to maternal healthcare is public healthcare consultation for postnatal care. The devolution effect in this case is also positive. The devolution effect is around (7.4%) in this case. The overall evaluation of maternal healthcare after devolution suggests improvements in the healthcare utilization of public healthcare institutions at the district level. The results of all types of maternal healthcare utilization are positive, but there is an observation on these findings which could lead to skepticism. One can argue that increase in the maternal healthcare utilization is exclusively due to devolution or this increase is due to the policies introduced prior to the devolution. It is important to note that under the Millennium Development Goals (MDGs) Pakistan has tried to improve maternal healthcare. For example, MDG 5.1 deals with improvements in maternal mortality and 5.5 highlights the need to increase the access to antenatal care coverage. Although Pakistan was unable to meet the targets, but significant efforts were made to improve maternal healthcare. Such efforts include initiatives like Health Policy and Strategic Framework 2005-2015¹³ in collaboration with WHO. This framework aims to improve the maternal healthcare at district level. Another program, Pakistan Initiative for Mother and Newborns (PAIMAN)¹⁴ in collaboration with USAID was introduced in 23 districts to improve maternal and child healthcare from 2004 to 2010. These initiatives might have influenced the maternal healthcare utilization along with the devolution effect. We cannot

¹³<http://www.who.int/pmnch/events/2007/pakistanpres1904.pdf>

¹⁴https://www.healthynewbornnetwork.org/hnn-content/uploads/PAIMAN_ExecSummary.pdf

Table 3.7: Results: Devolution and Healthcare utilization -Child Birth

VARIABLES	(1) Pooled OLS	(2) Fixed Effects	(3) Random Effects
Devolution Effect	0.073*** (0.009)	0.064*** (0.014)	0.086*** (0.011)
Distance	0.006 (0.027)	-0.051 (0.034)	-0.026 (0.029)
Population	-0.00016*** (0.00003)	0.00009 (0.00023)	-0.00013** (0.00006)
Income	-0.008*** (0.0016)	-0.001 (0.002)	-0.0058*** (0.0018)
Education	0.190*** (0.061)	-0.084 (0.142)	0.167** (0.085)
Dependency ratio	-0.179*** (0.052)	-0.032 (0.037)	-0.099** (0.044)
Household Size	0.004 (0.004)	-0.001 (0.006)	0.004 (0.004)
luminosity/Development	0.0028** (0.0011)	-0.0011 (0.0022)	0.0026 (0.0018)
Terrorism related incidents	0.041*** (0.0091)	0.015 (0.0109)	0.029*** (0.0100)
Natural Disasters	0.018* (0.010)	0.007 (0.0096)	0.011 (0.0097)
Constant	0.213*** (0.080)	0.239** (0.118)	0.155* (0.090)
Observations	428	428	428
R-squared	0.382	0.0944	0.393
District FE	No	Yes	No
Year FE	No	Yes	No
F stat/Wald	21.64***	9.00***	124.9***

Notes: The table presents the results of pooled OLS, fixed and random effects in which the dependent variable is delivery at a public healthcare institute. In column 2 Year fixed effects and district fixed effects are used. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3.8: Results: Devolution and Healthcare Utilization-Post-Natal Care

VARIABLES	(1) Pooled OLS	(2) Fixed Effects	(3) Random Effects
Devolution Effect	0.072*** (0.020)	0.074** (0.032)	0.102*** (0.024)
Distance	0.022 (0.069)	-0.183* (0.101)	-0.080 (0.077)
Population	-0.0002*** (0.00006)	-0.0004 (0.00052)	-0.0002** (0.00012)
Income	-0.005 (0.004)	0.0018 (0.005)	-0.005 (0.004)
Education	0.029 (0.132)	-0.041 (0.371)	0.003 (0.170)
Dependency ratio	-0.087 (0.102)	0.215* (0.110)	0.077 (0.100)
Household Size	-0.0093 (0.001)	-0.044** (0.018)	-0.020* (0.0105)
luminosity/Development	-0.0033 (0.0025)	0.0032 (0.0058)	-0.0031 (0.004)
Terrorism related incidents	0.071*** (0.0224)	-0.0062 (0.025)	0.0361 (0.022)
Natural Disasters	0.028 (0.026)	0.022 (0.026)	0.017 (0.027)
Constant	0.447** (0.181)	0.645** (0.309)	0.473** (0.216)
Observations	428	428	428
R-squared	0.107	0.0276	0.116
District FE	No	Yes	No
Year FE	No	Yes	No
F stat/Wald	7.70***	3.95***	49.40***

Notes: The table presents the results of pooled OLS, fixed and random effects in which the dependent variable is utilization of post-natal healthcare services from a public healthcare institute. In column 2 Year fixed effects and district fixed effects are used. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

single out the contribution of such initiatives, but we can affirm that after devolution the district administrations or provincial governments have not discontinued such policy initiatives.

3.5.4 Hospital Utilization in Terrorism and Natural Disasters Affected Districts

During the period of this study Pakistan faced severe acts of terrorism and natural disasters. The impacts of such events are devastating not only for the lives and limbs of individuals, but such event can challenge the efficacy of public institutions. Such events can provide details related to the strengths and weakness in the public sector delivery. Furthermore, events like terrorism and natural disasters can directly affect the existing healthcare system and infrastructure. The impact of devolution becomes even more pronounced in those districts where such events had taken place. By including the sub-samples of districts using terrorism and natural disasters, we try to find out that after devolution how the district administrations have responded to such challenges. On average (43%) of the districts in our sample were affected by terrorism and (16%) of the districts confronted a natural disaster.

Table 3.9 depicts the situation of public hospital utilization in the districts with terrorism and districts without terrorism. We obtain a very interesting result of the devolution effect for the terrorism-affected districts. The devolution effect is negative with a coefficient value of -0.16 or approximately (16%). This depicts that after devolution public hospital utilization decreased by (3%) more in terrorism-affected districts (for comparison see table 3.4). This finding suggests that the districts prone to the terrorism were unable to improve their respective public healthcare services. A probable reason for decline in the utilization in these districts could be due to the supply shortages. Another possible reason could be that under such situation, the public hospital utilization may have also reduced due to life-threatening situation at hospitals, as hospitals were also targeted by

Table 3.9: Results: Public Healthcare Utilization in terrorism affected & non-affected Districts

VARIABLES	Terrorism Affected			Non-Affected		
	Pooled OLS	Fixed Effects	Random Effects	Pooled OLS	Fixed Effects	Random Effects
Devolution Effect	-0.00783 (0.02967)	-0.16013*** (0.03403)	-0.07956*** (0.03024)	0.01751 (0.01844)	-0.10373 (0.08175)	0.00378 (0.03969)
Distance	-0.02657 (0.08962)	-0.34234** (0.16511)	-0.05452 (0.10924)	0.18567** (0.08224)	-0.08983 (0.09393)	0.06790 (0.07611)
Population	-0.00032*** (0.00007)	0.00111*** (0.00035)	-0.00031*** (0.00010)	-0.00027*** (0.00009)	0.00144 (0.00201)	-0.00038*** (0.00015)
Income	-0.00998* (0.00569)	0.01206 (0.00968)	-0.00308 (0.00654)	-0.00704* (0.00419)	0.01901** (0.00868)	0.00191 (0.00623)
Education	-0.24598 (0.17670)	-0.76308 (0.52083)	-0.20696 (0.20165)	-0.06864 (0.14279)	-0.12153 (0.54618)	-0.02490 (0.20647)
Dependency ratio	-0.14036 (0.12742)	-0.16509 (0.17293)	-0.11873 (0.14170)	-0.13490 (0.11905)	0.07941 (0.19136)	-0.04453 (0.17350)
Household Size	-0.00508 (0.01193)	-0.02055 (0.01935)	-0.00678 (0.01331)	-0.01191 (0.01292)	-0.01768 (0.01860)	-0.00924 (0.01323)
luminosity/Development	0.00152 (0.00247)	0.00904* (0.00508)	0.00066 (0.00370)	-0.00427** (0.00211)	0.00310 (0.00848)	-0.00410 (0.00337)
Natural Disasters	-0.00163 (0.03907)	0.01578 (0.03801)	0.02286 (0.03918)	0.00476 (0.02830)	-0.03751 (0.03259)	-0.01135 (0.02780)
Constant	0.76959*** (0.24430)	1.26047** (0.50433)	0.79495*** (0.29255)	0.39306* (0.19974)	0.17499 (0.45000)	0.38600 (0.29518)
Observations	186	186	186	242	242	242
R-squared	0.120	0.0873	0.185	0.185	0.158	0.180
District FE	No	Yes	No	No	Yes	No
Year FE	No	Yes	No	No	Yes	No
F stat/Wald	8.7***	3.40***	38.07***	5.91***	0.92	27.13***
Number of Districts		75	75		82	82

Notes: The table presents the results of pooled OLS, fixed and random effects in which the dependent variable is utilization of public healthcare institute in terrorism affected and non-affected areas. In column 2 and column 5 Year fixed effects and district fixed effects are used. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

the terrorists^{15 16}. Access to healthcare services is often compromised in such situations. Druetz et al. (2020) report a decline of (3.8%) in the utilization of healthcare facilities for childbirth because of a terrorist attacks in Burkina Faso. A higher decline in such type of utilization in the terrorism-affected districts may seem understandable.

Another important result from this table is regarding the development of the districts, it is observed that in the case of a relatively developed districts there is a higher utilization of public hospital. This relationship shows that better infrastructure at district level can lead to an increase in the healthcare utilization even in such conditions. The result for the fixed effects is insignificant for the districts not affected by terrorism.

The results for the healthcare utilization in a district hit by a natural calamity are reported in table 3.10. The results for the devolution effect for the fixed effects model is positive. The value of the coefficient suggests a rise of (20%) in public hospital utilization. As a result of a disaster the healthcare utilization may increase, this value can undermine the earlier findings, but a proposition can justify why this specific relationship should be positive. Our proposition is that natural disasters such as floods and earthquakes in a particular area or districts are often viewed as a national emergency. Relief efforts are made by provincial, federal, and international organizations. This includes setting up field hospitals to provide healthcare. As the gravity of the situation in case of such disasters is so acute that post-disaster healthcare utilization increases. For instance, in 2010 the floods affected nearly 18 million people in 28 districts of Pakistan¹⁷. A total of 1985 people lost their lives and 2964 were injured (CRED, 2016). Post disaster diseases like Cholera, Malaria, Diarrhea, and Dengue can increase healthcare utilization and can even turn into an epidemic. Some health conditions like disability and trauma can also increase the healthcare consultations.

The results of devolution effects in the above analysis would have strengthened if the role of government in restoration efforts of the healthcare facilities was known. Unfortunately, we do not have concrete evidence in terms of data about the restoration of public healthcare

¹⁵<https://www.aa.com.tr/en/asia-pacific/7-killed-in-twin-terrorist-attacks-in-nw-pakistan/1537379>

¹⁶<https://news.un.org/en/story/2016/08/536242-pakistan-ban-condemns-appalling-terrorist-attack-hospital-quetta>

¹⁷https://www.who.int/hac/crises/pak/pakistan_early_recovery_plan_2february2011.pdf

Table 3.10: Results: Public Healthcare Utilization in Natural calamity hit areas

VARIABLES	Calamity			No-Calamity		
	Pooled OLS	Fixed Effects	Random Effects	Pooled OLS	Fixed Effects	Random Effects
Devolution Effect	-0.02516 (0.04738)	0.20223* (0.11326)	0.09017 (0.12413)	0.01043 (0.01774)	-0.15728*** (0.03911)	-0.03393 (0.02620)
Distance	0.25002 (0.24743)	-0.19143 (0.29736)	0.22197 (0.25806)	0.06510 (0.05956)	-0.21770** (0.08622)	0.00021 (0.06900)
Population	-0.00041*** (0.00011)	-0.00036 (0.00082)	-0.00049*** (0.00014)	-0.00022*** (0.00005)	0.00151* (0.00076)	-0.00020*** (0.00009)
Income	-0.02936** (0.01272)	0.00485 (0.01910)	-0.02367* (0.01387)	-0.00757** (0.00349)	0.02074*** (0.00604)	-0.00076 (0.00436)
Education	0.13624 (0.32605)	0.20485 (1.24494)	0.22418 (0.36150)	-0.18813 (0.11852)	-0.33939 (0.34126)	-0.18128 (0.15088)
Dependency ratio	-0.04544 (0.14726)	0.79870 (0.49821)	-0.00344 (0.17198)	-0.14190 (0.09506)	0.00253 (0.13205)	-0.09991 (0.12012)
Household Size	-0.02541 (0.02621)	-0.16708*** (0.05048)	-0.05577* (0.02873)	0.00076 (0.00916)	-0.01069 (0.01232)	0.00140 (0.00933)
luminosity/Development	0.00262 (0.00589)	0.02336* (0.01165)	0.00320 (0.00765)	-0.00273 (0.00173)	0.00279 (0.00467)	-0.00323 (0.00283)
Terrorism related incidents				0.06730*** (0.01888)	-0.00475 (0.02397)	0.05363*** (0.01896)
Constant	0.33623 (0.53009)	0.77567 (0.75818)	0.57304 (0.52104)	0.49910*** (0.16621)	0.53156* (0.30647)	0.52535** (0.21226)
Observations	68	68	68	360	360	360
R-squared	0.200	7.08e-05	0.370	0.188	0.123	0.197
District FE	No	Yes	No	No	Yes	No
Year FE	No	Yes	No	No	Yes	No
F stat/Wald	6.80***	4151***	58.29***	11.10***	2.34*	52.12***
Number of Districts		43	43		107	107

Notes: The table presents the results of pooled OLS, fixed and random effects in which the dependent variable is utilization of public healthcare institute in calamity affected and non-calamity areas. In column 2 and column 5 Year fixed effects and district fixed effects are used. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

facilities in the disaster struck districts. Due to this unavailability of information, we cannot comment on the role of district governments in the restoration efforts of healthcare institutions.

Interestingly, the results of the districts not hit by any natural calamity show that the overall healthcare utilization in the public healthcare sector decreased by (15%). This result is in line with the earlier findings, but this result is intuitive in the sense that utilization of public hospitals is positively skewed towards the areas predisposed to disasters and negatively to the areas where such calamities have not occurred, hence, we can emphasize that devolution has dissimilar effects on healthcare utilization by calamity.

3.5.5 Primary Healthcare Utilization in Terrorism and Natural Disasters Affected Districts

As discussed earlier, the average utilization of BHU in the districts of Pakistan is high. BHU utilization shows the primary healthcare utilization at the district level, it turns out to be an important factor in the evaluation of the impact of the devolution on primary healthcare, especially in districts prone to terrorism and natural disasters.

Table 3.11 shows the results of the districts with and without terrorism. We can see that the results for pooled OLS, fixed effects, and random effects are significant, and the direction of this relationship is negative. Since the fixed effects is the appropriate estimation technique for this research, we identify that the coefficient of devolution effect has a negative value of around (9%) in the districts affected by terrorism. These results are congruent with the results shown in table 3.9. The post-devolution drop in BHUs utilization in the terrorism-affected areas implies that the rural healthcare system for the primary care is also affected in terrorism hit districts and devolution has not been fruitful in increasing this utilization. In the case of the non-affected areas, the coefficient of pooled OLS and random effects model are significantly negative, but for the fixed effects model, the coefficient value is insignificant.

Table 3.12 provides the results for the BHU utilization in the calamity affected and non-affected districts. The devolution effect in the case of the calamity affected and

Table 3.11: Results: BHU Utilization in Terrorism affected and non-affected areas

VARIABLES	Terrorism Affected			Non-Affected		
	Pooled OLS	Fixed Effects	Random Effects	Pooled OLS	Fixed Effects	Random Effects
Devolution Effect	-0.10820*** (0.02935)	-0.09739** (0.04607)	-0.11749*** (0.03755)	-0.08524*** (0.02466)	0.01211 (0.06353)	-0.09488*** (0.03500)
Distance	-0.17098** (0.07930)	-0.32990*** (0.10679)	-0.20772*** (0.07895)	0.15080* (0.07873)	-0.00596 (0.08706)	0.05399 (0.07981)
Population	-0.00026*** (0.00008)	-0.00120 (0.00107)	-0.00034** (0.00016)	-0.00032*** (0.00009)	-0.00389 (0.00250)	-0.00043*** (0.00013)
Income	0.01009* (0.00518)	0.01422* (0.00844)	0.01078* (0.00605)	-0.00059 (0.00404)	-0.01043* (0.00616)	-0.00266 (0.00446)
Education	0.11815 (0.16600)	0.17986 (0.46558)	0.14966 (0.20560)	-0.40999** (0.18852)	0.63792 (0.43206)	-0.24051 (0.21427)
Dependency ratio	0.28708*** (0.10680)	0.42083*** (0.10546)	0.37293*** (0.10430)	0.04926 (0.13797)	0.24740* (0.13879)	0.17436 (0.13611)
Household Size	-0.01110 (0.01183)	-0.02025 (0.02234)	-0.01521 (0.01376)	-0.00886 (0.01180)	-0.02635 (0.02056)	-0.01724 (0.01157)
luminosity/Development	-0.00981*** (0.00342)	-0.00739 (0.01118)	-0.00902* (0.00479)	-0.00672*** (0.00216)	0.00055 (0.01061)	-0.00835*** (0.00225)
Natural Disasters	-0.03131 (0.03378)	0.02644 (0.03658)	0.02213 (0.03010)	0.00296 (0.03347)	-0.00114 (0.03692)	0.00948 (0.03279)
Constant	0.73395*** (0.24664)	0.97615** (0.43955)	0.71981*** (0.24624)	0.76037*** (0.24752)	0.98233* (0.52587)	0.80675*** (0.26968)
Observations	186	186	186	242	242	242
R-squared	0.379	0.369	0.404	0.398	0.179	0.427
District FE	No	Yes	No	No	Yes	No
Year FE	No	Yes	No	No	Yes	No
F stat/Wald	17.26***	5.22***	88.61***	25.12***	5.88***	213.6***
Number of districts		75	75		82	82

Notes: The table presents the results of Pooled OLS, fixed, and random effects in which the dependent variable is utilization of primary healthcare institutes in terrorism affected and non-affected areas. In column 2 and column 5 Year fixed effects and district fixed effects are used. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3.12: Results: BHU Utilization in Calamity affected areas

VARIABLES	Calamity			No-Calamity		
	Pooled OLS	Fixed Effects	Random Effects	Pooled OLS	Fixed Effects	Random Effects
Devolution Effect	-0.06457 (0.04658)	-0.08173 (0.07870)	-0.16430*** (0.05793)	-0.10079*** (0.02092)	-0.04158 (0.03792)	-0.10058*** (0.02591)
Distance	0.01436 (0.15085)	0.22176 (0.17149)	-0.01704 (0.17034)	-0.01709 (0.06261)	-0.10699 (0.07999)	-0.06265 (0.06750)
Population	-0.00026*** (0.00009)	-0.00115** (0.00056)	-0.00032*** (0.00011)	-0.00030*** (0.00008)	-0.00311*** (0.00078)	-0.00032*** (0.00011)
Income	0.02045* (0.01032)	0.00706 (0.01381)	0.00962 (0.01104)	0.00076 (0.00354)	-0.00421 (0.00496)	-0.00169 (0.00380)
Education	0.79057** (0.30170)	0.37158 (0.85540)	0.54325 (0.40836)	-0.29523** (0.12827)	0.21495 (0.30911)	-0.15885 (0.15550)
Dependency ratio	0.54872*** (0.16179)	-1.02174*** (0.30199)	0.27084 (0.21021)	0.13146 (0.09662)	0.38697*** (0.11860)	0.28021*** (0.10080)
Household Size	-0.02831 (0.02027)	-0.06171 (0.04340)	-0.03118 (0.02099)	-0.00420 (0.00980)	-0.02428* (0.01384)	-0.01535 (0.01011)
luminosity/Development	-0.00689 (0.00418)	-0.01415 (0.01322)	-0.00668 (0.00534)	-0.00812*** (0.00225)	-0.00814 (0.00685)	-0.00845*** (0.00257)
Terrorism related incidents				0.04566** (0.02086)	0.02410 (0.02084)	0.03607* (0.01860)
Constant	-0.05129 (0.41706)	2.18069*** (0.42776)	0.50126 (0.49858)	0.80496*** (0.18988)	1.04230*** (0.26830)	0.77158*** (0.20796)
Observations	68	68	68	360	360	360
R-squared	0.417	0.137	0.449	0.373	0.277	0.391
District FE	No	Yes	No	No	Yes	No
Year FE	No	Yes	No	No	Yes	No
F stat/Wald	23.77***	1636***	173***	27.36***	9.04***	255***
Number of districts		43	43		107	107

Notes: The table presents the results of pooled OLS, fixed and random effects in which the dependent variable is utilization of primary healthcare institutes in calamity affected and non-calamity affected areas. In column 2 and column 5 Year fixed effects and district fixed effects are used. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

non-affected districts for the fixed effects model is insignificant. The random effects model in this scenario suggests a negative relationship between BHU utilization and devolution. The insignificant relationship observed in the fixed effects model may be due to the reason that BHUs mostly provide primary healthcare in rural settings. In the aftermath of such calamities often secondary care is required. The other possibility is that after such calamities, the BHUs affected may not be functional. For instance, In the 2010 floods 515 healthcare facilities were damaged, among the damaged healthcare facilities, the highest number of damaged healthcare facilities were BHUs (WHO, 2011). The probable cause of this insignificant relationship may be explained if the non-functionality of the BHUs is considered. We cannot provide further detail on this due to the unavailability of data on the restoration efforts of the non-functional BHUs.

3.5.6 Heterogeneity in Public Healthcare Utilization by Development and Location

Figure 3.8 shows the patterns of development in the districts of Pakistan. As discussed earlier we use night light data as a proxy of development. The average light or luminosity data gives useful information about the development of a district. Figure 3.8 depicts that the provincial capitals are significantly more luminous or developed as compared to the other districts. All districts in the bottom 10 (least luminous or in the lightest shade of Blue) belong to Balochistan. In the bottom 20, there are 17 districts of Balochistan and three districts of KP. In the category of least developed districts, (82%) are from Balochistan and in the category of most developed districts there is no district from Balochistan. The top ten districts include the federal capital Islamabad and three provincial capitals Karachi, Lahore, and Peshawar, along with other urban centers like Rawalpindi, Faisalabad, Gujranwala, Multan, and Hyderabad. In the category of the highest developed districts (45%) of the districts are from the province of Punjab, (27%) of districts from KP and remaining are from Sindh.

Table 3.13 reports the estimated effects of devolution on public hospital utilization based on the development of the district and the location of the households. The locations of the

Development by District: Night Light luminosity

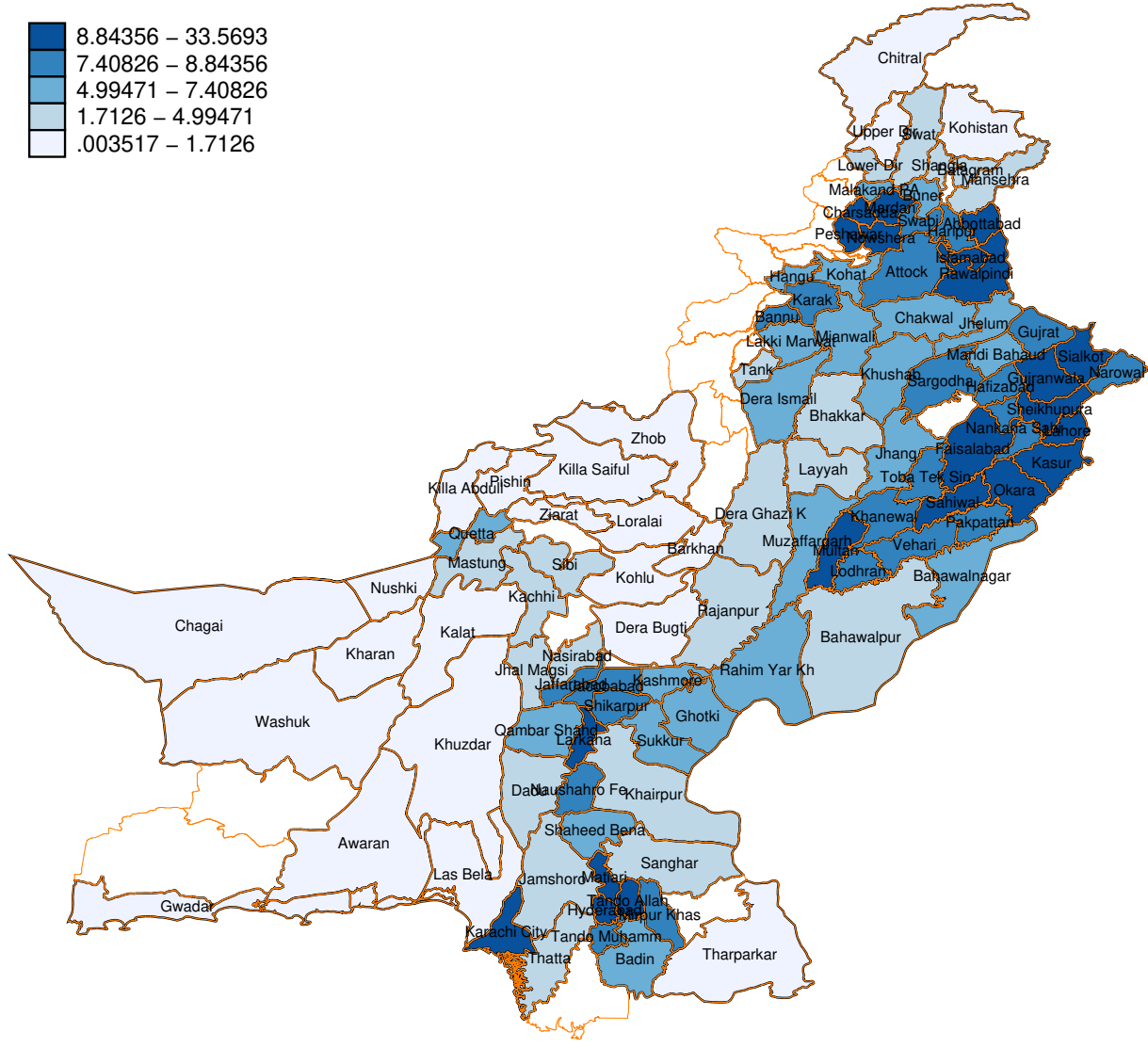


Figure 3.8: luminosity/Patterns of Development in the Districts of Pakistan

households are reported in the PSLM data sets. This analysis enables us to understand the locational and developmental differences affecting the healthcare utilization at a district level. Columns (1) and (2) show estimates for the fixed effects model for relatively developed and less-developed districts. Based on the median value, districts above the median value are categorized as comparatively developed and vice versa. Columns (3) and (4) show the results for the above-median and below-median districts, respectively. The rural-urban classification is also based on the median values of the districts based on the location of the households.

The devolution effect for the relatively developed districts is insignificant, but in the case of the less developed districts, the devolution effect is significantly negative. The coefficient value is (24%), implying that the utilization of public healthcare in the less developed districts declined considerably after devolution. This result shows the largest percentage decline in public healthcare utilization post-devolution. This implies the effects of devolution have not been effective in the less developed districts. This finding points toward the crucial limitation in the implementation phase of the devolution in the rural and less developed districts of Pakistan.

The results based on the location reveal that households residing in the relatively rural districts of Pakistan have also decreased healthcare consultations after devolution. The decline in public healthcare utilization by rural households is (12%). This result not only corroborates the preceding results but also the results obtained for the BHU utilization. The decline in public healthcare utilization in less developed and rural districts assert that residents of these areas are alternating their healthcare choices. This also implies that public healthcare institutions in these areas may be deficient in terms of resources and because of this the patients either choose to alter their healthcare choices or do not consult. Another possible reason is that since devolution, the drop in service quality may be more acute in less developed areas as service delivery may have got concentrated in provincial capitals and urban districts. In the earlier chapter of this research we had discussed about significant disparities in public healthcare provision between urban and rural districts of Pakistan.

Another interesting finding in the case of the less developed and rural district is the

Table 3.13: Results: Public Utilization based on development and region

VARIABLES	Developed Fixed Effects	Less developed Fixed Effects	Rural Fixed Effects	Urban Fixed Effects
Devolution Effect	-0.035 (0.021)	-0.244*** (0.065)	-0.13** (0.052)	-0.003 (0.028)
Distance	-0.115* (0.066)	-0.189* (0.106)	-0.216 (0.136)	-0.246*** (0.089)
Population	0.0001 (0.0003)	0.0065** (0.0028)	0.003 (0.0032)	-0.0004 (0.0004)
Income	0.005 (0.004)	0.024*** (0.009)	0.021* (0.011)	-0.002 (0.005)
Education	-0.712*** (0.248)	0.025 (0.393)	0.425 (0.537)	-0.014 (0.340)
Dependency ratio	-0.097 (0.138)	0.093 (0.136)	-0.006 (0.151)	0.196* (0.117)
Household Size	-0.017 (0.017)	-0.028* (0.0160)	-0.021 (0.025)	-0.031** (0.014)
luminosity/Development			-0.010 (0.022)	0.0062 (0.005)
Terrorism related incidents	-0.036** (0.013)	0.031 (0.036)		
Natural Disasters	0.0004 (0.025)	-0.0030 (0.038)	0.008 (0.034)	-0.008 (0.028)
Constant	0.922*** (0.231)	0.194 (0.410)	0.292 (0.531)	0.683** (0.276)
Observations	216	212	213	215
R-squared	0.04	0.113	0.112	0.008
District FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
F stat	1.80**	2.92***	1.54	2.03***
Number of districts	65	58	80	107

Notes: The table presents the results of fixed effects in which the dependent variable is utilization of public healthcare institutes in developed/non-developed, column (1-2) and Rural/urban, column (3-4), districts. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

relationship between income and public healthcare utilization. We observe from the column (2) and (3) that the coefficient of income is positive and significant for both rural and less developed districts. In the case of less developed and rural areas, income becomes an important factor to finance the associated costs related to consultation, which include transportation, meals, and lodging. In some cases, income can be a deciding factor regarding consultation. The PSLM data of 2014-15 shows that (4.5%) of the individuals getting sick do not take medical consultation. The top two factors behind no consultations by the individuals are expenses incurred on healthcare consultations (28.5%) and healthcare facility being located at a distant location (10%). In the rural and less developed areas, income can be an influential factor while deciding to opt for public healthcare consultations. Furthermore, the top two reasons for not utilizing a BHU are distance (20.85%) and inadequate facilities at BHU (21.45%), other reasons include unavailability of staff and suitability. The response of households on changes in the facilities of BHU show that (15.74%) of the households report a decline in the healthcare provision at BHUs and (76.12%) reported that there were no changes observed in the healthcare provision at BHUs. The before-mentioned responses from the households corroborates the findings of this study.

3.6 Conclusion

This research studied the impact of devolution on the utilization of the different public healthcare institutions. An increase in the use of public healthcare service after devolution can be viewed as confidence of people in their respective local public healthcare system or vice versa. In case of Pakistan, the utilization of public hospital and basic healthcare units declined. This research also includes need based and heterogeneity-based healthcare utilization. The results in most of these scenarios depict a decline in the public healthcare utilization. The possible reason for this decline in the utilization of the public healthcare facilities refers to the inability of the local governments to bring about changes in the existing healthcare infrastructure.

The detail of this inability to improve local healthcare infrastructure lies in the imple-

mentation of devolution and the reluctance of the provincial governments in devolving administrative and financial powers to the local governments. Other possible explanations for this decline include delays in local bodies elections, lower provision of finances to healthcare institutions by the provincial governments, and less administrative oversight of the institutions.

The results of this research lead to several implications. The first implication drawn from this research is that impact of devolution on healthcare utilization differs based on the type of utilization. The decline in utilization of public hospitals and BHUs utilization implies that devolution caused a further deterioration of the existing healthcare structure, leading to decline in healthcare utilization by individuals, specifically, in rural and less developed districts this situation seems bleaker as compared to the overall sample. The essence of the devolution lies in the fact that local government would address the issues pertaining to the local population and improvements in the existing infrastructure would eventually help in the betterment of local institutions. In case of Pakistan, we observe that a decline in the utilization of the public health sector presents a different narrative of the individuals.

On the contrary, we observe that the impact of the devolution on maternal healthcare seem to be positive. The uncertainty in this regard is that the policy initiatives prior to the devolution under millennium development goals and sustainable development program have fostered this increase in maternal healthcare or devolution is the sole driving force behind this increase.

Further, we suggests that the efforts for the improvement of the public healthcare infrastructure by the district government seem inadequate. If the improvements were a case, then healthcare utilization would have increased after devolution. The lack of efforts to improve healthcare institutions is related to several factors, the important factors in this context is the decentralization of the funds to the district administrations, delays in local elections, and a lack of implementation strategy. Unfortunately, there is no evidence of district financial award in any province of Pakistan. The election of the local government within each province is still a prevailing issue. The 18th amendment of the constitution was an initiative towards provincial autonomy, but a question still unanswered is that

has devolution taken place in true spirit?. The answer to this question according to the findings of this research does not seem positive.

Public healthcare sector is the lifeline of millions of poor individuals, a post-devolution decline in healthcare utilization questions the ability of the governments, especially in provision of healthcare. We conclude this research with a notion that post-devolution improvements in healthcare utilization can only be achieved through true delegation of power to the local authorities, along with financial allocations, better oversight, and public representation. We recommend that more healthcare infrastructure is needed to reduce the effects of distance on healthcare utilization. Further, we also recommend that provincial and local governments should prioritize public healthcare delivery in rural areas and less developed districts. Childbirth at public healthcare institutions increased over time, but it is still low in maternal healthcare consultations, more efforts can improve the number of deliveries in public hospitals and this can significantly decrease infant and maternal mortality in Pakistan. The increase in the utilization of public healthcare infrastructure for childbirth can be achieved through awareness campaigns.

This research tries to fill in the gaps in existing literature, but there are some limitations in this study that need further analysis. As we took utilization of healthcare as a health outcome, further analysis can be conducted using certain health outcome measures like infant mortality, patient satisfaction, and life expectancy at district-level. The measure for devolution used in this research is a time dummy, the impact of devolution can also be measured by using fiscal, political, and administrative decentralization, although data availability and measurement of these factors is a difficult task. Another aspect on which a further analysis may be required is the post-devolution role of the federal government in healthcare policy making, coordination, and its recommendation to provincial governments to ensure quality in healthcare service. The need for coordination between the federal and provincial healthcare systems was starkly made apparent during the Covid-19 pandemic.

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Chapter 4

Migrant Remittances and Healthcare Choice

Abstract

Optimum healthcare decision protects households against adverse health shocks. Healthcare decisions are affected by several factors, including household finances. Migrant remittances can ease the financial constraint of the household, thereby influencing their choice of healthcare services. In developing countries, migrant remittances act as an additional source of income for many households. Remittances play a vital role in shaping household preferences like consumption, investment, and healthcare. Remittance inflows enable the recipient households to allocate more resources for healthcare and choose a healthcare service provider which they deem as best, based on the perceived quality of the healthcare provider. The existing body of literature shows that the choice of healthcare service providers is based on enabling and contextual characteristics of the household. The effect of remittance as an enabling factor for healthcare choice is yet not ascertained. This research intends to fill this gap by looking at the effect of remittances on the healthcare preferences of Pakistani households. To find out this relationship, we use household data from the 2019-20 round of Pakistan Social and Living-Standards Measurement Survey (PSLM), using instrumental variable strategy, we find that the ratio of preference for private healthcare providers increases by (10.8%) with an increase of (1%) in overall remittances. The preference to opt for a private healthcare provider increases by (16%) and (8%) for foreign and domestic remittances recipient households, respectively. Among households preferring allopathic consultations, remittances increase the use of private healthcare services by 11% (17% for foreign remittance recipients and 7.6% for domestic remittance recipients). The choice of healthcare service may also depend on the characteristics of the household head and enabling factors. Estimations carried out on the sub-samples of households grouped by the gender and education of the household head and the location of the household indicate that remittances recipient households are more likely to prefer private healthcare providers subject to the rise in remittances. Three major implications can be drawn from these findings. First, remittances lead to increased use of private healthcare services. This trend can become a leading factor for

the development of the private healthcare sector. Second, the low utilization of public healthcare services by remittance recipients could decrease public sector investments in healthcare, leading to public moral hazard. Finally, the growth in private healthcare may differ among regions. Regions receiving more remittances witness more growth in private healthcare services than regions with less out-migration, thereby aggravating existing disparities in private healthcare services.

JEL Codes: I11; I12; I15; F24; O10; I18

Keywords: Private Healthcare, Remittances, Instrumental variable, Pakistan.

4.1 Introduction

“Wealthier is healthier ”

Pritchett and Summers 1996

Decision-making is an essential part of our daily lives. As economic agents, the decisions we make can influence several people and institutions. One of the important decisions a household makes is about its preference for a specific healthcare provider. With a wide range of healthcare providers at the disposal of the decision-maker: formal, informal, traditional medicine, healer, public, and private healthcare, any sub optimal decision about the selection of healthcare provider can have grave consequences for not only the patient but also the household. Healthcare decisions may vary between households because of the constraints faced by the decision-maker. A noteworthy set of constraints may include access to healthcare services, perceived quality, patient satisfaction, gender, and income (Nana et al., 2010; Sarma, 2009). The accessibility and out-of-pocket payments are some other factors that can lead to undesirable health outcomes for individuals and groups, especially those having no or limited access to healthcare (Masiye and Kaonga, 2016). The choice of healthcare services is complex and is dependent upon the characteristics of the patients, which are usually different from one another, and the characteristics of the healthcare service providers (Victoor et al., 2012).

The decision regarding private healthcare is often dependent upon the financial resources of a household. In the case of utilizing private healthcare, wealth or income is one of the important determinants. In the absence of mandatory health insurance, households finance the healthcare expenditures by savings, curtailing their consumption, loans, or by the remittances they receive from members working away from home. Kapri and Jha (2020) suggest that remittances received from abroad or domestically work as a stimulus to improve the health expenditures of the household. Remittances act as an additional way to finance the health expenditures and the receipts of the remittances can impact the household decision of healthcare utilization, hence remittances from the migrants can be viewed as an additional income source for households.

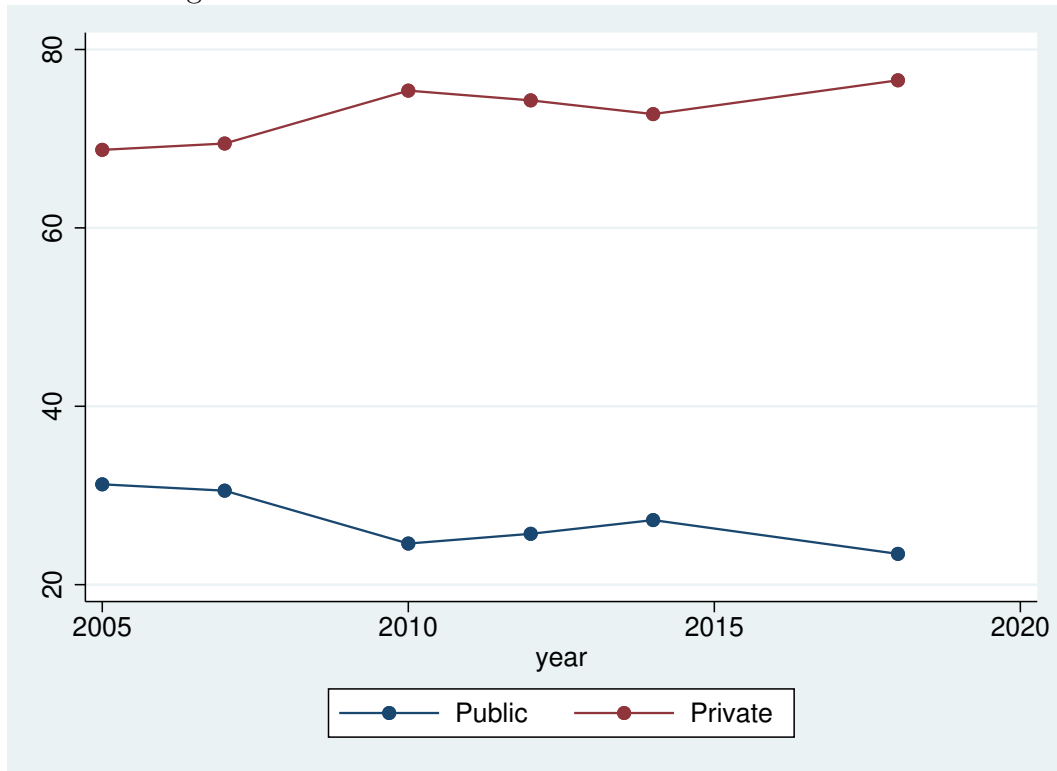
In a collective decision-making model based on the Pareto efficient outcomes, households maximize their utility keeping in view their respective health production and income. In case of a health shock, domestic and foreign remittances may act as an additional source of finance. Based on collective decision-making, a remittance recipient household may use remittance to increase its health production. Health production depends on several factors including characteristics of healthcare providers. In case, a remittance recipient household selects a private healthcare provider, this choice may reflect the perception of the household regarding the quality of the healthcare provider. The choice for the healthcare provider eventually maximizes the household utility function, increasing the demand for private healthcare. This study focuses on the preference for the private healthcare provider by remittance recipient households in Pakistan.

Pakistan has both public and private healthcare service providers. The public healthcare services in Pakistan are either free or have minimal cost, but the public healthcare services in Pakistan are often criticized due to low budget allocations, absenteeism of healthcare staff and lack of essential medicine ¹. In rural areas, it has been observed that basic medical equipment is deficient. The medical equipment and diagnostic laboratories need an up-gradation and lack of such facilities in rural areas lead to the overcrowding of the public healthcare services in the cities ². Furthermore, available public healthcare infrastructure is not adequate, as discussed in the earlier chapter of this research there is a shortage of doctors, nurses, and inpatient beds in most of the districts of Pakistan. Shortages of equipment, medicine, and healthcare professionals in the rural areas and overcrowding of the public healthcare institutes in the major cities may be a leading factor for increased demand for private healthcare. Private healthcare is expensive, but its utilization by Pakistani households has increased over time. Figure 4.1 shows the gap between the utilization of private and public healthcare. More utilization of private healthcare services indicates that Pakistani households perceive that the quality of private healthcare services is better, especially, while considering the previously referred prevailing issues in public healthcare. Greater utilization of private healthcare services also implies

¹<https://www.dawn.com/news/1267410>

²<https://dailytimes.com.pk/333295/curing-pakistan-ailing-healthcare-system/>

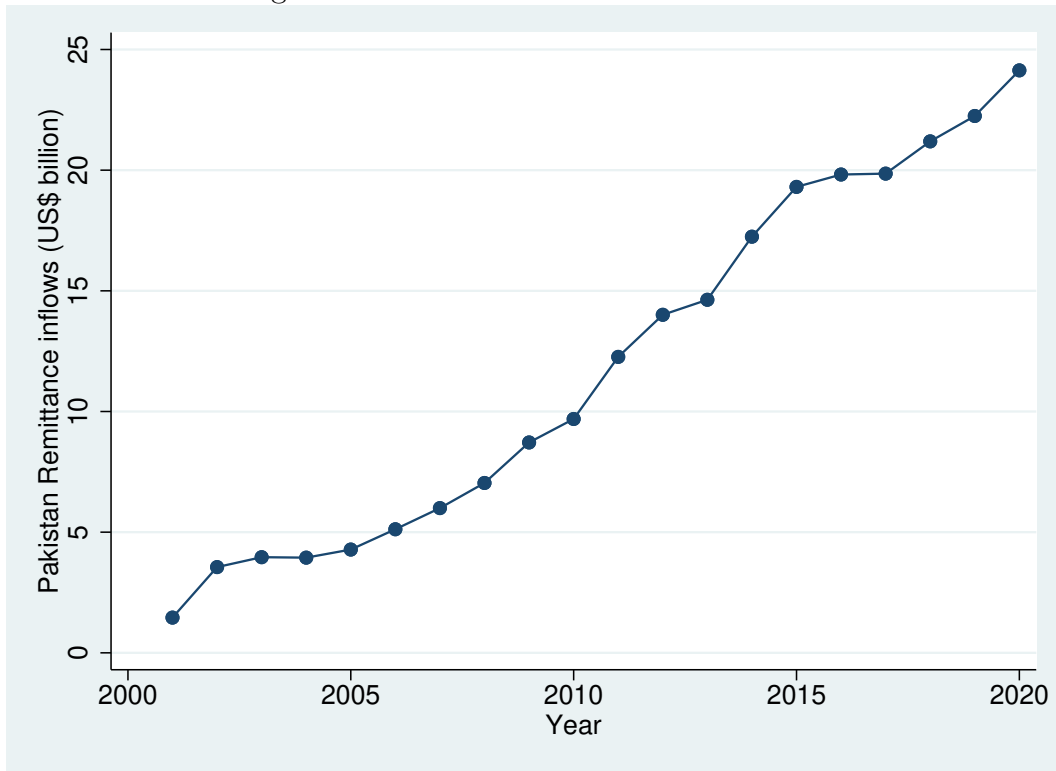
Figure 4.1: Public versus Private Healthcare utilization



Source: Author's Calculation Using PSLM Data sets

more out-of-pocket expenditures. These expenditures on healthcare require allocating more financial resources, remittance being one of them. Figure 4.2 shows an increasing trend of remittance inflows in Pakistan. Pakistan is among the top ten remittance recipient countries (World Bank, 2020). In 2018-19, the inflow of foreign remittance in Pakistan was 21.74 billion dollars nearly equivalent to the income from exports (Government of Pakistan, 2020). Based on the current analysis of household-level data, we observe that about (14%) of Pakistani households receive remittances, including (6%) of households receiving remittances from abroad. Anwar and Mughal (2012) show that the motivation behind sending remittances is to improve the overall well-being and standards of living of the household, increasing the household's consumption, investment, and expenditures on healthcare. Ahmed et al. (2018) suggest that Pakistani households receiving domestic remittances increase the share of health expenditures. Therefore, it is of critical importance to consider that these receipts influence the preference for a healthcare provider. This leads to the understanding that remittances are not only a source of finance but also act

Figure 4.2: remittance inflows in Pakistan



Source: Author's Calculation Using World Bank Data (2020)

as a leading factor while choosing a healthcare service provider.

For analysis of the relationship between remittances and healthcare providers, this study uses Pakistan Social and Living-Standards Measurement Survey (PSLM), 2019-2020. Results suggest that both foreign and domestic remittances lead to a higher demand for private healthcare. Using OLS and instrumental variable techniques like 2SLS and Poisson, the findings suggest that the ratio of preference for private healthcare providers increases by (10%) with an increase of (1%) in remittances. Similarly, the preference to opt for a private healthcare provider increases by (16.5%) and (8%) when there is an increase of (1%) in the foreign and domestic remittances, respectively. This implies that demand for private healthcare providers is higher among foreign remittance recipient households as compared with domestic remittance recipient households.

The choice of healthcare service may also depend on the characteristics of the household head and enabling factors. To look at some of these factors, we include sub-samples of gender and education of the household head and location of the household. All sub-sample

estimates show that remittance recipient households are more likely to prefer private healthcare providers subject to the rise in remittances. The results of sub-samples indicate that the results of this research are consistent and validate the main findings of this research. The sub-sample based on gender shows that male household heads' have a higher preference for private healthcare providers as compared to females. The sub-sample based on education illustrates that both educated and non-educated household heads have similar preference for private healthcare providers. The sub-sample based on the location of households reveals that preference for healthcare providers by urban households is higher as compared to the rural households.

Furthermore, estimations using the sub-sample of allopathic healthcare consultations show a positive and significant impact of remittance on the preference of households for private healthcare service. This sub-sample is additionally analyzed based on domestic and foreign remittance recipient households. The preference for private healthcare in foreign remittance recipient households increases around (18%) with a (1%) increase in the inflow of remittances and around (7.6%) in the case of domestic remittance recipient households. In summary, the results of this research substantiate that remittance recipient households prefer private healthcare providers over public healthcare providers.

This study fills the existing gap of literature about the role of remittances in shaping the choice of healthcare providers. After demonstrating possible hypotheses through a stylized model, we empirically test this relationship using household-level data. Studies like [Amuedo-Dorantes and Pozo \(2011\)](#); [Kapri and Jha \(2020\)](#); [Nguyen and Nguyen \(2015\)](#); [Thapa and Acharya \(2017\)](#) and [Valero Gil \(2009\)](#) only discuss the role of remittances in increasing the health expenditures of the household. To the best of our knowledge, this issue has not received attention in the literature.

Our analysis gives some insight into the role of remittances in the development of private healthcare and public moral hazard implications. As this analysis reveals, remittances can be an influential factor leading to a higher preference for private healthcare providers. This relationship between remittances and private healthcare utilization has two implications. First, if remittance recipient households continue to opt for private healthcare instead of public healthcare, this can influence the development and growth of private healthcare

services. Second, due to the low utilization of public healthcare services government may not invest in healthcare services which could lead to a public moral hazard.

4.1.1 Theoretical Model

We present a generalized model of healthcare choice and remittances. Let us consider a model of collective decision for N households. Households are defined as individuals living together and sharing their economic resources to maximize the welfare of their respective households. Household acts as a single decision-making unit and pools all financial resources, including remittances. There are k members in each household. Where

$$K = (1, \dots, n) \quad (4.1)$$

Under the assumption of the collective decision model as proposed by [Chiappori \(1988, 1992\)](#). A collective model of the household decision-making follows a Pareto efficient outcome. This implies two things in this study, first in case of any health consultations for an individual k the household's decision for a healthcare provider is a collective decision, and second, the assumption of Pareto efficiency is met. The latter means that the welfare of k^{th} individual facing a health condition requires that members of the household alter their consumption in such a way that the individual with a health condition can regain his lost utility due to the health shock and the overall welfare of the household remain the same.

The total number of households is divided into two categories; the first category of households has a $k-n$ number of migrants, and the migrated individuals send remittances to their respective households. The second category of the household has all k individuals living together, hence no migration has taken place and therefore the household does not receive remittances. This implies that we can define the total number of households as

$$N = N_r + N_{wr} \quad (4.2)$$

Where N is the total number of households, N_r represents remittances recipient households and N_{wr} represents non-recipient households. Income of these households can be differentiated based on remittance receipts, let the j^{th} member of a N_r household sends a proportion of his income as a remittance λ_q at any time t to its respective household.

$$t_i = \lambda_q \cdot y \quad (4.3)$$

λ_q shows a proportion of the migrant's income which he/she sends back home (remittance). It is pertinent to note here that we do not include the total income of the migrated individual as part of household income, but only λ_q . The subscript q refers to the type of remittance received by the household, i.e. domestic or foreign. q takes the value "D" for domestic remittance and "F" for foreign remittance received, respectively. The migrated individual may or may not be a part of the collective decision of the household in case of a health issue. We also assume that in case of a health-related issue of any member of the household, the utility of the household can be increased by the purchase of health-related goods or services, by using the overall resources available at the disposal of both N_r and N_{wr} households. The corresponding resources in terms of income for these households can be defined as

$$I_r = I + \lambda_q \quad (4.4)$$

$$I_{wr} = I \quad (4.5)$$

From the above equations, it is observable that equation three corresponds to remittances recipient households, and equation four corresponds to the income of non-remittance recipient households. All the N households tend to maximize the following strictly concave utility function.

$$U = \theta(X, H; Z) \quad (4.6)$$

Where X is the vector of all consumption goods and H is the health status of individuals in a household. The health status of the individuals in a household depends upon the health production function. The first-order conditions and second-order conditions for the utility function are $u_x > 0$, $u_h > 0$, and $u_{x2} < 0, u_{h2} < 0$. The health production function

used in this research is proposed by (Grossman, 1972) and (Rosenzweig and Schultz, 1982). Where Z stands for observable like education, gender, age, and household size.

$$H = h(\gamma, \delta; h_o) \quad (4.7)$$

The health production function is strictly concave, the health production function presented in equation 4.7 is a Grossman's type health production function and is widely used in literature see (Grossman, 1974; Muurinen, 1982). The health production function depends upon the initial level of health h_o and this can be viewed as some genetic or physical characteristics which can lead to good/bad health outcomes (a low weight at birth) (Fogel, 1994). γ is the vector of all the individuals or household characteristics/ factors influencing the improvement of health production like education, occupation, environment, and genetics. δ represents the health provider's characteristics, such as accessibility, quality, waiting time, diagnosis, and others. γ, δ can also be viewed as health inputs in the health production function. By substituting health production function in utility function we get the following equation.

$$U = \theta(X, h(\gamma, \delta; h_o, Z)) \quad (4.8)$$

The above utility function embedded with health production would lead to an optimal level of utility for each household. Households optimize their utility for a given income constraint. As discussed earlier, the income constraints for the recipient and non-recipient households are presented by I_r and I_{wr} , respectively. In case of a health shock a household decides to use healthcare services from a healthcare provider, the choice of the healthcare provider is based on δ (characteristics of the healthcare provider) and its price. For simplicity, we assume that the price for public healthcare service equals one $p_g = 1$, and the price for a private healthcare provider is $p_p > 1$.

The underlining assumption of collective decision-making is based on Pareto efficient allocations. This implies that preference for a specific healthcare provider is associated with the allocation of resources among the household. For instance, if a household tends

to prefer a private healthcare provider over a public healthcare provider, based on its perceived quality, the household members need to allocate more resources. The provider's characteristics δ tend to influence the choice of the healthcare provider. For example, if characteristics of a private hospital are better than a public hospital, the household would tend to prefer a private hospital or vice versa. We also assume that the individuals of the household do not pay an insurance premium for health care. The income constraint of the household can be written as

$$I_r = p_x X + p_p H_p + P_g H_g \quad (4.9)$$

$$I_{wr} = p_x X + p_p H_p + P_g H_g \quad (4.10)$$

Equation 4.9 represents the income constraint for the recipient households and equation 4.10 shows the income constraint for non-recipient households. Income is considered as one of the enabling resources for healthcare utilization ([Andersen, 1995](#)). Both types of households maximize equation 4.8 with respect to their respective income constraints. Maximization of utility function embedded with health production function provides the following health demand functions.

$$H_{r^*} = H(I_R, H_o, Z, P_p, P_x, \gamma, \delta) \quad (4.11)$$

$$H_{wr^*} = H(I_R, H_o, Z, P_p, P_x, \gamma, \delta) \quad (4.12)$$

Health demand function is a function of prices, income, the initial level of health, characteristics of the healthcare provider and individual/household characteristics. The remittance recipient and the non-recipient household's respective demand for health are shown in equations 4.11 and 4.12, respectively. The summation of the health demand functions would lead to the market demand for healthcare.

$$H^* = H_{wr^*} + H_{r^*} \quad (4.13)$$

The demand function for consumption good X is

$$X^* = X(I_r^* | I_{wr}^*, H_o, Z, p_p, p_x, \gamma, \delta) \quad (4.14)$$

Equation 4.13 is the market demand for health, where the choice of the healthcare provider is based on income, prices, households, and healthcare providers characteristics. By substituting demand functions into equation 4.8 we get an indirect utility function.

$$V^* = V(X^*, H^*, I^*) \quad (4.15)$$

Households tend to maximize their respective utility functions in case they face a health crisis. In the absence of health insurance, the income of the household serves as an enabling factor. Hypothetically, the healthcare choices should not vary across households with similar income and preferences, but by receiving remittances i.e., λ_q as an additional source of income the choice of healthcare among households may differ. This implies that remittance receipts may correspond to the demand for a specific healthcare provider. We can illustrate this by defining an indirect utility function for a single household.

Let us assume that a member of a household “i” faces a medical condition. The household members decide to use the services of a ”j” type healthcare provider, enabling them to maximize their indirect utility function V_{ij}^* .

$$V_{ij}^* = \alpha_i \gamma_i + \beta \delta_{ij} + e_{ij} \quad (4.16)$$

Where γ_i is the vector of the household characteristics or observable exogenous factors related to households or individuals like income, age, education, household size, marital status, distance, and location. δ_{ij} are healthcare provider specific observable. In the case of this study due to data limitation, such observable are confined to the selection of private or public healthcare providers based on their perceived quality. We assume that people tend to private healthcare providers if there is a significant difference in the perceived quality of healthcare services among private and public healthcare providers. These differences could be related to the quality of service delivery, waiting time, patient

satisfaction, and the availability of service hence maximizing their utility V_{ij^*} .

The choice of the healthcare provider is also subject to the receipts of remittances which is embedded in γ_i . In case of a medical need, a receipt, or an increase in remittance can increase the household's capacity to finance healthcare. The remittance receipts can change the demand for healthcare providers, i.e., opting for a better healthcare alternative. If household utility increases due to the demand for private healthcare, this indicates that remittances may be a leading factor for the selection of private healthcare. That is $V_{i_p} > V_{i_g}$ where "i" is the household receiving remittances and opting for private healthcare, leading to a rise in demand for private healthcare.

Among the remittance recipient households, there can be differences in demand for private healthcare, these differences are based on the type of remittance they receive. As an illustration, if there are two households receiving λ_F and λ_D respectively and if $\lambda_F > \lambda_D$, then it is more likely that the demand of the private healthcare will be higher for foreign remittance recipient households. The difference in demand for private healthcare can also be attributed to some household factors such as education and gender of the household head and its location.

From the above discussion, we can postulate three hypotheses. First, with the inflow of remittances, households opt for private healthcare services. Second, there may be differences within remittance-receiving households based on the type of remittance they receive. Third, the choice of healthcare provider for a remittance recipient household can also be influenced by its characteristics.

4.1.2 An overview of Pakistan's Healthcare System

In Pakistan, healthcare services are provided by both public and private healthcare organizations. Public healthcare service in Pakistan is inexpensive and has a large network. Private healthcare services are mostly profit-oriented and relatively expensive ³.

³A minimal amount in the shape of Parrchi/bill must be paid for general consultation, it cost around 0.05\$. There are minimal charges for some medical procedures but are very low as compared with Private healthcare services. For instance, an X-ray would cost 50-70 rupees (Approximately USD 0.3-0.4) in a government hospital, while in private it ranges from 500-1500 (Approximately USD3-9) depending upon the service provider

Despite having a large network of healthcare providers in Pakistan, we observe that the health statistics of Pakistan are not promising as compared to the countries in the region. For instance, according to WHO (2018) the health expenditure in Pakistan is (2.73%) of the GDP and is one of the lowest in the South Asian region. The life expectancy at birth is around 66.94 and infant mortality per 1000 live births is 58.8. Pakistan has 2nd lowest life expectancy in the region. In Pakistan, a major part of the household health expenditures is self-financed. In the absence of health insurance, the financial impact of health-related shocks may have consequences and can be regarded as an obstacle to getting quality healthcare services (SO et al., 2016). According to World Bank (2018b) as much as (4.5%) of the population in Pakistan spends ten percent or more of their household income on health-related expenditures.

Public versus private healthcare choice may correspond to the ability to pay versus a universal healthcare system. In a universal healthcare system, such as in Pakistan, public healthcare services are mostly free or can be used by paying a minimal cost. Public healthcare service in Pakistan is funded by the federal and provincial governments. There is a large network of government healthcare institutions providing healthcare services across Pakistan. The smallest unit of the public healthcare sector is a basic health unit (BHU) which mostly provides primary healthcare services. Other public healthcare institutions include maternal and child healthcare units, Tehsil headquarter hospital, District healthcare hospitals and the largest unit of public healthcare is the teaching hospitals which provide healthcare services to millions of patients every year. In the PSLM 2019-20 survey, respondents were asked about healthcare services provided at the nearest basic healthcare unit. (67%) of the total households responded that they do not use BHU for healthcare consultations. Out of the total households using BHUs for healthcare consultation, around (37%) reported dissatisfaction, and around (78%) report that during the last year there was no improvement in healthcare services at their respective BHU. This is a piece of important information, as this gives the respondent's perspective regarding one of the important units of public healthcare provision.

The basic/smallest unit in the case of private healthcare is a private clinic. A private clinic is usually operated by a single doctor, having a few basic healthcare equipments. Private

clinics usually offer outpatient healthcare based on the specialization of the practitioner. Most of the private clinics are part-time and are operated by doctors who work full-time (morning) in public hospitals. This is mentioned as "physician dual practice" in the literature. There are also large-scale private hospitals. These private hospitals have a well-developed infrastructure, human resources and provide secondary and tertiary healthcare services. Most of the large private hospitals are located in urban centers and provide a wide range of medical consultations. The motivation behind private healthcare provision is (mostly) profit generation. Individuals or households deciding to use private healthcare services must pay out-of-pocket. For instance, in Pakistan the share of out-of-pocket expenditures as a percentage of the current health expenditure is around (56.24%) ([World Bank, 2018a](#)), indicating that health expenditures are majorly self-financed. Private healthcare in Pakistan is not limited to private clinics and hospitals. There are several other options for private healthcare services. A few notables are herbalists, healers, and homeopathic doctors. In our sample around (9%) of households have opted for healthcare services from before-mentioned private healthcare providers.

4.2 Literature Review

4.2.1 Choice of Healthcare Services

The demand for healthcare is one of the most important factors in this domain. A few notable factors influencing the demand for healthcare are health status, income, education, gender, accessibility, insurance, and quality of healthcare services. The literature on this subject is attributed to the seminal work by [Grossman \(1972\)](#). The theoretical framework suggested by the author identifies health as a capital good. The health production function, depreciation of health with age, and the demand for healthcare increasing with wages are some salient features of his work. Over time, researchers have used this model in their respective research and have added value to the existing body of literature.

[Muurinen \(1982\)](#) proposed a generalized model of demand for healthcare based on Grossman's health production with the inclusion of environmental factors and education being treated as a capital stock, rather than a productivity factor. Further, the Grossman's

model was empirically tested by (Cropper, 1981; Grossman, 1974). A major contribution on the empirical side of the model is by (Wagstaff, 1986) who tested demand for healthcare using two models of pure investment and consumption which were not tested alongside in any of the earlier studies. A few recent studies on the demand for healthcare using the Grossman model include Erbsland et al. (2002); Jacobson (2000); Nocera and Zweifel (1998). The Grossman model although has received criticism but has been a foundation stone for the development of the subject.

The researchers agree on the notion that demand for healthcare is a derived demand. Victoor et al. (2012) are of the view that demand for healthcare is subjective and depends upon patient's and healthcare provider's characteristics. The previously mentioned studies also suggest that the demand for healthcare is dependent upon factors like education, age, income, price, accessibility, and availability. A study for India by Sarma (2009) shows that distance is also one of the influential factors affecting the demand for healthcare and discusses that greater distance can decrease the demand for healthcare.

To observe the characteristics of the healthcare providers, researchers have focused on the debate pertinent to public versus private healthcare. The proponents of both schools of thought have argued on the advantages of the respective healthcare system. The proponents of a public healthcare system view private healthcare services as profit-motivated and inequitable; excluding all those who cannot pay for the private healthcare service. (Marriott, 2009; Rannan-Eliya and Sikurajapathy, 2008). A study on Spain shows that socioeconomically disadvantaged people have a higher dependence/utilization of public healthcare facilities as compared to private healthcare (Regidor et al., 2008). A study by Kruse et al. (2018) on the selected European nations suggests that the notion of efficiency in the context of private healthcare is counterfactual and public healthcare is equally efficient. The proponents of private healthcare argue that private healthcare services have greater efficiency, better quality, and higher satisfaction of consumers, as well as private healthcare organizations play an important role to aid public healthcare providers in healthcare provision, overall improving healthcare coverage. see Bhattacharyya et al. (2010); Nguyen and Wilson (2017); Patouillard et al. (2007); Saksena et al. (2012); Taqdees et al. (2018).

Most of the research in the context of public versus private healthcare choice and determinants of private healthcare have focused on the developed world. Studies like ([Brekke and Sørsgard, 2007](#); [Kruse et al., 2018](#); [Nguyen and Wilson, 2017](#); [Regidor et al., 2008](#); [Tountas et al., 2005](#)) focus on the comparison and evaluation of the respective type of healthcare service. The socio-economic determinants for the demand for healthcare are also discussed, a few notable studies include ([Deb and Trivedi, 1997, 2002](#); [Fabbri and Monfardini, 2003](#)).

The literature from the developing world is less but a few notable studies in this area are by [Amaghionyeodiwe \(2008\)](#) and [Pokhrel and Sauerborn \(2004\)](#). These studies focus on decision-making and determinants of the choices of healthcare. Some studies from South Asia have also contributed to the body of the existing literature on healthcare choice. For example, [Pallegedara and Grimm \(2017\)](#) discuss the demand for private healthcare in Sri Lanka and find that preference for private healthcare is higher for the rich. [Rout et al. \(2019\)](#) finds low utilization of public healthcare services in the majority of the Indian states, moreover, the choice for private healthcare providers has a higher association with increasing wealth quantiles. [Pokhrel and Sauerborn \(2004\)](#) conducted a qualitative analysis of child healthcare decision-making in Nepal by constructing a four-step conceptual framework. The study finds gender bias in health consultation and indicates a higher utilization of public as compared to private healthcare. The only study for Pakistan is related to the satisfaction and loyalty of the patient utilizing private healthcare. The study focuses on six private hospitals of Islamabad, confirming that patient's loyalty is associated with the quality of healthcare received ([Taqdees et al., 2018](#)).

4.2.2 Remittances and Healthcare

The literature on migrant remittances can be broadly divided into two strands. First, the role of remittances on the economy, and second, the role of remittances on the attributes of the recipient household. Household-level studies have explored different aspects of households being influenced by the receipts of the remittances like poverty, education, consumption, etc. The existing literature also suggests that there is a relationship between remittances and health. This strand of literature primarily focuses on child health, health-

care expenditures, use of healthcare services, and healthcare coverage. For instance, the study by [Hildebrandt \(2005\)](#) on Mexican households establishes a relationship between migration and health of the children. The infant mortality in migrant households is observed to be low, with higher birth weight. This study also tries to formalize the channel by which health and migration are related and proposes that this relationship is due to an increase in health knowledge as an after-effect of migration. Another study on Mexico by [Kanaiaupuni and Donato \(1999\)](#) shows that infant mortality is higher in the regions with higher rates of migration, but declines with the receipt of remittances. They conclude that remittances can improve/benefit infant health outcomes over time. A household panel analysis by [Nguyen and Nguyen \(2015\)](#) shows that outpatient visits to the doctor by children and adolescents in Vietnam have a positive association with both domestic and foreign remittances.

[Kapri and Jha \(2020\)](#) show that remittances increased the healthcare spending of households in Nepal. Healthcare expenditures in the Nepalese household significantly differ among the migrant and non-migrant households, showing that remittance and migration can significantly influence the behavior of the household regarding healthcare decision-making. Another study from Nepal by [\(Thapa and Acharya, 2017\)](#) also conclude a positive association between remittances and health expenditures. A study by [Valero Gil \(2009\)](#) shows a positive association of remittances with health expenditures in Mexican households, both with and without employer's medical insurance. The receipts of remittances increase the healthcare expenditures in Mexican households, but the proportion of healthcare expenditures stays low in lower-income households receiving remittances. Households with healthcare coverage also spend a relatively low share of remittances on health expenditures. [Amuedo-Dorantes and Pozo \(2011\)](#) are of the view that remittance functions as an effective tool for equalizing the healthcare expenditures among households according to their respective healthcare coverage.

A cross-country study worth mentioning in the context of developing countries is by [Drabo and Ebeke \(2010\)](#). This study uses a panel of 56 developing countries, the main finding of the study suggests remittances improve healthcare in low-income countries. The study also suggests that foreign aid and remittances, both can increase access to healthcare

services and complement each other. Furthermore, an interesting finding is that with an increase in the remittances of recipient countries, there is a sectoral shift in healthcare utilization across private and public healthcare services which can be attributed to an inefficient public healthcare system. The literature on remittance and healthcare discussed in the previous lines point out that studies mostly aim to figure out a relationship between remittance and healthcare expenditures and a few studies had focused on the impacts of remittance on child health.

The demand for healthcare can be induced due to several factors (individual's health, environmental factors, and unforeseen events), therefore households tend to maximize their respective utility by choosing the best available healthcare provider. The choice for a healthcare provider is predominantly dependent upon several enabling and contextual factors, including remittance receipts. Migrant Remittances can play a vital role in shaping these preferences. The existing body of literature has not focused on this crucial determinant of healthcare choice and does not shed light on the preference of private healthcare by recipient households. This research aims to fill this gap by looking at the effect of remittances on the healthcare preferences of Pakistani households.

4.3 Data and Methodology

4.3.1 Variables and Descriptive Statistics

Table 4.1 gives the summary statistics and variable description of the variables used in this analysis. We use the ratio of private-public consultations at a household level as our main outcome variable. The definition of this variable is changed by truncating households based on allopathic consultations and this definition is used to check for the robustness of results. This change in the definition of the dependent variable allows us to observe healthcare choice of the households specifically for trained medical professionals. Further, we use the number of private healthcare consultations as an outcome variable. Changing the definition of our main outcome variable in this analysis helps us as a robustness check and validate the findings of baseline estimates.

In this study, the variable of interest is migrant remittance, as migrant remittances

Table 4.1: Data Description and descriptive statistics

Variable	Description of the variable	Obs	Mean	STD	Min	Max
Healthcare Choice	The Ratio of private healthcare consultations to public healthcare consultations , the value is 1 if all members consult private healthcare providers and 0 if all consultations are from Public healthcare providers in case of illness during the recall period of three months, the variable includes Private Hospitals, Private Clinics, Government hospitals, government dispensaries, BHU, Pharmacies, Herbalist, Sinai, LHW's.	45698	63.05	47.05	0	100
Healthcare Choice (only Allopathic)	The Ratio of private healthcare consultations to public health-care consultations , the value is 1 if all member consult private healthcare providers and 0 if all consultations are from Public healthcare providers in case of illness during the recall period of three months, the variable includes Private Hospitals or Clinics, Government hospitals or dispensaries.	39669	65.71	46.48	0	100
No of Private Consultations	The number of Patients in a household using private healthcare services.	160654	0.238	0.57	0	10
No of Private Consultations (allopathic)	The number of Patients in a household using private allopathic healthcare services.	160654	0.209	0.53	0	10
Remittances	The log value of remittances is used if the household head receives the amount in Pakistan. This variable includes both domestic and foreign remittances.	21686	0.7394	1.81	0	6.90
Foreign Remittances	The log value of foreign remittances is used if the household head receives the amount in Pakistan form a migrant abroad.	8412	5.35	0.46	3.47	7.17
Domestic Remittances	The log value of domestic remittances is used if the household head receives the amount in Pakistan form a domestic migrant.	13274	5.01	0.48	3	7.00
Location	This variable shows the location of the household, it is a dummy variables, 1 represents rural households and 0 represents Urban households.	45698	0.68	0.47	0	1
Education	A dummy variable is defined which takes a value one if the household head can read and write otherwise zero	45600	0.5563	0.50	0	1
Marital Status	The marital status takes a value one if the household head is married otherwise zero.	45698	0.9152	0.28	0	1
Gender	The gender of the household head is a dummy variable, it takes a value 1 for male, otherwise zero.	45698	0.9228	0.27	0	1
Income	The income of the household is generated by summing the income of all individuals in a household. This variable is also taken in log.	45475	11.256	3.83	0	17.176
Age	The age of the household head is accounted as the number of years at the time of survey.	45698	45.937	14.01	0	99
Household Size	The number of total individuals in a household	45698	6.0874	2.92	1	42
Dependency Ratio	This variable shows the ratio of dependents in a household. The ratio of all individuals below 14 and above 65 is taken with respect to working age group individuals in a household.	45698	1.0385	0.91	0	10
Distance	This variable is a binary variable, it take a value 0 if the nearest healthcare facility is with in 2km and 1 otherwise.	44125	0.3742	0.48	0	1

The table presents the mean and standard deviation of all variables used in this analysis, using PSLM 2019-20. The above statistics are for the whole sample. The variable definitions are given in column 1, followed by mean, standard deviation, minimum and maximum

have different origins like foreign or domestic, we include the overall remittances as our main variable of interest. Moreover, we also estimate the effect of foreign and domestic remittances on the outcome variable, separately. Household characteristics like income, location, household size, and dependency ratio are included as control variables. The income of a household is one of the leading factors while deciding the healthcare choices [Pallegedara and Grimm \(2017\)](#), the income variable used in this analysis excludes remittances. The location of the household either rural or urban area may also have an impact on the choices of healthcare. This can be explained in the context of the availability of healthcare services. For instance, if rural households have a public healthcare service far from where they live, they will decide to opt for private healthcare due to convenience and saving cost of traveling and time.

The characteristics of the household head are included to see how education, age, and gender of the household head affect the preference for the healthcare provider. Further, we use education, gender, and location of the household to create sub-samples and try to find out the differences in the preferences for healthcare based on these characteristics. The importance of the head's characteristics can be explained by an example, for instance, if we take into consideration the gender of the household head, the choice for healthcare services can be influenced by his/her gender. A common example in this regard is the distance of the healthcare facility from the dwelling. The decision of selecting the nearest versus the best available may rely upon the subsequent fact that a male versus female household head may not have equal access to transportation. There is also heterogeneity of healthcare preferences among males and females [Pallegedara and Grimm \(2017\)](#). Another influential factor affecting healthcare is the distance of the household from the healthcare provider. We include distance as a control variable to check its impact on healthcare choices. As discussed by [Jain et al. \(2015\)](#) an additional kilometer of distance can decrease the institutional delivery by (3%). This variable also controls for the supply side of healthcare provider's accessibility, the farther is the clinic from the dwelling the supply of healthcare becomes scarce. The heterogeneity among the districts is controlled using the dummy variables for districts.

4.3.2 Data

Our analysis is based on the data set of the Pakistan Social and Living-Standards Measurement Survey (PSLM) 2019-20. PSLM comprises data on 161,306 households, this data set is a district-wide household representative survey, the sampling scheme used for data collection of PSLM is two-step stratified random, this method enables to sample households through stratification on a regional and district basis. PSLM collects data on household income, education, and other household characteristics. PSLM 2019-2020 also contains sections pertinent to health and remittance. The section related to health covers the healthcare services used by household members. Households report their choice among public or private healthcare providers. Around (66%) of the total household are rural, (14%) of the total households receive remittances and (27%) of households have made healthcare consultations in the past two weeks. Based on current data, we see that about (14%) of Pakistani households receive remittances, including (6%) of households receiving remittances from abroad. Out of total recipient households, (61%) of households receive remittances from a domestic source. (61%) households in this data set report consultations from private healthcare providers.

Table 4.2 shows bivariate for recipient and non-recipient households. The ratio of private healthcare service usage is higher in remittance recipient households and this difference is also significant. For foreign remittance recipient households, the difference is higher as compared with the overall sample. This shows that foreign remittance recipient households have a greater preference for private healthcare as compared to non-recipient households. If we compare the results for domestic and foreign remittance recipient households, we find that domestic remittance recipient households have significantly higher preferences for private healthcare providers, but in comparison with foreign remittance recipient households, this preference is comparatively low. If we further look at the results of allopathic consultations by households, we see that there are significant differences in private healthcare use among overall and foreign remittance recipients, but the mean difference for allopathic consultations between domestic recipient and non-recipient is insignificant.

Table 4.2: Household Profile by Remittance and Type of Remittance received-Bivariate statistics

Variable	Remittance Recipient Household	Remittance Non-Recipient Household	Difference	Foreign Remittance Recipient Household	Foreign Remittance Non-Recipient Household	Difference	Domestic Remittance Recipient Household	Domestic Remittance Non-Recipient Household	Difference
Healthcare Choice	69.68	63.70	(5.98***)	73.20	64.01	(9.19***)	67.45	64.21	(3.24***)
Healthcare Choice (only Al-lopathic)	70.51	66.32	(4.19***)	74.11	66.46	(7.65***)	68.11	66.75	1.36
Location	0.74	0.59	(0.15***)	0.73	0.59	(0.14***)	0.74	0.59	(0.15***)
Education	0.50	0.60	(-0.1***)	0.57	0.59	(-0.02*)	0.46	0.60	(-0.14***)
Marital Status	0.85	0.91	(-0.06***)	0.87	0.91	(-0.04***)	0.84	0.91	(-0.07***)
Gender	0.60	0.96	(-0.36***)	0.57	0.93	(-0.36***)	0.60	0.94	(-0.33***)
Income	6.78	11.67	(-4.88***)	6.28	11.31	(-5.03***)	7.11	11.39	(-3.69***)
Age	47.69	43.62	(4.07***)	48.38	43.91	(4.47***)	47.25	43.87	(3.37***)
Household Size	5.38	5.28	(0.10***)	5.75	5.27	(0.48***)	5.14	5.30	(-0.16*)
Dependency Ratio	1.16	0.87	(0.29***)	1.14	0.89	(0.24***)	1.18	0.88	(0.30***)
Distance	0.33	0.37	(-0.03***)	0.35	0.36	(-0.01)	0.33	0.37	(-0.04***)

The table shows bivariate estimates for remittance recipient and non-recipient households. Values in parenthesis show difference between recipient and non-recipient households, survey weights are used to obtain the above values *** p<0.01, ** p<0.05, * p<0.1

The bivariate for location show that a relatively higher proportion of remittance recipient households reside in rural areas. Out of total recipient households, (80%) of households are rural, for the foreign remittance recipients the proportion of rural households is (78%) and for domestic this proportion is around (81%).

The education of the recipient household head is lower as compared to non-recipient households. The foreign remittance recipient household heads are relatively less educated as compared with non-recipients, but the mean value of education of the household head is higher in foreign remittance recipient households in comparison with domestic remittance recipient households.

There is an interesting observation about the gender of the household head, relatively more recipient households are led by females as compared with non-recipients. In non-recipient households, (3.5%) of households have a female head, while in remittance recipient households (40%) of the households have a female head. This may assert a prominent role of female household heads in decision-making about healthcare choices. This pattern is also observable for both foreign and domestic remittance recipient households. The remittance recipient household heads are older as compared with non-remittance recipients. The income of recipient households (excluding remittances) is lower as compared with non-recipient households. The marital status reveals that the heads of remittance recipient households have a lower proportion of being married in both foreign and domestic households. The household size for foreign remittance recipients is larger than the non-recipients and for domestic remittance recipients, the household's size is smaller.

The dependency ratio in all types of remittance recipient households is higher indicating more elderly and children in recipient households. The mean difference in the distance from the nearest healthcare provider of foreign remittance recipient households and non-recipient households is not significant, although a minor difference is found for the domestic recipient and non-recipient households. The highest number of households with a member living abroad are located in Punjab, followed by KPK, Sindh, and Balochistan and we see similar pattern for domestic migrations. Rawalpindi, Gujrat, Faisalabad, Narowal, and Sargodha are the top 5 districts of Pakistan having the greatest number of migrant households.

4.3.3 Econometric Specification

To find the impact of remittances on private healthcare choice, we estimate the following empirical model.

$$hc_{i,j} = \alpha_0 + \beta_i remit_i + \sigma_i X_{i,j} + e_{i,j} \quad (4.17)$$

where $hc_{i,j}$ the healthcare choice of the i^{th} household using j^{th} type of healthcare facility. $remit_i$ stands for the inflow/amount of remittances received, $X_{i,j}$ includes controls for household and household head characteristics like age, education, gender, location, income, dependency ratio, distance to the nearest healthcare provider, and household size. These factors can influence the behaviors of the decision-maker to choose among public or private healthcare services. District-level fixed-effects are incorporated in our estimates to control heterogeneity, $e_{i,j}$ stands for error term, that may include such unobservable attributes which can affect the variable of outcome.

4.3.4 Identification Strategy

The main concern using OLS is that the estimates obtained by using this technique are likely to be correlated with the error term. Our variable of interest remittances is neither random nor independent from the characteristics of recipient households, thus recipient and non-recipient households may differ systematically. Further, the omitted variable bias can also influence estimates such as: the wealth of the household can be a confounding factor affecting both the healthcare decision and migration for the household in the past. Furthermore, there is a possibility that some unobserved characteristic of the household that simultaneously affects healthcare choice and remittance is omitted such as: the role of the emigrant in healthcare decision making and the cost of private healthcare. There is also a possibility of reverse causation affecting our estimates because selecting a private healthcare provider may induce a need for more financial resources, hence increasing the inflow of remittances.

To reduce the likelihood of the potential bias arising due to endogeneity in our estimates, we use the Instrumental Variable (IV) technique. The instrument used in our analysis is the average amount of remittance received by the households at a primary sampling unit

(PSU) level, excluding the i^{th} household. In literature, this instrument is referred as the "Network effect", excluding the i^{th} household allows variation between households at PSU level. It is expected that the remittance inflows at a PSU level are positively correlated with remittance receipts to the household in the same PSU. However, by excluding the information of the i^{th} household it becomes less likely that mean remittances at the PSU level will affect the household's decision to use a specific healthcare provider. The instrument used in this research is valid and has relevance. Table B4 (see appendix) shows the first stage estimates, we see that coefficients for network effect for overall, foreign, and domestic remittances are positive and significant. This implies that for overall and sub-samples based on the origin of the remittances, the instrumental variables have significant effects on the endogenous regressand. The value for the F-stats is significantly high, indicating that the instrument used in this analysis cannot be regarded as a weak instrument. We estimate the following equation to obtain our results. All other variables in the following equation are the same, \widehat{remit}_i is the estimated value of the remittances for the i^{th} household after instrumentation.

$$hc_{i,j} = \gamma_0 + \phi_i \widehat{remit}_i + \theta_i X_{i,j} + \mu_{i,j} \quad (4.18)$$

4.3.5 Methodology

Using the above equation, we empirically analyze the hypotheses of this research. Our baseline model shows the impact of overall remittances on the preference for private healthcare providers, employing OLS, 2SLS, and IV-Poisson as estimation techniques. Further, we examine this relationship for domestic and foreign remittance recipient households. In the second stage, we establish this relationship for allopathic consultations by modifying the definition of the outcome variable. Following the before-mentioned pattern estimates for overall, foreign, and domestic remittance recipients are presented. In the third stage, we estimate sub-samples based on the location of the household, gender, and education of household heads. The use of sub-samples in this analysis not only serves as robustness check but are important to capture the effect of heterogeneity among

households. All stages of empirical analysis make use of 2SLS as a standard estimation technique. All estimates incorporate survey weights, ensuring adequate representation of the sample. In the case of sub-sample by gender, however, the estimation for female household heads was conducted without using survey weights due to relatively small size of the sub-sample.

We also include district fixed effects in this analysis to control for the heterogeneous characteristics of the households in healthcare decision-making and unobserved variations among healthcare services in districts. These fixed effects can affect both the remittances and healthcare choices.

4.4 Results and Discussion

4.4.1 Healthcare Choice and Remittance

Table 4.3: Baseline estimates- Effects of Remittances on Private Healthcare Utilization

	OLS		IV-Poisson		IV-Reg	
	1	2	3	4	5	6
Remittance	1.253***	1.120***	0.223***	0.205***	9.530***	10.810***
Controls	No	Yes	No	Yes	No	Yes
District Dummies	No	Yes	No	No	No	Yes
Durbin Chi2					538.86***	110.44***
Wu-Hausman F					545.28***	110.37***
First Stage F-stat					4953.51	852.05
Observations	45475	43904	160041	143086	45475	43904

Note: The coefficient values are estimated including survey weights. The diagnostic test for the validity of instruments are reported without using survey weights, vce clustered at district level. The estimates including all controls in reported in appendix table c2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4.3 presents the results of baseline estimates obtained using OLS, IV-Poisson, and 2SLS, respectively. Column (1) and (2) show the OLS estimates, column (3) and (4) shows estimates of IV-Poisson and the last two columns show the results for 2SLS. Columns (1), (3), and (5) present estimates without using controls, and even-numbered columns provide results using controls. It is important to mention that for IV-Poisson our dependent variable is the number of patients consulting a private healthcare provider in a house-

hold. All estimation procedures show a positive association between private healthcare and remittances. OLS and IV-Poisson models in this analysis will only help gauge the association between outcome variables and variables of interest. The estimates of OLS are subject to endogeneity and estimates of IV-Poisson do not capture heterogeneity, thereby the estimates of 2SLS are robust and consistent, because 2SLS can tackle both issues. The 2SLS estimates in column (6) show that a one-unit change in the overall remittances increases the preference for private healthcare providers by (10.8%). The positive relationship between remittance and preference for a private healthcare provider is plausible given that higher remittance can ease the financial constraint of the household and increases the demand for a private healthcare provider, this also indicates that remittance recipient households perceive that the private healthcare providers provide better services. The first stage F-stats shows the strength of the instrument and the Durbin chi-square and Wu-Hausman test indicate that remittances are endogenous.

The remittance recipient households are dis-aggregated based on the origin of remittance (foreign or domestic). Based on this dis-aggregation or classification of households we can observe differences in preference for private healthcare providers among domestic and foreign recipients. Additionally, this dis-aggregation is also useful to corroborate the results of baseline estimates. Table 4.4 presents the results of foreign and domestic remittance recipient households. Columns 1-4 show the impact of foreign remittances on preference for private healthcare and column 6-8 show estimates for domestic remittance recipient households. It is evident that for both foreign and domestic remittances, recipient households prefer private healthcare, as coefficients in columns (4) and (8) are positive and statistically significant. This finding strengthens the previously discussed baseline estimates. Interestingly, the value of the coefficient of remittances in column (4) is twice as compared to column (8). This implies that preference for private healthcare providers is higher for foreign remittance recipient households. The preference for private healthcare being comparatively high in foreign remittance recipient households is likely due to the size of remittance. For instance, if we compare the mean values of foreign and domestic remittances, we observe that the mean value of foreign remittance is higher as compared

Table 4.4: Effects of Foreign and Domestic Remittances on Private Healthcare Use

	Foreign Remittance			Domestic Remittances				
	OLS	IV-Reg	OLS	OLS	IV-Reg	OLS	IV-Reg	
1	2	3	4	5	6	7	8	
Remittance	1.767***	1.772***	11.994***	16.565***	0.722***	0.225	10.637***	8.031***
Controls	No	Yes	No	Yes	No	Yes	No	Yes
District Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Durbin chi2			197.4***	54.97***			460.256***	67.75***
Wu-Hausman F			198.25***	54.86***			464.93***	67.65***
First Stage F-stat			3139	429.9			4218.67	1166.38
Observations	45475	43904	45475	43904	45475	43904	45475	43904

Note: The coefficient values are estimated including survey weights. column (1-4) presents results for Foreign remittance recipient households and column (5-8) presents results for domestic remittance recipient households. The diagnostic test for the validity of instruments are reported without using survey weights, vce clustered at district level. The estimates including all controls in reported in appendix table c3. *** p<0.01, ** p<0.05, * p<0.1

with domestic (See Table 4.2). This difference in the outcome confirms the hypothesis that the type of remittance can also influence healthcare decision-making at the household level.

Table 4.5: Effects of Remittances on Private Healthcare Use (Allopathic Consultation)

	OLS		IV-Poisson		IV-Reg	
	1	2	3	4	5	6
Remittance	0.944***	1.203***	0.223***	0.205***	7.073***	11.271***
Controls	No	Yes	No	Yes	No	Yes
District Dummies	No	Yes	No	No	No	Yes
Durbin Chi2					225.05***	106.64***
Wu-Hausman F					226.32***	106.55***
First Stage F-stat					4220.4	767.9
Observations	39476	39321	160041	143086	39476	39321

Note: The coefficient values are estimated including survey weights. The sample in this table is truncated only for allopathic consultations. The diagnostic test for the validity of instruments are reported without using survey weights, vce clustered at district level. The estimates including all controls in reported in appendix table c4. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

For a further detailed analysis of this relationship, we changed the definition of the outcome variable. In this definition, rather than including all types of public and private healthcare providers, we only include consultations from a doctor or previously mentioned as allopathic consultations. By using this definition, the sample size reduces around (10%), this reduction in sample size may seem considerable, but it helps in two ways. First, estimates using this alternate definition allow us to compare or contrast earlier presented results, and second, this helps us to limit our discussion to only certified allopathic healthcare providers.

Table 4.5 shows the results for the alternative definition, we can observe from the coefficients that there is a positive association between migrant remittances and private consultation from a doctor. Column (6) gives the result of 2SLS including controls and district dummies. A percentage rise in the overall remittance amount will increase private allopathic consultations by (11.3%). These results are in accordance with our baseline estimates. If we compare the coefficients for remittance in Tables 4.3 and 4.5, column (6),

we can see a slightly higher preference for private allopathic consultations as compared to the overall sample used in the baseline model. The first stage F-stat is considerably above 10 this indicates the strength of our instrument remains intact. For overall remittances, the preference for a private allopathic provider is positive and significant. To see this pattern at a more dis-aggregated level, we again characterize households based on the type of remittance they receive (foreign or domestic). Table 4.6 shows estimates of foreign and domestic remittance recipient households. Columns 1-4 shows estimates for foreign remittance recipient households and 5-8 show estimates for domestic remittance recipient households. For both domestic and foreign recipients, the coefficient value for the corresponding type of remittance is positive and significant. The impact of foreign remittance is higher as compared to domestic remittances. The impact of foreign remittance is around (18%), while the impact for domestic remittance on private allopathic consultations is (7.6%). These findings are similar to the earlier results. Overall, we can suggest that these findings imply that remittance recipient households are more inclined towards selecting private healthcare providers.

4.4.2 Locational, Educational, and Gender Differences

As discussed in the earlier parts of this research, the preference for a healthcare service is dependent upon several enabling and contextual factors. In this section, we will focus on some of the factors that can influence healthcare preferences. For instance, location (urban/rural), education, and gender differences among the households can give some insight regarding preference for private healthcare providers. The use of private versus public healthcare is dependent upon the availability of these services. It is observed that the concentration of private healthcare providers is relatively high in urban centers, the third chapter of this research shows that public healthcare utilization in less developed districts is higher as compared to that in the developed districts. This implies that healthcare preferences are subject to the availability of healthcare providers. In this study around (68%) of the remittance recipient households are rural, it is interesting to gauge the healthcare preferences of households by dis-aggregating them based on location. Similarly, if the household head is a male or a female this can impact the decision to choose

Table 4.6: Effects of Foreign and Domestic Remittances on Private Healthcare Use (Allopathic Consultation)

	Foreign Remittance				Domestic Remittances			
	OLS	IV-Reg	OLS	IV-Reg	OLS	IV-Reg	OLS	IV-Reg
	1	2	3	4	5	6	7	8
Remittance	1.498***	1.959***	6.801***	17.961***	0.396**	0.188	7.954**	7.632**
Controls	No	Yes	No	Yes	No	Yes	No	Yes
District Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Durbin chi2			33.10***	57.87***			206.78***	56.78***
Wu-Hausman F			33.13***	57.76***			207.85***	56.66***
First Stage F-stat			2789.28	385.45			3553.49	1072.4
Observations	39475	39321	39476	39321	39476	39321	39476	39321

Note: The coefficient values are estimated including survey weights. The sample in this table is truncated only for allopathic consultations. column (1-4) presents results for Foreign remittance recipient households and column (5-8) presents results for domestic remittance recipient households. The diagnostic test for the validity of instruments are reported without using survey weights, vce clustered at district level. The estimates including all controls in reported in appendix table c5. *** p<0.01, ** p<0.05, * p<0.1

among the available options of healthcare providers. A male household head may have more access and a larger sample for the selection of the healthcare facilities as compared with the female household heads. Furthermore, the education of the household head may also influence the choice of healthcare provider. An educated household head may prefer allopathic consultation on traditional medicine or healers. To consider all these factors we dis-aggregate our baseline model based on the location of the household, gender of the household head, and education of the household head.

Table 4.7 shows estimates for the effects of remittance on preference for private healthcare providers. Households are dis-aggregated based on their respective locations. The results of table 4.7 show that households living in rural areas prefer private healthcare providers, as the coefficient for remittance is positive and significant. By comparing this result with urban households, we see that the preference for private healthcare by urban households is twice as of rural households. This suggests that demand for private healthcare by remittance recipient households is comparatively higher in urban areas. This higher preference for private healthcare services by urban households can be attributed to several factors like accessibility, availability, and the quality of the private healthcare providers in urban areas. Private healthcare is profit-oriented and demand-driven, the establishment of private healthcare organizations in urban areas is not an anomaly as the development of the private healthcare sector in urban areas is based on the principle of demand and agglomeration. The above results indicate that preference for private healthcare providers differs by location, verifying the notion that the location of a household can significantly affect its preference for a healthcare provider. Another interesting aspect of this result is that remittances do shape the healthcare preferences of households and these preferences differ based on whether a household is urban or rural.

Table 4.8 shows the preferences of remittance recipient households characterized by the gender of the household head. Column (4) shows the results for remittance recipient households having a male household head and column (8) shows the results for female household heads. In both cases, there is a positive impact of remittance receipts on the preference for private healthcare providers. By the comparison of columns (4) and (8), it becomes obvious that the choice for a private healthcare provider may differ by the gender

Table 4.7: Effects of Remittances on Private Healthcare Use by Location

	Urban				Rural				
	OLS	2	3	IV-Reg	OLS	5	6	7	8
Remittance	1.305***	1.531***	11.689***	18.03***	1.507***	0.861***	10.718***	5.750***	
Controls	No	Yes	No	Yes	No	Yes	No	Yes	
District Dummies	No	Yes	No	Yes	No	Yes	No	Yes	
Durbin chi2			108.76***	83.33***			534.80***	34.40***	
Wu-Hausman F			109.56***	83.13***			544.12***	34.28***	
First Stage F-stat			951.39	256.34			3671.42	520.19	
Observations	14428	14246	14428	14246	31047	29658	31047	29658	

Note: 68% of the remittance recipient household live in rural areas. The coefficient values are estimated including survey weights. column (1-4) presents results for urban households and column (5-8) presents results for rural households. The diagnostic test for the validity of instruments are reported without using survey weights, vce clustered at district level. The estimates including all controls in reported in appendix table c6. *** p<0.01, ** p<0.05, * p<0.1

Table 4.8: Effects of Remittances on Private Healthcare Use by Gender

	Male			Female				
	OLS	IV-Reg	IV-Reg	OLS	OLS	IV-Reg	IV-Reg	
	1	2	3	4	5	6	7	
Remittance	1.119***	0.981***	12.897***	12.016***	1.306***	1.433***	2.31***	6.057***
Controls	No	Yes	No	Yes	No	Yes	No	Yes
District Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Durbin chi2			537.19***	107.44***			5.622*	3.12*
Wu-Hausman F			544.112***	107.37***			5.626*	3.00*
First Stage F-stat			3294.66	733.15			1312.09	107.68
Observations	42009	40677	42009	40677	3466	3227	3466	3227

Note: The number of female households heads receiving remittances is 40%, out of 21686 remittance recipients 4364 are female heads, Survey Weights not used in Female heads sub-sample with controls due to significantly low observations. column (1-4) presents results for male household head and column (5-8) presents results for female household head. The diagnostic test for the validity of instruments are reported without using survey weights, vce clustered at district level. The estimates including all controls in reported in appendix table c7. *** p<0.01, ** p<0.05, * p<0.1

of the household head. Male household heads choose private healthcare providers two folds in comparison with female household heads. This difference is indicative that either female heads have less accessibility or the healthcare choices are heterogeneous based on gender (Pallegedara and Grimm, 2017).

Next, we elaborate the heterogeneity among recipient households based on education. Table 4.9 shows estimates of educated and non-educated household heads. The disaggregation of recipient households based on education shows that both educated and non-educated heads have similar preference for private healthcare providers. The coefficient for remittance in both cases is around 10.5 and is significant. However, there is a slight advantage of 0.136 to educated household heads. These results can be interpreted as the remittance receipts can induce households to opt for private healthcare providers, with a slight advantage to the educated household heads.

The last result we present is concerning a strict public or private healthcare choice. For this case, we only include those households who do not alternate their healthcare preferences. This means that if there are two or more patients in the household their preference for healthcare consultation remains the same, or in other words, households always prefer a particular healthcare provider over the other. This categorization of households reduces our sample size by around (5%). This reduction in sample size means that in our overall model there were only (5%) of households who altered their healthcare preferences. This categorization of households allows us to observe only those remittance recipient households who do not change their preferences. The results obtained are given in table 4.10.

This table only reports estimates for overall, foreign, and domestic remittance recipient households, obtained using 2SLS. The first two columns show results for overall remittance, columns (3) and (4) show results for foreign remittances, and the last two columns show results for domestic remittance recipient households. Column (2) shows that all recipient households with a strict preference for healthcare providers increase the preference for private healthcare providers by (10.83%) if the overall amount of remittance increases by (1%). For foreign remittance recipient households an increase of (1%) in the foreign remittances increases the preference for a private healthcare provider by (16.73%), and

Table 4.9: Effects of Remittances on Private Healthcare Use by Education

	Educated				Non-Educated			
	1	2	3	4	5	6	7	8
Remittance	1.363***	1.156***	10.212***	10.769***	1.377***	0.998***	9.035***	10.663***
Controls	No	Yes	No	Yes	No	Yes	No	Yes
District Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Durbin chi2			266.68***	63.02***			262.84***	47.95***
Wu-Hausman F			269.49***	62.84***			266.28***	47.74***
First Stage F-stat			2175.02	466.6			2813.9	371.27
Observations	25263	24473	25263	24473	20116	19431	20116	19431

Note: The percentage of household heads with no education is 52.5%. column (1-4) presents results for educated household head and column (5-8) presents results for uneducated household head. The diagnostic test for the validity of instruments are reported without using survey weights, vce clustered at district level. The estimates including all controls in reported in appendix table c8. *** p<0.01, ** p<0.05, * p<0.1

Table 4.10: Effects of Remittances on Private Healthcare Use (Public or Private)

	Overall		Foreign		Domestic	
	1	2	3	4	5	6
Remittance	10.10***	10.83***	13.06***	16.73***	11.11***	8.05***
Controls	No	Yes	No	Yes	No	Yes
District Dummies	No	Yes	No	Yes	No	Yes
Durbin chi2	553.41***	105.49***	209.42***	52.15***	466.80***	63.05***
Wu-Hausman F	560.54***	105341***	210.43***	52.05***	471.86***	62.94***
First Stage F-stat	4757.81	839.71	2967.53	413.63	4061.85	1126.19
Observations	43293	41733	43293	41733	43293	41733

Note: The dependent variable is strict preference for either Public or Private healthcare institute. This change in our outcome variable reduced our sample by around 5%. This table only shows estimates of IV-reg. column (1-2) presents results for overall, column (3-4) presents results for foreign and last two columns present results for domestic recipient households. The diagnostic test for the validity of instruments are reported without using survey weights, vce clustered at district level. The estimates including all controls in reported in appendix table c9. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

(1%) increase in domestic remittances increases the preference for private healthcare provider by (8%). If we compare these results with tables 4.2 and 4.3, we can postulate that these results corroborate the findings of our baseline estimates, along with the estimates obtained by dis-aggregation of the type of remittance. To summarize, the results of all sub-samples and alternative definitions indicate that remittance can influence recipient households to prefer private healthcare providers.

4.4.3 Discussion

These findings show that there is a strong and contingent relationship between remittance receipts and choice for the private healthcare provider. The demand for private healthcare providers is positively associated with the inflow of remittance. Recipients of foreign remittances tend to have a relatively higher tendency to choose private healthcare providers, as compared with domestic remittance recipient households. This relationship shows that remittances either from abroad or domestic can induce an increase in the financial ability of the household, hence enabling recipient households to adjust the allocations for their healthcare needs. The receipts of remittances act as an enabling factor that increases

the ability of the household to afford private healthcare providers. This willingness to pay for better services increases the demand for private healthcare services and the use of private healthcare services increases the utility of the household. [Ahmed et al. \(2018\)](#) show that the domestic remittances recipient households in Pakistan allocate more budget for healthcare expenditures compared with non-recipient households.

In developing countries, public healthcare services are often deficient and inadequate to cater to the need of their respective populations ([World Bank, 2003](#)). There are other reasons for the low utilization of public healthcare which include waiting time, the quality of healthcare services, awareness, education, and wealth ([Rout et al., 2019](#)). The quality of public healthcare services can often be not as good as compared with private healthcare services. In Pakistan, we cannot deduce this preposition directly, but as an indirect measure, households in general prefer private healthcare services and specifically those households who receive remittances. The gap in the utilization of the public and private sectors are shown in figure 4.1 is an indication that preference for private healthcare is on the rise and for the latter, there is a decline.

The difference in the preferences for healthcare providers among recipient households is of much interest. Households receiving remittances prefer private healthcare providers, among the recipient household's foreign remittance recipients have a higher preference. This implies that the type of remittances or the size of remittance can also affect healthcare choices as households having comparatively more resources have a higher preference for private healthcare providers.

The effects of remittance on healthcare choices may also differ based on the location of the household. As discussed earlier, there are more rural remittance recipient households as compared to urban, but urban remittance recipient households have higher utilization of private healthcare services. We observe that in both types of remittance recipient households, there is a strong preference for private healthcare. However, the relatively low utilization of private healthcare services by rural households is because of the availability of private healthcare providers or better public healthcare services at their disposal. The decision-making regarding private healthcare choice is also related to access to private healthcare. Regions having more private healthcare providers are likely to utilize more

healthcare services from them and vice versa.

The education of the household head can play a significant role in healthcare choice, but we see only a slight advantage of educated heads over non-educated heads. An educated household head is likely to prefer private healthcare, there are several reasons for this. Researchers believe that educated household heads are more concerned about health issues and can better perceive the quality of the healthcare provided and value time ([Pallegedara and Grimm, 2017](#)). Without negating this idea, we also accept that an educated household head has a good perception of quality, nature of the consultation, and health loss due to waiting time, leading them to prefer private healthcare services.

In collective decision-making regarding the choice for a healthcare provider, there is also a possibility that migrant from the family not only sends remittances but also provides inputs on healthcare preferences based on his/her experience abroad. Such input by migrants in a collective decision may also increase the preference for private healthcare. Lastly, the results obtained by alternating the definition of the outcome variable, we can conclude that these results corroborate not only the baseline findings of this research but also conform to the view that the receipt of remittances can induce a higher preference for private healthcare.

4.5 Conclusion

In Pakistan, the annual remittance receipts are nearly equivalent to its total exports. Remittances play an important role on both macro and micro scale. Remittance act as an additional source of income for recipient households, thereby influencing several choices, including healthcare choice. The inflows of remittances can lead households to opt for the best available healthcare providers. Under the collective decision-making model, households act as one unit. Households can choose among healthcare providers, either private or public. A public healthcare provider has no or negligible cost, a public good without exclusion, and a private healthcare provider that is costlier, and where exclusion is possible. Our analysis shows that with the inflow of remittance, households' preference for private healthcare providers increases. Despite having free healthcare at the disposal of

households, preference for private healthcare by remittance recipient households indicates that remittance receipts are an influential factor in healthcare decision-making.

This increase in demand for private healthcare through the channel of remittances has several implications. The first implication is that the inclination of the households towards private healthcare is either due to greater accessibility, quality, and less waiting time or because of the lack or inaccessibility to the public healthcare providers. We already discussed in the second chapter of this thesis that several districts of Pakistan have a deficiency of public hospitals, inpatient beds, and healthcare personnel, such deficiencies in public healthcare delivery can compromise the quality of healthcare services.

The second implication is that remittance increase budget allocations for healthcare, this leads to greater preference for private healthcare providers. With an increase in the inflow of remittance to the household, the preference for private healthcare also increases. This indeed works similarly to the income effect: the more are the financial resources, the higher is the tendency to use private healthcare. The continuation of this trend may lead to a rise in demand for private healthcare compared with neglected or underutilized public healthcare.

The development of the private sector is ought to happen due to two reasons, first, low utilization and stagnation in the quality of public healthcare provision. Second, the incentive-driven development, as practitioners, have less incentive to perform in the public healthcare sector as compared to the monetary benefits from their private practice. With remittances coming from abroad and high incentives in private practice, the continuation of these patterns would eventually lead to a further decline in utilization rates of the public healthcare sector, as noted earlier, the gap between utilization rates of public versus private is increasing. These low utilization rates of the public healthcare institutions could eventually lead to a public moral hazard. Due to the low utilization of the public healthcare sector, the government would not invest in public healthcare. Consequently, if the healthcare needs are not met by public healthcare providers, the willingness to pay taxes to finance public healthcare may also decline, thereby creating a public moral hazard. This situation can become a leading factor for increased out-of-pocket payments, increasing the share of private healthcare and further dependence on remittances, thereby

accentuating the reliance on migration and remittances as the main source of healthcare financing.

The last implication is that demographic and locational indicators also contribute to healthcare choices. Gender, age, education, distance, and location are all those variables that can affect healthcare choice, but the effects of remittances on healthcare choice become important when location and gender come into play. Pakistan is a country with a dominant rural and ethnically heterogeneous population, where remittances are being sent from either the urban centers of the country or foreign countries. The demand for private healthcare is on the rise and one of the factors contributing to this increase is migrants' remittance. As of now, the major private healthcare institutes are predominantly in urban areas of Pakistan, but in rural areas remittance receipts may act as a catalyst in the development of the private healthcare sector. This could also have repercussions on regional disparities among regions that receive more remittance on average. The regions with high out-migration will have more private healthcare organizations as compared with areas with less out-migration, resulting in disparities of private healthcare provision. We recommend that the provision of quality healthcare by public healthcare organizations can pivot household preferences, governments should focus on improving public healthcare accessibility and availability. We conclude that remittances are an effective way to finance healthcare needs and its receipts can influence the choice of private healthcare providers.

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Chapter 5

Conclusion

This is the last chapter of this research. There are four sections of this chapter. The first section summarizes the findings of this research work. The second section proposes some policy implications, the third section of this chapter includes a discussion on some of the limitations of this research work and the last section gives some recommendations for future research.

5.1 Summary of the Main Findings

This thesis primarily focused on the questions related to healthcare provision and utilization in Pakistan. The first chapter of this thesis focused on the healthcare profile of Pakistan. We can summarize this chapter as an overview of the healthcare situation prevailing in Pakistan. We discussed some of the key variables related to the healthcare sector. Further, we included details related to the current challenges faced by the healthcare sector of Pakistan.

The second chapter of this research work focused on the questions related to sub-national disparities in the provision of public healthcare. We have tried to answer questions related to the existing differences in the availability of public healthcare facilities in the districts of Pakistan, the efficacy of available public healthcare services, and bias in the distribution and growth patterns of public healthcare services. Using various measures we conclude the existence of healthcare disparities among the districts of Pakistan. Our results indicate that the public healthcare resources distribution is more inclined towards provincial capitals, populous districts, and urban centers. Districts of Pakistan lack public healthcare resources and the existing public healthcare infrastructure is insufficient to accommodate needs of the growing population. Additionally, the distribution of healthcare resources and growth patterns indicate that disparities in the healthcare sector may have occurred due to the lack of policy and planning mechanisms and neglecting less urban and large districts.

Another set of questions pertinent to the devolution of healthcare services in Pakistan are discussed in the 3rd chapter of this research. We have tried to shed some light on the impact of devolution on healthcare services subsequent to the 2010's constitutional

amendment on healthcare utilization. We examined the effects of devolution on public hospital, primary, and maternal healthcare consultations. Post devolution, each type of public healthcare consultation answers the question of improvements/deterioration in public healthcare provision. Our findings suggest that there is a varying impact of devolution on healthcare utilization based on the type of consultation made. There is a negative impact of devolution on the two former types of consultations and a positive on the latter. Moreover, the impact of devolution on healthcare utilization in rural and less developed areas is even less promising. Improvements in the utilization of maternal healthcare are also subject to uncertainty. We conclude that the devolution has failed to increase the demand for public healthcare services, which may be a consequence of the local healthcare services being unable to improve their quality post-devolution.

The last set of questions answered in this research work are in connection with the relationship between migrant remittances and the choice of healthcare providers. We try to find the relationship between the choice for a specific provider and receipts of remittances, consistency of such a choice by the type of remittance received, and heterogeneity in such choices due to the household characteristics. We found that there is an association between migrant remittances and private healthcare utilization. The type of remittance received is also an influential factor in deciding the healthcare choice. Foreign remittance recipient households have more preference for private healthcare services as compared with the domestic remittance recipient households. Moreover, the choice for private healthcare is also affected by the its location and the gender of the household head. In the case of all sub-samples our results substantiate that remittance recipient households have a higher preference for private healthcare services.

5.2 Policy Implications

The topics covered in this research work lead to several policy implications. These policy implications become much more pronounced in the context of sub-national units as there is scant evidence available in the existing literature. The policy implications and recommendations from this research are distributed across the topics. The recommen-

dations/policy implications from the 2nd chapter include the recognition of healthcare as a basic human right in the constitution. Recognition of healthcare as a basic human right can be a milestone to increase the healthcare provision, especially in neglected areas, and this can also implement the principle of “*healthcare for all*” in spirit. Further, the equality of distribution in healthcare resources should be ensured to reduce the existing disparities among districts. The existing healthcare infrastructure is not sufficient and needs improvements. The improvement in the healthcare infrastructure can be more effective if policymakers follow the recommended guidelines of WHO about healthcare resources (human and physical). Furthermore, the allocation of healthcare resources would be more efficient if resource distribution is based on the principle of relative need, population, and the degree of deprivation among districts. To minimize the urban-rural gap in the existing healthcare resources serious governmental efforts are needed.

The policy recommendations from the 3rd chapter points out that devolution of healthcare can only be effective if the financial allocations to the districts are made through the provincial financial awards. Financial allocations to the local elected members can enable them to spend more on local needs. True essence of devolution is to empower local governments through participatory democracy and budgetary allocations. Local governments need to improve the existing healthcare infrastructure as well as establish new facilities in their respective areas to ensure quality and accessibility in healthcare provision. To improve public healthcare utilization an efficient public healthcare delivery system is mandatory.

The 4th chapter examines migrant remittances and private healthcare choices. We recommend that the provision of quality healthcare by public healthcare organizations can pivot household preferences, governments should focus on improving public healthcare accessibility and availability. The implications of this chapter indicate the rise in demand or preference for private healthcare services and substantially low utilization of the public healthcare sector can consequently result in a public moral hazard. This study also implies that regional disparities in private healthcare development may arise due to migrant remittances, as regions with greater out-migration will have more demand for private healthcare as compared to the regions having less out-migration, This can lead to a higher

development of the private healthcare facilities in the regions where out-migration is higher.

5.3 Limitations of this Study

Our analysis tried to investigate the sub-national aspects of the healthcare issues and while answering the questions raised in this research work, we noticed some limitations of this study and future dimensions for research.

The first limitation of this study revolves around data. The data for the 2nd chapter was constructed using available data sets from different sources and it took an ample amount of time and effort to unify the data set into a use-able format. The data used in the 2nd chapter covers the supply factors of the public healthcare system at a regional level, but it lacks the demand-side data like utilization of outpatient and in-patient healthcare services. The data related to the demand side can be very useful in further understanding the aspects of utilization of the public healthcare sector, patient-doctor ratios, bed occupancy, and other important factors that can portray a relatively more vivid picture of public healthcare institutions at a sub-national level. This data can be intuitive in the determination of the supply-demand mechanism in the public healthcare sector. Another limitation of the 2nd chapter is the unavailability of data on the private healthcare facilities and utilization. This can be beneficial to understand the overall disparities in the healthcare sector of Pakistan.

The first limitation of the 3rd chapter is unavailability of information regarding the financial disbursement to the districts by their respective provincial governments. This makes it difficult to consider the proportion of spending on healthcare by the local governments in comparison with the other public sector deliverable. The measure used in the 3rd chapter is a time dummy, measures like fiscal, political, and administrative decentralization can be very useful, but are subject to the availability of data. Another aspect worth noting is the distance from the healthcare facility, a Geo- coordinate based data set can be very useful in the determination of accessibility and pattern of utilization of the healthcare facilities, but such information is unavailable.

The 4th chapter considers migrant remittances and private healthcare choice. The limitation of this chapter is that we have hypothesized that private healthcare services are better, based on relatively higher utilization. Issues like patient satisfaction, waiting time, cost, and quality of healthcare services are not discussed. The reason for not including these aspects is also the unavailability of data. If such data is made available, the important aspects of private healthcare demand would have been explored more thoroughly.

5.4 Direction for Further Research

There are certain directions on which this work can be extended. The inclusion of the private healthcare sector can be useful in the explanation of the overall healthcare disparities. The utilization rate of the public healthcare sector is also another avenue to be explored. The analysis of the physician's dual practice can have several implications, especially on the low utilization of the public healthcare sector. This aspect is interesting as this could explain if the profit-motivated private healthcare sector is motivated by the physicians or it is a matter of preference. Further analysis can be conducted on the experience of the patients utilizing public and private healthcare for a comparative analysis of the merits and demerits of the respective healthcare provider. The analysis of the causes of improvement/deterioration in the local healthcare system can also be conducted based on information obtained from the local administration. The input from the local government representatives can be insightful to understand the extent of their authority and their perspective on devolution. Another line of inquiry could be the impact of governments newly introduced health insurance program on healthcare provision.

Appendix Chapter 2

Table A1: List of Districts in Alphabetical Order

1	Abbottabad	36	Jhelum	71	Musakhel	106	Tharparkar
2	Attock	37	Kachhi	72	Muzaffargarh	107	Thatta
3	Awaran	38	Kalat	73	Nankana Sahib	108	Toba Tek Singh
4	Badin	39	Karachi	74	Narowal	109	Tor Ghar
5	Bahawalnagar	40	Karak	75	Nasirabad	110	Umerkot
6	Bahawalpur	41	Kashmore	76	Naushahro Feroze	111	Upper Dir
7	Bannu	42	Kasur	77	Nowshera	112	Vehari
8	Barkhan	43	Kech	78	Nushki	113	Washuk
9	Batagram	44	Khairpur	79	Okara	114	Zhob
10	Bhakkar	45	Khanewal	80	Pakpattan	115	Ziarat
11	Buner	46	Kharan	81	Panjgur		
12	Chagai	47	Khushab	82	Peshawar		
13	Chakwal	48	Khuzdar	83	Pishin		
14	Charsadda	49	Killa Abdullah	84	Shahdadkot		
15	Chiniot	50	Killa Saifullah	85	Quetta		
16	Chitral	51	Kohat	86	Rahim Yar Khan		
17	Dadu	52	Kohistan	87	Rajanpur		
18	Dera Bugti	53	Kohlu	88	Rawalpindi		
19	Dera Ghazi Khan	54	Lahore	89	Sahiwal		
20	Dera Ismail Khan	55	Lakki Marwat	90	Sanghar		
21	Faisalabad	56	Larkana	91	Sargodha		
22	Ghotki	57	Las Bela	92	Shaheed Benazirabad		
23	Gujranwala	58	Layyah	93	Shangla		
24	Gujrat	59	Lodhran	94	Sheerani		
25	Gwadar	60	Loralai	95	Sheikhupura		
26	Hafizabad	61	Lower Dir	96	Shikarpur		
27	Hangu	62	Malakand	97	Sialkot		
28	Haripur	63	Mandi Bahauddin	98	Sibi		
29	Harnai	64	Mansehra	99	Sujawal		
30	Hyderabad	65	Mardan	100	Sukkur		
31	Jacobabad	66	Mastung	101	Swabi		
32	Jaffarabad	67	Matiali	102	Swat		
33	Jamshoro	68	Mianwali	103	Tando Allah Yar		
34	Jhal Magsi	69	Mirpur Khas	104	Tando Muhammad Khan		
35	Jhang	70	Multan	105	Tank		

Note: This list includes all districts used in this analysis. In some of the tables we have used short names for districts, like T.T Singh for Toba Tek Singh, T.M.Khan for Tando Muhammad Khan and others.

Table A2: Ranking Districts by the Availability of Public Healthcare Facilities-2008-11

Year	2008		2009		2010		2011
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Sheerani	2.00	Sheerani	2.00	Sheerani	1.67	Sheerani	1.67
Harnai	3.33	Barkhan	2.67	Barkhan	3.00	Harnai	2.67
Barkhan	3.67	Harnai	3.33	Harnai	3.67	Barkhan	3.00
Awaran	6.00	Awaran	6.33	Musakhel	4.00	Musakhel	4.33
Nushki	6.67	Musakhel	6.67	Awaran	5.33	Awaran	9.67
Musakhel	6.67	Nushki	7.67	Washuk	12.00	Kharan	10.33
Washuk	10.00	Washuk	10.67	Kharan	13.00	Nushki	10.67
Ziarat	11.67	Mastung	11.00	Jhal Magsi	13.00	Washuk	11.00
Mastung	13.00	Kharan	13.00	Nushki	13.33	Ziarat	11.33
Jhal Magsi	14.00	Kohistan	13.33	Kohistan	13.67	Jhal Magsi	12.33
Kharan	14.67	Ziarat	14.00	Ziarat	14.33	Kohistan	14.67
Kohistan	15.67	Jhal Magsi	14.67	T.M.Khan	16.00	T.M.Khan	16.67
Panjgur	17.00	Nasirabad	15.67	Nasirabad	16.67	Panjgur	17.00
Hangu	18.00	T.M.Khan	16.33	Mastung	16.67	Nasirabad	17.33
K.Saifullah	18.33	Panjgur	16.67	Panjgur	18.00	K.Saifullah	18.67
Nasirabad	18.33	Hangu	18.00	Hangu	18.33	Mastung	18.67
T.M.Khan	19.33	Tank	18.67	K.Saifullah	18.33	Tank	19.33
Chagai	19.67	K.Saifullah	18.67	Tank	18.67	Hangu	19.67
Tank	20.00	T.Allah Yar	21.33	Dera Bugti	20.67	Dera Bugti	20.33
K.Abdullah	20.67	Kashmore	23.00	T.Allah Yar	22.33	T.Allah Yar	20.67
Kashmore	21.33	Dera Bugti	24.00	Kachhi	23.33	Kashmore	21.67
T.Allah Yar	22.33	K.Abdullah	24.00	Kashmore	23.33	Kachhi	22.67
Dera Bugti	22.67	Batagram	24.33	K.Abdullah	23.67	K.Abdullah	23.33
Batagram	25.00	Kachhi	25.67	Shangla	24.00	Chagai	26.33
Kachhi	25.00	Chagai	26.33	Batagram	24.67	Buner	27.00
Zhob	26.33	Shangla	26.67	Zhob	26.67	Zhob	27.33
Gwadar	27.67	Sibi	29.00	Chagai	26.67	Batagram	27.33
Kohlu	28.00	Zhob	29.67	Buner	28.00	Kohlu	27.33
Shangla	29.00	Buner	30.33	Kohlu	30.00	Gwadar	29.00
Sibi	31.00	Gwadar	30.33	Gwadar	30.33	Sibi	29.33
Buner	32.00	Kohlu	30.67	Sibi	30.33	Chitral	32.00
Kalat	35.33	Chitral	33.33	Chitral	34.00	Kalat	33.33
Matiari	36.00	Kalat	34.00	Kalat	34.67	Lakki Marwat	34.33
Umerkot	37.33	Matiari	35.33	Matiari	36.33	Shangla	35.33
Pishin	38.67	Lakki Marwat	37.00	Lakki Marwat	36.67	Matiari	37.00
Upper Dir	39.33	Pishin	37.67	Pishin	36.67	Jacobabad	38.00
Karak	40.67	Karak	38.00	Karak	38.33	Umerkot	38.00
Malakand	41.33	Jacobabad	38.33	Jacobabad	38.33	Pishin	38.00
Shahdadkot	41.33	Umerkot	39.00	Umerkot	38.67	Karak	41.00
Swabi	42.33	Shahdadkot	43.67	Shahdadkot	44.00	Shahdadkot	43.33
Jacobabad	42.67	Las Bela	44.33	Las Bela	44.00	Las Bela	43.33
Jaffarabad	42.67	Swabi	45.67	Khuzdar	45.67	Khuzdar	45.33
Chitral	43.00	Khuzdar	46.33	Swabi	46.00	Upper Dir	46.33
Lakki Marwat	43.67	Jaffarabad	47.67	Upper Dir	46.67	Hafizabad	48.00
Khuzdar	45.00	Hafizabad	48.67	Lodhran	48.33	Chiniot	49.00
Haripur	48.00	Loralai	49.67	Hafizabad	48.67	Nowshera	49.33
Hafizabad	48.33	Lodhran	50.00	Chiniot	49.00	Ghotki	49.67

Note: For table notes please consult table 2.1 and 2.2.

Table A2: Continued: Ranking Districts by the Availability of Public Healthcare Facilities-2008-11

Year	2008	2009	2010	2011			
Name	Ranking	Name	Ranking	Name	Ranking		
Lodhran	50.33	Lower Dir	50.33	Malakand	50.00	Lodhran	50.00
Ghotki	50.67	Upper Dir	50.33	Nowshera	50.33	Swabi	51.00
Las Bela	50.67	Malakand	51.00	Ghotki	50.67	Tharparkar	51.33
Nowshera	50.67	Ghotki	51.33	Kohat	52.00	Kohat	51.67
Loralai	53.33	Tharparkar	52.00	Tharparkar	52.33	Jaffarabad	54.67
Kech	55.00	Nowshera	53.00	Loralai	53.00	Loralai	54.67
Jamshoro	55.33	Jamshoro	54.67	Jaffarabad	55.00	Malakand	55.00
Rajanpur	55.33	Rajanpur	55.00	Jamshoro	56.00	Jamshoro	55.33
Tharparkar	55.33	Haripur	55.00	Lower Dir	56.33	Narowal	57.33
Lower Dir	55.67	Kohat	56.00	Charsadda	59.00	Sukkur	57.33
M.Bahauddin	57.67	Bannu	59.33	Narowal	59.33	Charsadda	57.67
Sukkur	60.00	M.Bahauddin	60.33	Rajanpur	59.33	Rajanpur	58.00
Pakpattan	61.33	Sukkur	60.33	M.Bahauddin	59.67	M.Bahauddin	58.67
Bannu	61.67	Narowal	60.67	Dadu	60.33	Dadu	60.00
Narowal	62.00	Dadu	61.00	Nankana	60.67	Kech	61.33
Charsadda	62.00	Pakpattan	61.00	Sukkur	61.33	Haripur	63.00
Kohat	64.00	Kech	62.00	Kech	61.33	Shikarpur	63.67
Shikarpur	65.33	Charsadda	62.00	Haripur	64.00	Chakwal	63.67
Chakwal	66.00	Shikarpur	65.33	Shikarpur	64.67	Pakpattan	64.33
Dadu	66.33	Chakwal	65.67	Chakwal	64.67	Lower Dir	64.67
Nankana	68.00	Nankana	67.67	Pakpattan	65.33	Nankana	68.33
Bhakkar	70.33	Bhakkar	69.33	Bannu	70.67	Bannu	70.00
Khushab	70.33	Khushab	71.33	Khushab	73.00	Mirpur Khas	71.00
Mirpur Khas	70.33	Badin	73.00	Mirpur Khas	73.00	Badin	71.67
Mianwali	74.00	Mirpur Khas	73.33	Badin	73.33	Khushab	72.67
Khanewal	74.67	D.I. Khan	74.00	Khanewal	74.67	T.T.Singh	74.00
Badin	74.67	Mianwali	75.00	Bhakkar	75.00	Bhakkar	74.33
N.Feroze	75.00	Khanewal	75.33	Layyah	75.33	Khanewal	74.33
Mardan	75.33	N.Feroze	75.67	N.Feroze	75.67	Layyah	75.67
D.I. Khan	75.67	Layyah	76.00	Mianwali	76.67	Mianwali	76.00
T.T.Singh	76.33	T.T.Singh	76.00	T.T.Singh	77.00	N.Feroze	76.67
Jhelum	76.67	Jhelum	76.67	Mardan	79.33	Jhelum	76.67
Layyah	77.33	Mardan	77.00	Swat	79.33	Mardan	80.33
Swat	81.00	Swat	79.67	Jhelum	80.00	D.I. Khan	81.00
Hyderabad	82.00	Attock	82.33	D.I. Khan	81.33	Thatta	82.00
Attock	82.33	Hyderabad	83.00	Thatta	82.67	Larkana	82.67
Larkana	83.33	Thatta	83.67	Larkana	83.67	Swat	82.67
Thatta	84.00	Larkana	84.00	Hyderabad	83.67	Sanghar	83.00
Kasur	84.33	S.Benazirabad	84.00	Sanghar	83.67	Hyderabad	83.67
S.Benazirabad	84.67	Mansehra	85.00	Vehari	85.67	Mansehra	85.00
Sanghar	85.33	Sanghar	85.33	Mansehra	86.00	Attock	85.67
Mansehra	87.00	Kasur	85.67	S.Benazirabad	86.00	Vehari	86.67
Okara	87.67	Vehari	87.00	Attock	86.33	Kasur	87.67
Sheikhupura	88.33	Quetta	88.00	Kasur	87.00	S.Benazirabad	87.67
Abbottabad	88.33	Okara	88.33	Jhang	87.33	Khairpur	87.67
Vehari	88.67	Khairpur	89.33	Quetta	88.33	Jhang	89.00
Quetta	89.00	D.G.Khan	89.67	Khairpur	88.67	Quetta	89.00
Khairpur	90.00	Sheikhupura	90.00	Okara	90.00	Okara	89.67

Table A2: Continued: Ranking Districts by the Availability of Public Healthcare Facilities-2008-11

Year		2008		2009		2010		2011	
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
D.G.Khan	90.67	Abbottabad	91.00	D.G.Khan	90.33	D.G.Khan	90.33		
Sahiwal	92.33	Sahiwal	92.33	Abbottabad	91.33	Abbottabad	91.33		
Bahawalnagar	92.67	Bahawalnagar	92.67	Sheikhupura	92.33	Sheikhupura	91.67		
Jhang	92.67	Jhang	93.33	Bahawalnagar	94.33	Bahawalnagar	93.67		
Muzaffargarh	93.00	Muzaffargarh	93.33	Sahiwal	94.67	Sahiwal	94.33		
Sialkot	97.00	Gujrat	97.00	Muzaffargarh	95.00	Muzaffargarh	94.67		
Gujrat	97.00	Sialkot	98.00	Gujrat	98.33	Gujrat	98.67		
Karachi	102.00	Karachi	102.00	Sialkot	99.33	Sialkot	99.33		
Gujranwala	102.33	Gujranwala	102.33	Karachi	103.00	Karachi	102.67		
R.Y.Khan	103.33	R.Y.Khan	103.67	Gujranwala	104.33	Gujranwala	104.67		
Peshawar	103.67	Peshawar	104.00	Peshawar	104.67	R.Y.Khan	104.67		
Bahawalpur	104.00	Bahawalpur	104.33	R.Y.Khan	104.67	Peshawar	104.67		
Sargodha	104.00	Sargodha	104.33	Bahawalpur	105.33	Sargodha	105.00		
Multan	105.67	Multan	105.67	Sargodha	105.67	Bahawalpur	105.33		
Rawalpindi	108.00	Rawalpindi	107.67	Multan	107.00	Multan	107.00		
Faisalabad	110.33	Faisalabad	110.00	Rawalpindi	108.67	Rawalpindi	108.33		
Lahore	111.33	Lahore	111.33	Faisalabad	111.33	Faisalabad	111.33		
				Lahore	112.33	Lahore	112.67		

Table A2: Continued: Ranking Districts by the Availability of Public Healthcare Facilities-2012-15

	2012	Year	2013		2014		2015
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Sheerani	1.33	Sheerani	1.33	Sheerani	1.67	Tor Ghar	1.00
Barkhan	2.33	Barkhan	2.00	Barkhan	2.67	Sheerani	2.33
Awaran	4.33	Awaran	4.00	Awaran	4.67	Barkhan	3.33
Harnai	5.00	Harnai	5.33	Harnai	5.00	Awaran	5.00
Washuk	8.00	Nushki	8.67	Nushki	8.67	Harnai	5.33
Nushki	9.00	Washuk	9.00	Kohistan	9.00	Nushki	9.67
Ziarat	11.00	Ziarat	10.00	Washuk	9.67	Washuk	10.00
Nasirabad	11.00	Nasirabad	10.33	Ziarat	10.67	Musakhel	10.33
Musakhel	12.33	Musakhel	11.00	Musakhel	11.00	Ziarat	11.33
Kohistan	14.67	Kohistan	14.00	Nasirabad	12.67	Nasirabad	12.00
Kharan	17.33	Kharan	14.33	Kharan	14.67	Jhal Magsi	14.67
Dera Bugti	17.33	T.M.Khan	16.33	Jhal Magsi	15.67	Kharan	15.00
Mastung	17.67	K.Saifullah	16.33	K.Saifullah	16.67	K.Saifullah	16.67
T.M.Khan	18.00	Jhal Magsi	16.67	T.M.Khan	17.67	Panjgur	16.67
Tank	18.33	Mastung	17.00	Panjgur	18.00	Mastung	18.00
Panjgur	18.67	Panjgur	17.67	Mastung	18.00	T.M.Khan	18.33
Hangu	19.00	Hangu	18.67	Hangu	18.67	Hangu	19.00
Kachhi	19.33	Dera Bugti	19.33	Kachhi	20.33	Chagai	20.00
Jhal Magsi	19.67	Kachhi	20.00	Chagai	20.33	Dera Bugti	21.33
K.Saifullah	20.00	Chagai	20.33	Dera Bugti	21.67	Kachhi	21.67
Chagai	22.00	Gwadar	21.33	Gwadar	22.33	Gwadar	22.67
Gwadar	23.00	Tank	21.33	Tank	22.67	Batagram	23.33
K.Abdullah	23.67	Zhob	24.33	Shangla	24.33	Tank	23.67
Zhob	25.67	Batagram	24.67	Batagram	25.00	Sibi	25.00
Sibi	27.33	Sibi	25.67	Sibi	25.67	Zhob	26.33
Kohlu	27.33	Kohlu	26.33	Zhob	26.67	Kohlu	29.00
Batagram	27.67	K.Abdullah	27.00	Kohlu	28.67	Shangla	29.00
Buner	27.67	Kalat	30.00	K.Abdullah	29.00	K.Abdullah	30.00
T.Allah Yar	30.33	Kashmore	31.00	Kalat	30.67	Kalat	30.33
Kalat	31.00	Shangla	31.67	Kashmore	32.00	Kashmore	32.00
Lakki Marwat	32.33	Pishin	32.67	Buner	33.33	Kohistan	34.00
Kashmore	33.00	Buner	32.67	Pishin	34.67	Pishin	34.33
Shangla	34.33	Matuari	34.33	Matuari	35.00	Buner	34.33
Chitral	36.00	T.Allah Yar	36.00	T.Allah Yar	36.00	Matuari	36.00
Pishin	37.00	Las Bela	36.67	Umerkot	36.33	T.Allah Yar	36.67
Las Bela	37.33	Umerkot	36.67	Jacobabad	37.00	Las Bela	37.67
Jacobabad	37.67	Jacobabad	37.00	Las Bela	37.33	Jacobabad	39.33
Umerkot	38.33	Chitral	41.67	Lakki Marwat	41.33	Karak	40.33
Matuari	38.33	Shahdadkot	42.00	Shahdadkot	42.00	Sujawal	41.00
Karak	41.00	Khuzdar	43.00	Khuzdar	42.67	Lakki Marwat	42.33
Khuzdar	42.00	Lakki Marwat	43.00	Chitral	44.67	Umerkot	43.00
Shahdadkot	42.67	Karak	46.00	Karak	45.00	Khuzdar	43.33
Upper Dir	46.33	Ghotki	47.00	Chiniot	45.00	Shahdadkot	45.33
Nowshera	47.33	Jaffarabad	47.33	Upper Dir	46.00	Jaffarabad	45.33
Ghotki	49.00	Chiniot	47.67	Ghotki	46.67	Chiniot	45.33
Jaffarabad	49.33	Upper Dir	48.00	Jaffarabad	47.00	Chitral	46.00
Lodhran	49.67	Lodhran	50.33	Malakand	47.33	Thatta	46.67

Table A2: Continued: Ranking Districts by the Availability of Public Healthcare Facilities-2012-15

2012		Year	2013		2014		2015
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Swabi	50.67	Nowshera	51.33	Jamshoro	48.33	Hafizabad	47.00
Malakand	50.67	Hafizabad	51.67	Lodhran	49.00	Upper Dir	48.00
Chiniot	50.67	Kech	52.33	Kohat	50.33	Ghotki	48.00
Jamshoro	51.33	Jamshoro	52.67	Hafizabad	51.33	Sukkur	49.67
Hafizabad	52.00	Loralai	53.00	Kech	52.67	Kohat	50.67
Tharparkar	53.00	Sukkur	53.33	Swabi	53.00	Nowshera	51.00
Loralai	53.00	Tharparkar	53.67	Tharparkar	53.33	Malakand	51.67
Kech	53.33	Malakand	54.67	Nowshera	53.33	Kech	52.00
Charsadda	54.00	Swabi	55.00	Loralai	54.00	Jamshoro	53.67
Sukkur	55.00	Kohat	55.67	Charsadda	54.00	Loralai	54.67
Kohat	57.33	Dadu	57.33	Sukkur	54.33	Charsadda	55.00
Rajanpur	58.67	Charsadda	57.67	Shikarpur	56.67	Swabi	56.33
Dadu	59.33	Shikarpur	59.33	Dadu	58.33	Shikarpur	58.00
Lower Dir	60.67	M.Bahauddin	60.33	Haripur	62.00	Lodhran	59.67
Shikarpur	61.00	Narowal	60.67	M.Bahauddin	62.33	Dadu	60.00
Narowal	61.67	Rajanpur	61.67	Narowal	62.67	Haripur	62.00
Haripur	65.00	Lower Dir	62.00	Rajanpur	62.67	M.Bahauddin	65.67
M.Bahauddin	65.67	Nankana	63.00	Nankana	63.33	Tharparkar	66.00
Bannu	66.33	Haripur	65.00	Pakpattan	64.67	Narowal	66.33
Mirpur Khas	67.67	Mirpur Khas	65.00	Mirpur Khas	65.67	Pakpattan	66.67
Badin	68.33	Pakpattan	65.67	Khushab	66.67	Mirpur Khas	66.67
Khushab	69.00	Badin	67.67	Badin	67.00	Rajanpur	66.67
Chakwal	69.00	Khushab	68.33	Lower Dir	69.67	Lower Dir	67.00
Nankana	70.00	Bannu	70.67	Mianwali	73.00	Nankana	67.33
Mianwali	72.33	Chakwal	72.00	Naushahro	75.33	Badin	69.33
Layyah	73.00	Mianwali	72.67	Chakwal	77.00	Khushab	70.00
Naushahro	75.00	Naushahro	74.33	Jhelum	77.33	Naushahro	75.00
D.I.Khan	77.67	T.T.Singh	77.67	D.I.Khan	77.33	Mianwali	75.67
T.T.Singh	77.67	Jhelum	77.67	Hyderabad	78.00	D.I.Khan	76.67
Pakpattan	78.33	Bhakkar	78.33	Bhakkar	78.67	Layyah	77.00
Jhelum	78.67	Layyah	79.00	T.T.Singh	79.33	Jhelum	77.33
Bhakkar	79.33	D.I.Khan	79.00	Layyah	79.33	Bhakkar	79.00
Abbottabad	80.67	Larkana	80.33	Larkana	79.33	Sanghar	79.33
Larkana	81.00	Hyderabad	81.33	Sanghar	80.00	Hyderabad	79.33
Mardan	81.33	Khanewal	82.00	Mardan	80.00	Bannu	80.00
Mansehra	81.67	Thatta	82.33	Bannu	80.00	Mansehra	80.67
Khanewal	82.00	Sanghar	83.00	Thatta	80.67	Larkana	81.00
Hyderabad	82.67	Mansehra	84.00	Khanewal	81.00	Chakwal	81.67
Attock	83.67	Swat	84.00	Mansehra	81.33	Khanewal	82.33
Thatta	83.67	S.Benazirabad	84.33	S.Benazirabad	83.00	T.T.Singh	84.00
Swat	84.00	Attock	84.33	Attock	83.33	Mardan	84.00
Sanghar	84.33	Abbottabad	85.33	Swat	83.67	Swat	85.00
S.Benazirabad	85.00	Mardan	85.67	Quetta	88.33	Attock	85.00
Jhang	87.33	Quetta	88.00	Khairpur	88.67	Abbottabad	88.00
Muzaffargarh	89.33	Khairpur	88.33	Kasur	89.00	S.Benazirabad	88.00
Khairpur	89.67	Kasur	89.00	Okara	89.33	Sahiwal	90.00
Quetta	89.67	Jhang	89.00	Abbottabad	89.33	Quetta	90.33

Table A2: Continued: Ranking Districts by the Availability of Public Healthcare Facilities-2012-15

2012		Year		2013		2014		2015	
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Sheikhupura	90.33	Sheikhupura	90.00	Jhang	90.67	Khairpur	90.67		
Okara	91.33	Muzaffargarh	90.33	Muzaffargarh	92.00	Kasur	91.33		
D.G.Khan	92.00	Okara	91.33	Sheikhupura	93.00	Sheikhupura	94.33		
Kasur	92.33	D.G.Khan	94.33	D.G.Khan	93.67	Okara	94.67		
Vehari	92.67	Sahiwal	95.33	Sahiwal	96.00	D.G.Khan	95.00		
Bahawalnagar	95.67	Bahawalnagar	97.00	Bahawalnagar	98.00	Muzaffargarh	95.67		
Sahiwal	97.33	Vehari	98.00	Vehari	99.00	Jhang	96.33		
Gujrat	99.67	Gujrat	100.33	Gujrat	100.33	Vehari	97.00		
Sialkot	100.33	Sialkot	100.67	Sialkot	101.33	Bahawalnagar	98.00		
Karachi	104.00	Karachi	103.33	Karachi	102.00	Gujrat	98.00		
R.Y.Khan	104.67	Sargodha	104.67	Multan	105.33	Sialkot	99.67		
Rawalpindi	105.00	Rawalpindi	105.00	Sargodha	105.33	Peshawar	106.00		
Gujranwala	105.00	Gujranwala	105.00	Rawalpindi	105.67	Rawalpindi	106.33		
Sargodha	105.33	Multan	105.33	Gujranwala	105.67	Sargodha	106.33		
Peshawar	105.33	Peshawar	106.00	Peshawar	106.00	Multan	106.33		
Bahawalpur	105.67	Bahawalpur	106.67	R.Y.Khan	106.33	Gujranwala	106.67		
Multan	107.33	R.Y.Khan	106.67	Bahawalpur	107.33	Karachi	107.00		
Faisalabad	111.00	Faisalabad	111.00	Faisalabad	111.00	R.Y.Khan	107.33		
Lahore	113.00	Lahore	113.00	Lahore	113.00	Bahawalpur	108.33		
						Faisalabad	112.33		
						Lahore	114.33		

Table A2: Continued: Ranking Districts by the Availability of Public Healthcare Facilities-2016

Year	2016	2016	2016
Name	Ranking	Name	Ranking
Tor Ghar	1.00	Jaffarabad	46.33
Sheerani	2.00	Upper Dir	46.33
Barkhan	3.00	Ghotki	47.67
Awaran	5.00	Hafizabad	48.67
Harnai	5.67	Malakand	51.00
Nushki	10.00	Sukkur	51.00
Ziarat	10.33	Kohat	51.00
Washuk	10.33	Kech	52.00
Musakhel	11.00	Jamshoro	52.33
Nasirabad	12.00	Sujawal	53.67
Jhal Magsi	14.33	Loralai	54.00
Kharan	14.67	Charsadda	54.33
Chagai	16.00	Nowshera	54.33
K.Saifullah	16.00	Umerkot	55.33
T.M.Khan	16.67	Shikarpur	56.67
Mastung	17.00	Narowal	59.00
Panjgur	18.33	M.Bahauddin	60.00
Hangu	19.67	Lodhran	60.00
Dera Bugti	20.00	Badin	60.67
Kachhi	20.33	Tharparkar	61.33
Zhob	22.00	Mirpur Khas	64.00
Gwadar	22.00	Rajanpur	64.33
Batagram	24.67	Swabi	64.67
Sibi	24.67	Sanghar	65.33
Tank	27.67	Haripur	66.00
K.Abdullah	30.33	Dadu	68.00
Kohlu	31.00	Pakpattan	68.67
Kalat	32.33	Lower Dir	69.67
Pishin	32.33	Nankana	70.33
Kohistan	33.67	Khushab	70.67
Shangla	33.67	Naushahro	72.67
T.Allah Yar	34.33	Bannu	73.00
Buner	35.67	Abbottabad	74.00
Kashmore	36.67	D.I.Khan	75.67
Jacobabad	37.33	Layyah	77.67
Matiari	38.00	Larkana	78.33
Karak	39.67	Bhakkar	78.67
Las Bela	41.67	Chakwal	79.00
Khuzdar	42.00	Jhelum	79.67
Chitral	44.33	Hyderabad	80.00
Shahdadm Kot	45.00	Sheikhupura	80.33
Thatta	45.00	Mardan	83.00
Chiniot	45.67	Mansehra	83.67
Lakki Marwat	46.33	Khanewal	84.00
		Attock	86.33
		Swat	87.00
		Mianwali	87.00
		T.T.Singh	87.33
		S.Benazirabad	87.67
		Khairpur	88.67
		Quetta	91.00
		Kasur	92.00
		Jhang	94.00
		D.G.Khan	94.33
		Muzaffargarh	95.00
		Okara	95.33
		Vehari	96.00
		Sahiwal	96.00
		Bahawalnagar	98.00
		Sialkot	99.33
		Gujrat	101.33
		Gujranwala	105.33
		Peshawar	105.67
		Multan	106.67
		Karachi	107.00
		Sargodha	107.00
		Rawalpindi	107.33
		Bahawalpur	107.67
		R.Y.Khan	107.67
		Faisalabad	113.00
		Lahore	114.00

Table A3: Ranking Districts by the Availability of Public Healthcare Resources with respect to Population-2008-11

Year	2008	2009	2010	2011			
Name	Ranking	Name	Ranking	Name	Ranking		
Kashmore	10.67	Kashmore	11.67	Kashmore	11.33	Kashmore	10.00
Khanewal	13.00	Khanewal	12.33	Khanewal	11.33	Khanewal	10.67
Swabi	13.00	Kohistan	15.33	Kohistan	14.33	Kohistan	13.67
Muzaffargarh	17.00	Muzaffargarh	16.33	T.M.Khan	17.00	Muzaffargarh	15.67
Lodhran	18.00	Swabi	16.67	Lodhran	17.00	Lodhran	17.67
Kohistan	19.33	T.M.Khan	16.67	Muzaffargarh	17.33	T.M.Khan	19.00
Rajanpur	19.33	Lodhran	19.00	Swabi	17.67	Kasur	19.33
Kasur	20.33	Kasur	19.00	Kasur	18.67	Rajanpur	19.67
Pakpattan	22.67	Rajanpur	20.33	Rajanpur	21.67	Shahdadko	21.67
Shahdadko	24.00	Shahdadko	24.33	Shahdadko	23.00	Ghotki	22.33
T.AllahYar	25.00	Pakpattan	25.00	T.AllahYar	25.00	T.AllahYar	23.33
Ghotki	25.33	T.AllahYar	25.00	Narowal	25.67	Narowal	23.33
Narowal	25.33	Ghotki	25.67	Vehari	25.67	Swabi	25.33
T.M.Khan	28.00	Narowal	25.67	Ghotki	26.00	Karachi	26.67
Nowshera	28.00	Okara	28.67	Tharparkar	28.33	Tharparkar	27.00
Okara	28.67	Sheikhupura	29.67	Okara	29.67	Pakpattan	28.00
Mardan	29.33	Tharparkar	30.00	Pakpattan	29.67	Okara	28.67
Sheikhupura	30.67	Vehari	32.00	Nowshera	33.33	Nowshera	30.00
Vehari	31.00	Mardan	34.00	Chiniot	34.00	Vehari	30.00
Tharparkar	31.00	K.Abdullah	34.67	Umerkot	34.67	Umerkot	30.67
Umerkot	34.00	Jacobabad	35.67	Buner	35.67	Sheikhupura	32.67
Jacobabad	36.00	Umerkot	36.00	Mardan	36.00	Chiniot	33.00
K.Abdullah	36.00	Buner	36.33	K.Abdullah	36.67	Jacobabad	33.67
Sialkot	36.67	Sialkot	36.67	Sheikhupura	37.67	Charsadda	34.00
Gujranwala	36.67	Nowshera	37.67	Jacobabad	38.00	Buner	34.33
T.T.Singh	38.33	Sheerani	38.00	Shangla	38.00	K.Abdullah	34.67
Sheerani	39.00	Gujranwala	38.33	Musakhel	38.33	Dadu	36.00
M.Bahauddin	39.00	M.Bahauddin	38.33	M.Bahauddin	38.67	M.Bahauddin	36.00
Charsadda	41.00	T.T.Singh	38.33	T.T.Singh	38.67	T.T.Singh	37.67
Karachi	42.33	Dadu	38.67	Charsadda	39.00	Sialkot	38.67
Dadu	43.33	Charsadda	42.33	Dadu	39.00	Gujranwala	39.33
Sukkur	43.67	Karachi	42.67	Gujranwala	39.33	Sheerani	39.33
Buner	44.00	Shangla	42.67	Sheerani	40.00	Mardan	39.67
Washuk	44.67	Hangu	43.33	Sialkot	40.33	Sukkur	41.00
R.Y.Khan	45.00	Lower Dir	43.67	Karachi	40.67	Jhang	42.67
Matiari	45.33	Nasirabad	44.67	Jhang	42.00	D.G.Khan	43.33
Upper Dir	45.67	Matiari	44.67	Matiari	43.33	Badin	43.67
D.G.Khan	47.00	Sukkur	46.00	D.G.Khan	44.00	Matiari	45.00
Hafizabad	47.67	D.G.Khan	46.00	Badin	46.33	Bahawalnagar	46.33
Bahawalnagar	47.67	Bahawalnagar	47.33	Sukkur	46.67	Hafizabad	47.33
Shangla	49.00	Hafizabad	47.67	Swat	46.67	Lakki Marwat	47.67
Hangu	49.00	Barkhan	47.67	Hangu	46.67	R.Y.Khan	48.00
Badin	49.67	Badin	48.67	Barkhan	48.33	Layyah	50.00
Lower Dir	50.00	Swat	49.00	Bahawalnagar	48.67	Hangu	53.00
Bhakkar	50.00	R.Y.Khan	50.33	Lakki Marwat	49.33	Chakwal	53.00
Swat	50.67	Bhakkar	51.33	Hafizabad	49.67	Nasirabad	53.00

Note: For table notes please consult table 2.3 and 2.4.

Table A3: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to Population-2008-11

Year	2008		2009		2010		2011
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Layyah	51.00	Lakki Marwat	52.33	R.Y.Khan	49.67	Sanghar	53.67
Barkhan	51.33	Layyah	52.67	Nankana	50.33	Barkhan	54.67
Chakwal	52.67	Chakwal	52.67	Nasirabad	50.33	Upper Dir	55.33
Mirpur Khas	54.33	Panjgur	55.33	Layyah	51.67	Khairpur	56.67
Sahiwal	54.33	Nankana	56.00	Lower Dir	53.33	Bhakkar	57.33
Nankana	54.33	Batagram	56.00	Chakwal	54.33	Sahiwal	57.67
Nushki	54.67	Sahiwal	57.33	Batagram	56.67	Nankana	57.67
Musakhel	56.00	Jhang	57.67	Pishin	57.67	Mirpur Khas	58.67
Nasirabad	56.00	Attock	58.00	Upper Dir	57.67	Musakhel	58.67
Attock	56.33	Harnai	58.33	Sahiwal	59.00	Lower Dir	59.00
Jhang	57.33	Sanghar	58.67	Bhakkar	59.00	Swat	59.33
Gujrat	58.00	Gujrat	59.00	Sanghar	59.00	Pishin	60.33
Harnai	58.33	Karak	59.67	Panjgur	60.67	Shangla	60.67
N.Feroze	58.67	Multan	61.00	Khairpur	61.00	Multan	61.00
Sanghar	58.67	Musakhel	61.00	Karak	61.67	Gujrat	61.00
Mianwali	59.67	Pishin	61.00	Dera Bugti	61.67	Khuzdar	61.33
Pishin	60.33	Khairpur	61.00	Multan	62.00	Panjgur	62.33
Multan	61.67	Mirpur Khas	61.33	N.Feroze	62.67	Rawalpindi	62.33
Khairpur	61.67	Mianwali	61.67	Mirpur Khas	62.67	N.Feroze	62.67
K.Saifullah	61.67	Mastung	61.67	Gujrat	63.33	Kohat	63.33
Haripur	62.33	Upper Dir	61.67	K.Saifullah	63.33	Attock	63.33
Panjgur	63.00	Nushki	62.00	Khuzdar	65.33	Mianwali	64.33
Rawalpindi	63.00	N.Feroze	62.33	Attock	65.33	Washuk	64.67
Khushab	64.33	K.Saifullah	64.00	Rawalpindi	65.67	Shikarpur	65.00
Shikarpur	65.00	Dera Bugti	64.33	Kohat	65.67	Dera Bugti	65.67
Batagram	66.33	Bannu	64.33	Shikarpur	65.67	Tank	65.67
Faisalabad	66.33	Shikarpur	65.00	Mianwali	66.00	K.Saifullah	66.00
Khuzdar	66.67	D.I.Khan	65.67	Tank	66.33	Karak	66.33
Lakki Marwat	67.00	Washuk	66.33	Faisalabad	67.33	Batagram	66.33
Lahore	67.67	Rawalpindi	66.33	Mastung	70.33	Khushab	67.33
Awaran	68.00	Khuzdar	66.33	Jamshoro	70.33	Jamshoro	67.67
Sargodha	68.00	Khushab	67.00	Khushab	70.33	Faisalabad	68.00
D.I.Khan	68.33	Tank	67.00	Lahore	70.67	Harnai	70.00
Bannu	69.00	Faisalabad	68.67	Harnai	71.33	Lahore	70.00
Dera Bugti	70.33	Lahore	69.33	Bahawalpur	71.33	Sargodha	71.67
Mastung	71.00	Haripur	70.00	Washuk	72.33	Las Bela	72.00
Jamshoro	71.33	Kohat	71.00	Sargodha	73.00	D.I.Khan	72.67
Karak	72.00	Sargodha	71.33	Hyderabad	73.33	Hyderabad	73.00
Hyderabad	72.33	Jamshoro	71.67	S.Benazirabad	74.00	Bahawalpur	73.33
Kech	72.33	Hyderabad	72.33	Awaran	74.33	Kech	74.00
Jhelum	73.00	Bahawalpur	73.33	Las Bela	74.33	Peshawar	75.33
S.Benazirabad	73.67	S.Benazirabad	73.67	D.I.Khan	75.00	Mansehra	75.67
Bahawalpur	74.00	Peshawar	74.67	Peshawar	75.33	Chitral	76.00
Peshawar	74.33	Awaran	75.33	Kech	77.00	S.Benazirabad	76.33
Tank	74.33	Las Bela	75.67	Mansehra	78.00	Jhelum	76.67
Jaffarabad	75.67	Jhelum	76.67	Chitral	78.67	Kalat	77.00
Malakand	76.67	Mansehra	77.33	Larkana	79.00	Larkana	77.00
Larkana	77.33	Larkana	78.00	Quetta	79.00	Bannu	78.33
Mansehra	78.33	Kech	78.33	Kalat	79.33	Mastung	78.33

Table A3: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to Population-2008-11

Year	2008		2009		2010		2011	
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking	
Las Bela	79.00	Chitral	78.67	Jhelum	79.33	Quetta	78.67	
Kohat	79.67	Kalat	79.00	Haripur	79.33	Haripur	79.00	
Quetta	81.33	Quetta	79.67	Bannu	81.00	Nushki	82.67	
Kalat	82.00	Malakand	85.67	Malakand	84.00	Kohlu	87.33	
Abbottabad	86.00	Kohlu	89.67	Nushki	84.67	Kharan	88.67	
Zhob	90.67	Kharan	89.67	Zhob	89.33	Malakand	89.67	
Kohlu	91.00	Kachhi	92.00	Kharan	89.67	Zhob	91.00	
Kharan	92.33	Jaffarabad	92.00	Kohlu	89.67	Kachhi	93.00	
Kachhi	93.33	Abbottabad	92.67	Jhal Magsi	92.00	Abbottabad	93.00	
Chitral	94.33	Zhob	93.00	Abbottabad	92.67	Ziarat	93.33	
Jhal Magsi	95.00	Jhal Magsi	94.33	Kachhi	93.33	Jaffarabad	93.67	
Gwadar	95.00	Ziarat	95.00	Jaffarabad	94.33	Awaran	94.00	
Ziarat	95.67	Gwadar	95.33	Gwadar	95.00	Gwadar	95.00	
Thatta	98.33	Thatta	97.67	Ziarat	95.33	Jhal Magsi	97.67	
Chagai	100.33	Loralai	103.67	Thatta	98.33	Thatta	97.67	
Loralai	104.67	Chagai	104.33	Chagai	105.00	Chagai	103.33	
Sibi	109.67	Sibi	109.67	Loralai	106.33	Loralai	105.67	
				Sibi	110.67	Sibi	110.67	

Table A3: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to Population-2012-15

Year	2012	2013	2014	2015			
Name	Ranking	Name	Ranking	Name	Ranking		
Muzaffargarh	13.00	Muzaffargarh	8.67	Muzaffargarh	9.67	Tor Ghar	2.00
Lodhran	14.33	Kasur	14.00	Ghotki	14.67	Muzaffargarh	11.67
Kohistan	14.67	Kohistan	14.67	Kohistan	15.00	Karachi	12.67
Khanewal	17.00	Lodhran	15.67	Kasur	15.33	Ghotki	14.00
Kashmore	17.67	Khanewal	16.00	Karachi	15.33	Kashmore	14.67
Sheikhupura	19.67	Kashmore	17.00	Lodhran	15.67	Kasur	16.33
Shahdadko	20.33	Ghotki	17.00	Khanewal	16.00	Khanewal	17.00
Ghotki	20.67	Karachi	17.67	Kashmore	17.33	Chiniot	22.67
Rajanpur	21.00	T.M.Khan	20.33	T.M.Khan	21.00	T.M.Khan	24.00
T.M.Khan	21.33	Shahdadko	20.67	Rajanpur	21.00	Shahdadko	24.67
Tharparkar	22.00	Sheikhupura	20.67	Shahdadko	22.00	Rajanpur	25.00
Swabi	22.67	Rajanpur	21.33	Chiniot	22.67	Swabi	28.67
Karachi	22.67	Tharparkar	23.33	Sheikhupura	22.67	Sheikhupura	28.67
Kasur	23.33	Umerkot	24.00	Swabi	23.67	Lodhran	29.00
Nowshera	24.67	Okara	28.33	Umerkot	24.33	Pakpattan	30.33
Umerkot	25.67	Narowal	28.67	Tharparkar	24.67	Nowshera	31.00
Narowal	26.33	Pakpattan	29.00	Okara	26.67	Nasirabad	31.67
T.T.Singh	30.00	Swabi	30.00	Pakpattan	29.00	Okara	31.67
Chiniot	31.33	Nowshera	30.00	Charsadda	30.00	Sukkur	32.00
Charsadda	31.67	Chiniot	30.33	Narowal	30.67	Charsadda	32.67
Okara	32.00	T.T.Singh	30.67	Jacobabad	32.00	Umerkot	33.33
Buner	32.00	Dadu	30.67	Nasirabad	33.33	Jacobabad	33.67
Dadu	32.67	Jacobabad	31.00	Nowshera	33.33	Dadu	36.33
Jacobabad	33.67	Nasirabad	33.00	Dadu	33.67	K.Abdullah	37.67
Nasirabad	36.00	Sukkur	33.33	Shangla	34.00	Tharparkar	37.67
K.Abdullah	36.33	M.Bahauddin	33.67	T.T.Singh	35.00	Sialkot	38.33
Jhang	37.67	Charsadda	35.00	Sukkur	35.33	Narowal	40.00
Gujranwala	38.00	Buner	39.00	M.Bahauddin	37.33	Hafizabad	40.00
Sialkot	38.33	Badin	40.33	Badin	39.00	Shangla	41.67
Sukkur	39.33	K.Abdullah	40.33	Mardan	39.00	Badin	41.67
Badin	41.67	Gujranwala	41.00	K.Abdullah	41.33	M.Bahauddin	42.00
Sheerani	43.00	Sheerani	41.33	Sialkot	42.33	Sheerani	42.00
T.AllahYar	43.33	Jhang	41.67	Buner	42.67	Sanghar	43.67
D.G.Khan	43.67	Sialkot	42.00	Jhang	42.67	Gujranwala	44.00
M.Bahauddin	44.33	Rawalpindi	44.00	Sheerani	44.33	Mardan	44.67
Mardan	45.00	T.AllahYar	47.67	Gujranwala	45.67	T.T.Singh	46.00
Lakki Marwat	45.33	D.G.Khan	48.33	Sanghar	45.67	Buner	46.00
Vehari	47.00	Khuzdar	48.33	D.G.Khan	46.33	Khuzdar	47.67
Khuzdar	48.67	Mirpur Khas	50.00	Hangu	48.67	T.AllahYar	47.67
Rawalpindi	48.67	Hangu	50.67	T.AllahYar	48.67	D.G.Khan	48.00
R.Y.Khan	49.00	Mardan	50.67	Khuzdar	51.67	Vehari	49.33
Hangu	49.33	Sanghar	50.67	Mirpur Khas	52.00	Lakki Marwat	51.00
Layyah	49.67	Hafizabad	51.67	Khairpur	52.33	Pishin	51.00
Bahawalnagar	49.67	Bahawalnagar	52.00	Pishin	53.33	R.Y.Khan	52.00
Sanghar	54.00	Khairpur	52.00	Lakki Marwat	53.33	Layyah	52.00
Las Bela	54.33	Nankana	52.67	Swat	53.33	Bahawalnagar	52.33

Table A3: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to Population-2012-15

Year	2012		2013		2014		2015
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Khairpur	55.00	Shangla	52.67	R.Y.Khan	53.67	Hangu	52.67
Hafizabad	55.00	Matiari	53.67	Matiari	54.33	Khairpur	53.33
Pakpattan	56.00	Pishin	53.67	Bahawalnagar	54.33	Jhang	53.67
Dera Bugti	56.33	R.Y.Khan	54.67	Rawalpindi	54.33	Mirpur Khas	54.00
Mirpur Khas	56.33	Vehari	54.67	Hafizabad	54.67	Swat	54.00
Lower Dir	56.67	Las Bela	55.33	Nankana	55.00	Upper Dir	54.33
Chakwal	57.00	Multan	55.67	Upper Dir	55.33	Kohistan	54.67
Upper Dir	57.67	Lower Dir	56.67	Multan	55.33	Sahiwal	54.67
Pishin	58.67	Swat	57.67	Layyah	56.67	Thatta	56.33
Matiari	58.67	Dera Bugti	57.67	Shikarpur	57.00	Dera Bugti	56.67
Attock	59.33	Barkhan	58.33	Las Bela	57.33	Las Bela	57.00
Barkhan	59.33	Kech	59.33	Attock	57.67	Kech	57.33
Mianwali	59.33	Layyah	59.33	Dera Bugti	57.67	Barkhan	58.00
Faisalabad	59.67	Mianwali	59.67	Vehari	57.67	N.Feroze	58.00
Nankana	60.00	Attock	59.67	Kech	58.67	Batagram	59.33
Swat	61.00	Chakwal	59.67	Barkhan	59.33	Rawalpindi	59.33
Shangla	62.00	Sahiwal	60.00	N.Feroze	59.67	Lower Dir	59.33
N.Feroze	62.67	N.Feroze	60.67	Lower Dir	62.00	Nankana	59.67
Sahiwal	62.67	Batagram	61.33	Sahiwal	62.33	Shikarpur	60.00
Kech	63.00	Shikarpur	62.00	Mianwali	62.67	Bhakkar	60.67
Tank	63.67	Bhakkar	62.33	K.Saifullah	63.67	Attock	61.00
Shikarpur	63.67	K.Saifullah	63.00	Kohat	63.67	Multan	61.33
Karak	63.67	Lakki Marwat	63.00	Faisalabad	64.00	Matiari	61.67
Bhakkar	65.00	Kohat	64.00	Bhakkar	64.33	K.Saifullah	62.33
Panjkur	65.33	Panjkur	64.33	Panjkur	65.00	D.I.Khan	63.00
Washuk	66.00	Upper Dir	66.67	Batagram	65.33	Gujrat	63.33
Kohat	66.00	Faisalabad	66.67	Khushab	66.00	Panjkur	63.33
Gujrat	66.33	Sargodha	67.00	Jamshoro	66.67	Karak	63.67
Mastung	67.67	Khushab	67.33	D.I.Khan	67.33	Mianwali	64.33
Batagram	68.00	Washuk	70.33	Mansehra	68.33	Faisalabad	65.00
Khushab	68.00	Gujrat	71.33	Chakwal	69.33	Kohat	66.00
Multan	68.33	Hyderabad	71.67	Sargodha	70.33	Sujawal	66.33
Sargodha	69.00	D.I.Khan	72.00	Hyderabad	71.33	Mansehra	67.67
Jamshoro	71.33	Jamshoro	72.67	Larkana	73.00	Khushab	68.67
Mansehra	71.33	Musakhel	74.00	Lahore	73.00	Jamshoro	70.00
D.I.Khan	71.67	Peshawar	74.33	Washuk	73.33	Sargodha	71.67
Hyderabad	72.33	Tank	74.33	Gujrat	74.00	Washuk	72.00
K.Saifullah	73.67	S.Benazirabad	75.00	Peshawar	75.00	Hyderabad	72.33
Peshawar	74.00	Mansehra	75.00	S.Benazirabad	75.33	Haripur	72.33
Musakhel	74.33	Lahore	75.67	Musakhel	75.67	Kalat	74.00
Bahawalpur	74.67	Mastung	76.00	Quetta	76.00	Larkana	74.00
S.Benazirabad	75.00	Quetta	76.33	Tank	76.33	Chakwal	74.67
Larkana	75.33	Larkana	76.33	Kalat	76.67	Musakhel	75.33
Kalat	75.67	Kalat	76.33	Haripur	76.67	Tank	76.33
Bannu	76.33	Bahawalpur	78.00	Karak	78.33	Peshawar	76.67
Lahore	77.33	Awaran	78.00	Nushki	78.67	Lahore	76.67
Chitral	77.67	Karak	78.33	Awaran	79.67	Quetta	78.00
Awaran	78.33	Jhelum	78.67	Bahawalpur	80.33	Nushki	79.33
Quetta	79.33	Nushki	79.33	Jhelum	80.67	Awaran	80.00

Table A3: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to Population-2012-15

Year	2012		2013		2014		2015
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Haripur	80.67	Haripur	82.33	Mastung	83.67	S.Benazirabad	81.00
Nushki	81.00	Bannu	84.33	Malakand	84.33	Bahawalpur	81.00
Jhelum	82.33	Abbottabad	84.67	Jaffarabad	84.33	Jhelum	82.67
Abbottabad	84.67	Jaffarabad	87.00	Kohlu	88.33	Jaffarabad	83.33
Kohlu	85.67	Malakand	88.00	Zhob	89.00	Mastung	85.67
Malakand	86.00	Zhob	88.33	Gwadar	89.00	Malakand	87.00
Jaffarabad	88.67	Kohlu	88.67	Ziarat	89.33	Ziarat	88.67
Zhob	90.00	Ziarat	88.67	Kharan	89.67	Zhob	89.33
Kharan	90.33	Kharan	89.33	Bannu	91.33	Gwadar	89.67
Ziarat	91.00	Gwadar	89.33	Kachhi	92.33	Kohlu	89.67
Kachhi	91.33	Kachhi	92.67	Abbottabad	92.67	Bannu	89.67
Gwadar	91.67	Chitral	93.33	Harnai	92.67	Kharan	91.67
Harnai	96.00	Harnai	93.67	Thatta	94.33	Abbottabad	93.00
Thatta	96.33	Thatta	96.33	Chitral	97.33	Kachhi	94.00
Chagai	99.67	Chagai	99.00	Chagai	99.00	Harnai	95.00
Jhal Magsi	102.67	Jhal Magsi	101.00	Jhal Magsi	100.33	Chitral	99.00
Loralai	104.67	Loralai	104.67	Loralai	105.00	Chagai	100.00
Sibi	110.33	Sibi	110.33	Sibi	111.00	Jhal Magsi	100.67
						Loralai	107.33
						Sibi	112.33

Table A3: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to population- 2016

Year	2016	2016	2016
Name	Ranking	Name	Ranking
Tor Ghar	1.00	Layyah	51.33
Karachi	8.00	T.T.Singh	52.33
Muzaffargarh	10.67	Swat	52.33
Ghotki	12.33	Bahawalnagar	52.67
T.M.Khan	19.00	Kohistan	53.33
Sheikhupura	19.67	Kech	53.67
Kasur	20.67	R.Y.Khan	53.67
Khanewal	21.67	N. Feroze	54.67
Shahdadkot	23.00	Thatta	55.33
Rajapur	23.33	Shikarpur	55.67
Kashmore	24.67	Umerkot	55.67
Sanghar	24.67	Upper Dir	56.33
Chiniot	25.00	K.Saifullah	56.33
Lodhran	26.67	D.I.Khan	56.33
Badin	27.67	Barkhan	57.00
Nasirabad	30.00	Shangla	57.67
Charsadda	30.33	Lower Dir	58.00
Sukkur	31.33	Multan	61.33
Jacobabad	31.33	Attock	62.00
Narowal	31.67	Las Bela	62.33
K.Abdullah	33.67	Bhakkar	62.33
Pakpattan	34.00	Matiali	62.67
Okara	34.33	Rawalpindi	62.67
Nowshera	35.00	Lakki Marwat	63.00
M.Bahauddin	36.33	Kohat	64.33
Gujranwala	38.33	Karak	64.67
Tharparkar	38.67	Sahiwal	65.00
Sialkot	39.67	Panjkur	65.67
Sheerani	40.00	Batagram	66.00
Mardan	40.67	Nankana	66.67
Swabi	42.67	Faisalabad	66.67
T.Allah Yar	42.67	Jamshoro	68.67
Hafizabad	43.00	Sargodha	69.00
Buner	44.33	Abbottabad	70.00
Khuzdar	46.00	Mansehra	71.00
Mirpur Khas	46.33	Gujrat	71.67
Pishin	46.67	Kalat	73.00
Vehari	47.33	Chakwal	73.33
Jhang	47.33	Khushab	73.33
Dadu	48.00	Peshawar	73.33
D.G. Khan	48.33	Hyderabad	73.33
Hangu	48.33	Larkana	73.33
Khairpur	49.67	Washuk	73.67
Dera Bugti	51.33	Lahore	74.67
		Bannu	75.67
		Musakhel	76.00
		Sujawal	76.67
		Quetta	78.00
		S.Benazirabad	78.00
		Nushki	78.67
		Awaran	80.67
		Bahawalpur	81.00
		Haripur	81.00
		Mianwali	82.33
		Mastung	83.33
		Jaffarabad	84.67
		Zhob	86.00
		Jhelum	86.33
		Malakand	87.00
		Ziarat	87.67
		Kohlu	89.33
		Gwadar	89.33
		Tank	90.00
		Kharan	91.33
		Chagai	92.67
		Kachhi	94.00
		Harnai	94.33
		Chitral	99.33
		Jhal Magsi	100.67
		Loralai	106.33
		Sibi	112.33

Table A4: Ranking Districts by the Availability of Public Healthcare Resources with respect to Area-2008-11

Year	2008		2009		2010		2011
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Washuk	1.67	Washuk	1.67	Awaran	1.67	Washuk	1.67
Awaran	2.00	Awaran	2.00	Washuk	2.00	Awaran	2.00
Chagai	3.33	Chagai	4.33	Chagai	3.67	Chagai	2.67
Panjgur	6.33	Panjgur	5.33	Kharan	6.00	Kharan	5.00
Khuzdar	7.00	Kharan	6.33	Panjgur	6.00	Panjgur	5.33
Kharan	7.67	Khuzdar	8.00	Khuzdar	7.00	Khuzdar	6.00
Sheerani	8.00	Sheerani	8.00	Musakhel	8.33	Sheerani	8.00
Nushki	9.00	Kohistan	10.00	Sheerani	8.67	Musakhel	10.67
Musakhel	10.33	Zhob	10.67	Kohistan	9.67	Zhob	10.67
Zhob	10.33	Nushki	11.67	Zhob	10.67	Kohistan	12.33
Barkhan	13.00	Musakhel	12.33	Barkhan	12.00	Dera Bugti	12.67
Gwadar	13.00	Barkhan	13.00	Dera Bugti	13.00	Gwadar	13.33
Kech	13.67	Dera Bugti	13.67	Gwadar	13.67	Chitral	13.67
Kohistan	14.33	Gwadar	14.00	Chitral	15.00	Tharparkar	15.33
Dera Bugti	15.00	Chitral	15.33	Tharparkar	16.00	Barkhan	15.33
Tharparkar	15.33	Kech	16.00	Kech	16.00	Kech	15.67
Harnai	16.33	Tharparkar	16.00	Las Bela	16.67	Las Bela	16.33
Las Bela	17.00	Las Bela	16.67	Nushki	17.33	Nushki	17.00
Killa Saifullah	17.33	Harnai	17.00	Killa Saifullah	18.00	Harnai	18.00
Chitral	18.33	Killa Saifullah	18.00	Harnai	19.33	Killa Saifullah	18.00
Kohlu	19.67	Kohlu	20.00	Kohlu	20.00	Kohlu	19.67
Kalat	22.33	Kalat	22.00	Kalat	22.33	Kalat	21.67
Rajanpur	25.33	Mastung	25.33	Rajanpur	26.67	Jamshoro	26.33
Jamshoro	25.33	Rajanpur	26.67	Jhal Magsi	27.00	Jhal Magsi	26.67
Ziarat	27.00	K.Abdullah	27.33	Jamshoro	27.00	K.Abdullah	26.67
Jhal Magsi	27.33	Jhal Magsi	27.33	Ziarat	27.33	Ziarat	27.00
K.Abdullah	27.33	Jamshoro	27.67	K.Abdullah	27.67	Rajanpur	27.00
Mastung	28.67	Ziarat	28.33	Sibi	29.33	Sibi	29.00
Sibi	30.00	Nasirabad	28.67	Kachhi	29.67	Kachhi	29.33
Kachhi	31.33	Sibi	30.00	Mastung	29.67	Thatta	30.33
Pishin	31.33	Kachhi	30.67	Nasirabad	30.33	Nasirabad	33.00
Nasirabad	32.00	Thatta	32.00	Thatta	31.67	Pishin	33.00
Loralai	33.00	Pishin	32.67	Pishin	32.33	Mastung	34.33
Umerkot	34.33	Loralai	33.00	Loralai	34.33	Umerkot	34.67
Khairpur	36.33	Umerkot	36.67	Umerkot	35.33	Loralai	35.33
Shahdadkot	37.67	Khairpur	38.33	Khairpur	38.00	Khairpur	37.00
Ghotki	39.33	Shahdadkot	38.33	Shahdadkot	38.00	Shahdadkot	38.33
Bahawalpur	39.67	Dadu	40.67	Dadu	40.00	Dadu	38.67
Dadu	40.33	Bahawalpur	41.33	Bahawalpur	40.33	Bahawalpur	41.00
Bhakkar	40.33	Ghotki	42.33	Ghotki	42.33	Ghotki	41.33
D.G.Khan	43.00	Bhakkar	42.67	D.G.Khan	43.33	D.G.Khan	42.33
Sanghar	44.67	D.G.Khan	44.00	Bhakkar	44.67	Kashmore	44.33
Kashmore	44.67	Kashmore	45.67	Kashmore	45.67	Bhakkar	44.33
Chakwal	46.00	Sanghar	46.33	Chakwal	46.00	Sanghar	44.67

Note: For table notes please consult table 2.5 and 2.6.

Table A4: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to Area-2008-11

Year	2008		2009		2010		2011
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Upper Dir	46.67	Chakwal	47.00	Sanghar	46.67	Chakwal	45.67
Khushab	47.67	Karak	48.67	Karak	49.00	Khushab	48.33
D.I.Khan	49.00	Lakki Marwat	49.67	Lakki Marwat	49.33	Sukkur	48.33
Sukkur	49.67	Khushab	49.67	Khushab	49.67	Lakki Marwat	48.67
Badin	52.67	D.I.Khan	49.67	Sukkur	51.67	Badin	51.33
Thatta	53.33	Sukkur	51.33	D.I.Khan	52.33	D.I.Khan	52.67
Mianwali	53.33	Tank	52.67	Tank	52.67	Tank	53.33
Karak	53.67	Badin	53.00	Badin	53.00	Layyah	53.67
Layyah	54.00	Layyah	54.33	Upper Dir	53.67	Upper Dir	54.00
Attock	54.00	Mianwali	54.67	Layyah	53.67	Karak	54.00
Tank	55.33	Attock	54.67	Bahawalnagar	55.67	Mianwali	55.33
Bahawalnagar	55.67	Upper Dir	56.00	Mianwali	55.67	Bahawalnagar	56.00
Lakki Marwat	56.67	Bahawalnagar	56.33	T.M.Khan	56.33	T.M.Khan	57.67
Muzaffargarh	57.33	T.M.Khan	56.67	T.Allah Yar	58.67	T.Allah Yar	58.33
Jhang	58.67	T.Allah Yar	58.33	Attock	58.67	Jacobabad	58.33
T.Allah Yar	60.00	Muzaffargarh	59.00	Jacobabad	59.67	Attock	58.67
Jacobabad	61.00	Jacobabad	60.33	Muzaffargarh	60.67	Muzaffargarh	60.00
Khanewal	63.33	Batagram	63.33	Jhang	63.33	Jhang	63.33
T.M.Khan	63.67	Buner	64.00	Khanewal	64.33	Khanewal	63.67
R.Y.Khan	64.67	Khanewal	64.00	Batagram	64.33	Buner	64.00
Lodhran	66.33	Lodhran	67.00	Chiniot	64.67	Chiniot	65.00
Swat	68.67	Shangla	68.00	Buner	65.00	Lodhran	66.33
Buner	69.67	Swat	68.00	Lodhran	65.67	R.Y.Khan	67.00
Batagram	71.00	Hangu	68.33	Shangla	66.33	Batagram	70.67
Hafizabad	72.00	R.Y.Khan	68.67	R.Y.Khan	67.67	Hafizabad	71.33
Shangla	72.33	Hafizabad	72.33	Swat	68.33	Swat	72.00
Hangu	72.67	Jhang	73.67	Hangu	69.67	Matiari	72.67
M.Bahauddin	73.33	Pakpattan	74.00	Hafizabad	73.33	Hangu	73.33
Pakpattan	74.00	Matiari	74.33	Matiari	74.00	Kohat	73.67
Jhelum	74.67	M.Bahauddin	74.33	M.Bahauddin	76.00	M.Bahauddin	75.33
Matiari	75.00	Jhelum	75.67	Kohat	76.33	Jhelum	75.67
Jaffarabad	76.67	Kohat	76.67	Vehari	76.67	Mansehra	77.67
Okara	77.33	Mansehra	77.67	S.Benazirabad	78.67	Pakpattan	78.33
Mirpur Khas	78.33	Vehari	78.67	Pakpattan	79.33	Vehari	78.67
S.Benazirabad	78.33	Okara	78.67	Mirpur Khas	80.00	Shangla	79.00
Vehari	78.67	S.Benazirabad	79.00	Jhelum	80.33	S.Benazirabad	79.00
T.T.Singh	79.00	Mirpur Khas	79.00	Mansehra	80.33	Mirpur Khas	79.00
Mansehra	79.67	Narowal	80.33	Okara	80.67	Okara	79.33
Kasur	80.00	Shikarpur	80.67	Narowal	81.67	Narowal	79.33
N.Feroze	80.33	T.T.Singh	80.67	N.Feroze	81.67	T.T.Singh	80.00
Kohat	80.33	Kasur	81.00	T.T.Singh	81.67	Shikarpur	81.00
Narowal	80.67	N.Feroze	81.00	Shikarpur	82.00	Kasur	81.67
Swabi	81.67	Jaffarabad	82.00	Kasur	83.33	N.Feroze	83.67

Table A4: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to Area-2008-11

Year	2008		2009		2010		2011	
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking	
Quetta	92.33	Sargodha	92.33	Quetta	92.67	Haripur	92.00	
Lower Dir	92.67	Quetta	92.33	Sargodha	92.67	Quetta	92.00	
Sahiwal	93.67	Sahiwal	94.00	Lower Dir	93.00	Sahiwal	94.33	
Malakand	97.67	Larkana	98.33	Sahiwal	94.67	Lower Dir	96.00	
Gujrat	98.67	Bannu	98.67	Malakand	99.33	Gujrat	98.67	
Larkana	99.00	Gujrat	98.67	Gujrat	99.67	Larkana	99.33	
Karachi	100.00	Karachi	99.33	Larkana	100.33	Karachi	99.67	
Mardan	100.00	Malakand PA	99.67	Karachi	100.33	Sialkot	100.33	
Sialkot	100.00	Mardan	100.33	Mardan	101.33	Mardan	101.33	
Bannu	100.33	Sialkot	100.67	Sialkot	101.67	Malakand	101.67	
Rawalpindi	102.00	Rawalpindi	102.33	Gujranwala	103.00	Gujranwala	102.33	
Gujranwala	103.00	Gujranwala	102.67	Rawalpindi	103.00	Rawalpindi	102.67	
Abbottabad	103.33	Multan	104.00	Bannu	104.00	Bannu	103.67	
Multan	104.00	Abbottabad	104.00	Charsadda	104.67	Charsadda	104.33	
Charsadda	105.00	Charsadda	104.33	Abbottabad	105.33	Abbottabad	105.00	
Hyderabad	106.00	Hyderabad	106.33	Multan	105.67	Multan	105.33	
Faisalabad	107.00	Faisalabad	107.00	Hyderabad	107.00	Hyderabad	107.33	
Peshawar	110.67	Peshawar	111.00	Faisalabad	107.67	Faisalabad	107.67	
Lahore	112.00	Lahore	112.00	Peshawar	112.00	Peshawar	112.00	
				Lahore	113.00	Lahore	113.00	

Table A4: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to Area-2012-15

Year	2012		2013		2014		2015
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Washuk	1.67	Awaran	1.67	Awaran	1.67	Awaran	1.67
Awaran	2.00	Washuk	2.00	Washuk	2.00	Washuk	2.00
Chagai	3.00	Chagai	3.00	Chagai	3.33	Chagai	3.00
Khuzdar	5.67	Panjgur	6.00	Panjgur	6.00	Panjgur	5.00
Panjgur	6.67	Khuzdar	6.00	Khuzdar	6.67	Khuzdar	6.33
Kharan	7.67	Kharan	7.67	Kharan	7.67	Kharan	7.33
Sheerani	8.33	Sheerani	8.00	Sheerani	8.33	Sheerani	8.33
Zhob	9.67	Zhob	9.00	Kohistan	9.00	Zhob	9.67
Dera Bugti	10.67	Gwadar	10.67	Zhob	9.33	Gwadar	11.00
Gwadar	11.67	Dera Bugti	11.33	Gwadar	11.00	Dera Bugti	12.33
Las Bela	13.00	Kohistan	12.33	Dera Bugti	12.00	Las Bela	13.00
Kech	13.00	Barkhan	12.67	Kech	13.33	Kech	13.33
Kohistan	13.33	Las Bela	13.00	Las Bela	13.33	Nushki	14.33
Chitral	14.67	Kech	13.00	Barkhan	13.67	Musakhel	15.67
Tharparkar	15.00	Tharparkar	15.33	Nushki	14.67	Barkhan	16.00
Barkhan	15.00	Nushki	15.33	Tharparkar	15.67	Killa Saifullah	17.67
Nushki	15.00	Musakhel	16.67	Musakhel	16.33	Chitral	18.00
Musakhel	16.67	Chitral	17.00	Chitral	17.67	Kohlu	20.33
Kohlu	19.00	Killa Saifullah	18.67	Killa Saifullah	17.67	Kalat	21.00
Killa Saifullah	19.67	Kohlu	20.00	Kohlu	20.33	Tor Ghar	22.00
Kalat	21.00	Kalat	20.33	Kalat	20.33	Kohistan	22.33
Jamshoro	24.67	Ziarat	25.00	Jamshoro	24.00	Jamshoro	24.67
Rajanpur	25.00	Jamshoro	25.00	Harnai	25.00	Harnai	25.00
Ziarat	26.67	Nasirabad	26.00	Ziarat	25.00	Ziarat	25.33
Nasirabad	26.67	Harnai	26.33	Rajanpur	26.67	Tharparkar	26.00
Harnai	27.33	Sibi	27.00	Nasirabad	27.00	Sujawal	26.67
Sibi	28.00	Rajanpur	27.00	Sibi	27.00	Jhal Magsi	27.00
K.Abdullah	28.33	Kachhi	27.00	Kachhi	27.33	Sibi	27.00
Kachhi	28.67	Thatta	28.00	Jhal Magsi	29.33	Nasirabad	27.33
Thatta	29.33	Pishin	29.33	Pishin	29.67	Kachhi	28.00
Mastung	30.67	Jhal Magsi	31.00	Mastung	31.33	Thatta	28.33
Jhal Magsi	32.00	Mastung	31.33	K.Abdullah	32.33	Rajanpur	29.33
Pishin	32.00	K.Abdullah	32.33	Umerkot	33.00	Pishin	30.33
Loralai	34.33	Loralai	33.67	Loralai	33.33	K.Abdullah	32.67
Umerkot	34.67	Umerkot	34.33	Khairpur	33.33	Mastung	32.67
Khairpur	35.33	Khairpur	34.33	Dadu	36.33	Loralai	33.67
Shahdadkot	36.67	Shahdadkot	36.67	Shahdadkot	37.00	Khairpur	36.00
Dadu	37.67	Dadu	37.00	Ghotki	37.33	Sanghar	38.33
Ghotki	40.67	Ghotki	39.67	Sanghar	38.67	Umerkot	38.33
Bahawalpur	41.33	Sanghar	40.67	Bahawalpur	43.33	Dadu	38.67
Sanghar	42.33	Bahawalpur	42.67	Sukkur	43.67	Ghotki	39.67
D.G.Khan	44.00	Bhakkar	43.33	Bhakkar	44.00	Shahdadkot	39.67
Bhakkar	46.00	Sukkur	45.67	Khushab	45.00	Bhakkar	44.33
Lakki Marwat	47.33	D.G.Khan	46.33	D.G.Khan	45.33	Sukkur	44.33
Sukkur	47.67	Khushab	46.67	Badin	46.00	Bahawalpur	46.00
Chakwal	48.33	Badin	46.67	D.I.Khan	46.33	Karak	46.67
Badin	48.67	Chakwal	48.00	Thatta	47.00	D.I.Khan	47.33

Table A4: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to Area-2012-15

Year	2012		2013		2014		2015
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Khushab	49.00	D.I.Khan	49.33	Kashmore	51.33	Khushab	47.67
D.I.Khan	50.33	Kashmore	51.00	Chakwal	52.00	D.G.Khan	48.33
Tank	50.67	Mianwali	53.33	Upper Dir	52.00	Badin	49.33
Kashmore	52.67	Muzaffargarh	53.67	Lakki Marwat	54.00	Kashmore	53.00
Karak	53.00	Tank	55.00	Attock	54.00	Upper Dir	54.00
Layyah	53.67	Upper Dir	55.33	Muzaffargarh	54.67	Layyah	54.00
Mianwali	54.33	Attock	55.33	Jacobabad	55.67	Mianwali	54.33
Muzaffargarh	54.33	Lakki Marwat	55.67	Layyah	56.00	Chakwal	56.00
Jacobabad	57.00	Layyah	55.67	Mianwali	56.00	Attock	56.33
Bahawalnagar	57.00	Karak	56.67	Bahawalnagar	56.67	Lakki Marwat	56.67
Upper Dir	57.33	Jacobabad	56.67	Karak	56.67	Muzaffargarh	57.00
Attock	57.33	Bahawalnagar	58.33	Tank	58.33	Jacobabad	57.33
T.M.Khan	57.33	T.M.Khan	58.67	T.M.Khan	59.00	Bahawalnagar	58.67
Jhang	62.67	Chiniot	62.33	Chiniot	62.00	T.M.Khan	59.00
Buner	63.33	Jhang	64.33	Jhang	65.00	Tank	59.00
R.Y.Khan	64.33	Lodhran	66.00	Lodhran	65.00	Chiniot	61.00
Lodhran	65.00	Batagram	67.33	Shangla	65.00	Hafizabad	66.33
Chiniot	65.33	Khanewal	67.33	Khanewal	68.67	Jhang	68.33
T.Allah Yar	66.00	Buner	68.33	R.Y.Khan	70.00	R.Y.Khan	69.67
Hangu	69.67	R.Y.Khan	69.67	Hangu	70.33	Batagram	70.00
Khanewal	69.67	Hangu	71.67	Swat	70.67	Shangla	70.33
Batagram	70.67	T.Allah Yar	72.33	Batagram	70.67	Khanewal	70.67
Swat	73.33	Swat	73.00	Buner	71.67	Swat	71.67
Hafizabad	73.67	Kohat	73.00	T.Allah Yar	72.33	Hangu	72.00
Kohat	74.33	Hafizabad	73.33	Kohat	73.67	Lodhran	72.00
Mansehra	74.33	Mirpur Khas	73.67	Mirpur Khas	74.00	Buner	72.67
Jhelum	74.67	Jhelum	73.67	S.Benazirabad	74.33	T.Allah Yar	74.33
S.Benazirabad	75.00	S.Benazirabad	74.67	Hafizabad	74.33	Kohat	74.67
Mirpur Khas	75.33	Matiali	74.67	Shikarpur	74.67	Mirpur Khas	76.33
Shangla	77.33	M.Bahauddin	75.00	Matiali	74.67	Shikarpur	76.67
Shikarpur	78.33	Shangla	75.00	Jhelum	76.33	Mansehra	76.67
M.Bahauddin	78.67	Mansehra	77.33	Mansehra	76.67	Jhelum	77.00
Jaffarabad	79.67	Pakpattan	77.67	Pakpattan	77.00	Jaffarabad	77.00
T.T.Singh	79.67	Jaffarabad	78.00	M.Bahauddin	77.00	S.Benazirabad	77.33
Matiali	80.33	Shikarpur	78.67	Jaffarabad	77.00	Pakpattan	79.33
Narowal	81.33	Okara	82.00	Okara	80.00	M.Bahauddin	79.67
Okara	82.00	T.T.Singh	82.00	N.Feroze	82.00	N.Feroze	81.33
Sheikhupura	82.67	Narowal	82.33	T.T.Singh	82.33	Matiali	82.00
N.Feroze	83.00	N.Feroze	82.67	Kasur	83.33	Okara	83.33
Nowshera	84.67	Kasur	84.33	Narowal	83.67	Kasur	85.33
Kasur	87.00	Sheikhupura	84.67	Sheikhupura	87.33	Narowal	87.67
Vehari	87.00	Nankana	87.67	Nankana	87.67	Sheikhupura	88.00
Nankana	89.00	Nowshera	89.33	Nowshera	90.00	T.T.Singh	88.00
Pakpattan	89.33	Sargodha	91.33	Quetta	91.67	Vehari	88.67
Swabi	91.67	Quetta	91.67	Haripur	91.67	Nankana	90.00
Rawalpindi	91.67	Rawalpindi	92.00	Sargodha	92.67	Nowshera	90.00

Table A4: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to Area-2012-15

Year	2012	2013	2014	2015			
Name	Ranking	Name	Ranking	Name	Ranking	Name	Ranking
Sargodha	92.00	Vehari	93.33	Vehari	92.67	Haripur	91.00
Quetta	92.33	Haripur	93.67	Rawalpindi	93.67	Sahiwal	92.67
Haripur	94.33	Swabi	95.00	Swabi	94.33	Sargodha	93.00
Lower Dir	96.00	Sahiwal	96.00	Sahiwal	96.67	Quetta	93.33
Sahiwal	96.67	Lower Dir	96.67	Lower Dir	97.67	Swabi	95.67
Larkana	99.33	Gujrat	100.00	Karachi	98.33	Rawalpindi	96.00
Karachi	99.67	Karachi	100.00	Gujrat	99.33	Gujrat	99.00
Abbottabad	99.67	Larkana	100.67	Malakand	100.00	Lower Dir	99.33
Gujrat	99.67	Malakand PA	101.33	Larkana	100.33	Larkana	101.33
Faisalabad	101.67	Multan	101.67	Mardan	101.00	Malakand PA	101.67
Sialkot	101.67	Sialkot	102.67	Multan	102.67	Sialkot	103.00
Malakand PA	102.00	Abbottabad	103.00	Charsadda	102.67	Mardan	103.00
Mardan	103.00	Mardan	103.00	Sialkot	103.00	Charsadda	103.00
Gujranwala	103.00	Charsadda	103.33	Abbottabad	103.33	Multan	104.33
Bannu	104.33	Gujranwala	103.33	Gujranwala	104.00	Abbottabad	105.67
Charsadda	104.67	Bannu	104.67	Faisalabad	107.00	Gujranwala	105.67
Multan	106.33	Faisalabad	107.33	Hyderabad	107.33	Karachi	105.67
Hyderabad	108.33	Hyderabad	108.00	Bannu	108.00	Bannu	107.67
Peshawar	112.00	Peshawar	112.00	Peshawar	112.00	Faisalabad	108.33
Lahore	113.00	Lahore	113.00	Lahore	113.00	Hyderabad	108.67
						Peshawar	113.33
						Lahore	114.33

Table A4: Continued: Ranking Districts by the Availability of Public Healthcare Resources with respect to Area-2016

Year	2016	2016	2016
Name	Ranking	Name	Ranking
Awaran	1.67	Bahawalpur	44.33
Washuk	2.00	Badin	44.67
Chagai	2.33	D.I.Khan	45.00
Khuzdar	5.67	Karak	46.00
Panjour	6.33	Khushab	46.33
Tor Ghar	7.00	D.G.Khan	48.00
Kharan	8.00	Chakwal	51.67
Sheerani	8.33	Layyah	52.67
Zhob	9.00	Upper Dir	54.00
Gwadar	11.33	Kashmore	54.67
Dera Bugti	11.67	Attock	55.00
Kech	13.67	T.M.Khan	55.67
Las Bela	14.67	Muzaffargarh	55.67
Nushki	15.33	Jacobabad	56.33
Barkhan	16.00	Bahawalnagar	58.33
Musakhel	16.67	Lakki Marwat	59.67
Killa Saifullah	17.00	Mianwali	61.67
Chitral	18.33	Tank	63.00
Kohlu	22.00	Chiniot	64.00
Kalat	22.00	Jhang	67.33
Kohistan	22.33	Hafizabad	68.33
Jamshoro	25.00	Swat	68.33
Ziarat	25.00	R.Y.Khan	70.00
Harnai	25.67	Batagram	71.00
Sibi	26.33	T.Allah Yar	71.00
Nasirabad	26.67	Lodhran	71.67
Tharparkar	27.33	Buner	72.00
Jhal Magsi	27.67	Hangu	72.33
Kachhi	28.00	Kohat	72.67
Thatta	28.33	Khanewal	74.00
Rajanpur	29.00	Shikarpur	74.67
Pishin	30.00	Mirpur Khas	75.67
Sanghar	31.33	M.Bahauddin	76.33
Mastung	32.33	Shangla	76.33
Sujawal	32.67	Mansehra	76.67
Loralai	33.67	Jaffarabad	77.00
K.Abdullah	33.67	Jhelum	77.00
Khairpur	35.33	S.Benazirabad	77.33
Ghotki	38.33	N.Feroze	80.00
Shahdadkot	39.33	Pakpattan	81.33
Dadu	41.67	Sheikhupura	81.67
Bhakkar	43.67	Matari	82.00
Umerkot	43.67	Narowal	83.00
Sukkur	44.33	Kasur	85.33
		Okara	85.33
		Vehari	88.33
		T.T.Singh	89.33
		Nowshera	89.67
		Sargodha	92.33
		Nankana	93.00
		Quetta	93.33
		Haripur	93.67
		Abbottabad	96.67
		Rawalpindi	97.67
		Swabi	98.00
		Sahiwal	98.00
		Lower Dir	99.33
		Gujrat	101.33
		Larkana	101.67
		Malakand PA	102.33
		Mardan	102.67
		Charsadda	104.33
		Gujranwala	104.33
		Sialkot	105.00
		Multan	105.00
		Bannu	105.33
		Karachi	105.67
		Hyderabad	108.67
		Faisalabad	109.33
		Peshawar	113.33
		Lahore	114.33

Table A5: Changes in District Ranking From 2008-2016

Name	Change in District Rankings by Availability of Healthcare Resources	Name	Change in District Rankings by Availability of Healthcare Resources by Population	Name	Change in District Rankings by Availability of Healthcare Resources by Area
Thatta	-39.0	Thatta	-43.0	Thatta	-25.0
Sanghar	-20.0	Karachi	-34.3	Sanghar	-13.3
Abbottabad	-14.3	Sanghar	-34.0	T.M.Khan	-8.0
Badin	-14.0	Nasirabad	-26.0	Badin	-8.0
Kohat	-13.0	Badin	-22.0	Kohat	-7.7
Sukkur	-9.0	Khuzdar	-20.7	Shikarpur	-7.7
Las Bela	-9.0	Dera Bugti	-19.0	Karak	-7.7
Shikarpur	-8.7	Kech	-18.7	Abbottabad	-6.7
Sheikhupura	-8.0	Las Bela	-16.7	Sheikhupura	-5.3
Charsadda	-7.7	Abbottabad	-16.0	Sukkur	-5.3
Mirpur Khas	-6.3	Kohat	-15.3	Nasirabad	-5.3
Pishin	-6.3	Pishin	-13.7	Jacobabad	-4.7
Sibi	-6.3	Ghotki	-13.0	Rawalpindi	-4.3
Nasirabad	-6.3	Sukkur	-12.3	D.I.Khan	-4.0
Gwadar	-5.7	D.I.Khan	-12.0	Sibi	-3.7
Jacobabad	-5.3	Khairpur	-12.0	Hafizabad	-3.7
Larkana	-5.0	Sheikhupura	-11.0	Kachhi	-3.3
Kachhi	-4.7	Charsadda	-10.7	Dera Bugti	-3.3
Zhob	-4.3	Jhang	-10.0	Mansehra	-3.0
Chagai	-3.7	Shikarpur	-9.3	Mirpur Khas	-2.7
Mansehra	-3.3	Kalat	-9.0	Las Bela	-2.3
Chiniot	-3.3	Chiniot	-9.0	Ziarat	-2.0
Narowal	-3.0	T.M.Khan	-9.0	Gwadar	-1.7
Ghotki	-3.0	Ziarat	-8.0	Muzaffargarh	-1.7
Khuzdar	-3.0	Mirpur Khas	-8.0	Khushab	-1.3
Jamshoro	-3.0	Chagai	-7.7	Pishin	-1.3
Kech	-3.0	Mansehra	-7.3	Khuzdar	-1.3
Kalat	-3.0	Karak	-7.3	Zhob	-1.3
T.M.Khan	-2.7	Muzaffargarh	-6.3	Layyah	-1.3
Dera Bugti	-2.7	Gwadar	-5.7	Benazirabad	-1.0
N.Feroze	-2.3	K.Saifullah	-5.3	Ghotki	-1.0
K.Saifullah	-2.3	Hafizabad	-4.7	Khairpur	-1.0
Hyderabad	-2.0	Jacobabad	-4.7	Chagai	-1.0
Khairpur	-1.3	Zhob	-4.7	Charsadda	-0.7
Ziarat	-1.3	Larkana	-4.0	Chiniot	-0.7
Awaran	-1.0	N.Feroze	-4.0	N.Feroze	-0.3
Karak	-1.0	Lakki Marwat	-4.0	K.Saifullah	-0.3
Barkhan	-0.7	Quetta	-3.3	Jamshoro	-0.3
Rawalpindi	-0.7	Jamshoro	-2.7	Kalat	-0.3
Batagram	-0.3	M.Bahauddin	-2.7	Awaran	-0.3
D.I.Khan	0.0	Killa Abdullah	-2.3	Swat	-0.3
Sheerani	0.0	Kohlu	-1.7	Hangu	-0.3

Table A5: Table continued: Changes in District Ranking From 2008-2016

Name	Change in District Rankings by Availability of Healthcare Resources	Name	Change in District Rankings by Availability of Healthcare Resources by Population	Name	Change in District Rankings by Availability of Healthcare Resources by Area
Kharan	0.0	Peshawar	-1.0	Kech	0.0
Khushab	0.3	Kharan	-1.0	Chitral	0.0
Layyah	0.3	Qambar Shahdadt	-1.0	Batagram	0.0
Jhal Magsi	0.3	Hangu	-0.7	Sargodha	0.0
Washuk	0.3	Multan	-0.3	Panjgur	0.0
Hafizabad	0.3	Batagram	-0.3	Jhal Magsi	0.3
Loralai	0.7	Rawalpindi	-0.3	Sheerani	0.3
Multan	1.0	Faisalabad	0.3	Washuk	0.3
Chitral	1.3	Buner	0.3	Kharan	0.3
Panjgur	1.3	Kasur	0.3	Jaffarabad	0.3
Jhang	1.3	Layyah	0.3	Loralai	0.7
Dadu	1.7	Kachhi	0.7	Attock	1.0
Hangu	1.7	Hyderabad	1.0	Multan	1.0
Peshawar	2.0	Sargodha	1.0	Quetta	1.0
Matiari	2.0	Sheerani	1.0	Dadu	1.3
Quetta	2.0	D.G.Khan	1.3	Gujranwala	1.3
Muzaffargarh	2.0	Gujranwala	1.7	Qambar Shahdadt	1.7
M.Bahauddin	2.3	Swat	1.7	Kohlu	2.3
Harnai	2.3	Loralai	1.7	Narowal	2.3
Sialkot	2.3	Panjgur	2.7	Faisalabad	2.3
Nankana	2.3	Sibi	2.7	Lahore	2.3
Lakki Marwat	2.7	Sialkot	3.0	Jhelum	2.3
Faisalabad	2.7	Rajanpur	4.0	Buner	2.3
Lahore	2.7	Benazirabad	4.3	Mardan	2.7
Benazirabad	3.0	Dadu	4.7	Hyderabad	2.7
Sargodha	3.0	Bahawalnagar	5.0	Larkana	2.7
Gujranwala	3.0	Chitral	5.0	Bahawalnagar	2.7
Jhelum	3.0	Jhal Magsi	5.7	Peshawar	2.7
Kohlu	3.0	Okara	5.7	Gujrat	2.7
Nushki	3.3	Attock	5.7	M.Bahauddin	3.0
Sahiwal	3.7	Barkhan	5.7	Barkhan	3.0
Bahawalpur	3.7	Narowal	6.3	Lakki Marwat	3.0
Nowshera	3.7	Bannu	6.7	Bhakkar	3.3
Jaffarabad	3.7	Lahore	7.0	Nankana	3.3
Buner	3.7	Bahawalpur	7.0	Mastung	3.7
Qambar Shahdadt	3.7	Nowshera	7.0	Rajanpur	3.7
D.G.Khan	3.7	Tharparkar	7.7	Shangla	4.0
Mastung	4.0	Lower Dir	8.0	Nowshera	4.3
Attock	4.0	Khanewal	8.7	Sahiwal	4.3
Rahim Yar Khan	4.3	Lodhran	8.7	Bahawalpur	4.7
Musakhel	4.3	Rahim Yar Khan	8.7	Malakand	4.7

Note: For table notes please consult table 2.7

Table A5: Table Continued: Changes in District Ranking From 2008-2016

Name	Change in District Rankings by Availability of Healthcare Resources	Name	Change in District Rankings by Availability of Healthcare Resources by Population	Name	Change in District Rankings by Availability of Healthcare Resources by Area
Gujrat	4.3	Shangla	8.7	Bannu	5.0
Shangla	4.7	Jaffarabad	9.0	Sialkot	5.0
Karachi	5.0	Khushab	9.0	D.G.Khan	5.0
Bahawalnagar	5.3	Sujawal	10.3	Lodhran	5.3
Swat	6.0	Malakand	10.3	Kasur	5.3
Tharparkar	6.0	Upper Dir	10.7	Rahim Yar Khan	5.3
Upper Dir	7.0	Sahiwal	10.7	Karachi	5.7
Pakpattan	7.3	Pakpattan	11.3	Chakwal	5.7
Vehari	7.3	Mardan	11.3	Sujawal	6.0
Mardan	7.7	Nankana	12.3	Musakhel	6.3
Kasur	7.7	Bhakkar	12.3	Nushki	6.3
Tank	7.7	Mastung	12.3	Killa Abdullah	6.3
Okara	7.7	Awaran	12.7	Haripur	6.7
Bhakkar	8.3	Jhelum	13.3	Lower Dir	6.7
Rajanpur	9.0	Gujrat	13.7	Matiali	7.0
Khanewal	9.3	Kashmore	14.0	Upper Dir	7.3
Killa Abdullah	9.7	Toba Tek Singh	14.0	Pakpattan	7.3
Malakand	9.7	Tank	15.7	Tank	7.7
Lodhran	9.7	Vehari	16.3	Okara	8.0
Toba Tek Singh	11.0	Matiali	17.3	Kohistan	8.0
Bannu	11.3	Tando Allah Yar	17.7	Mianwali	8.3
Tando Allah Yar	12.0	Haripur	18.7	Jhang	8.7
Sujawal	12.7	Musakhel	20.0	Harnai	9.3
Mianwali	13.0	Chakwal	20.7	Umerkot	9.3
Chakwal	13.0	Umerkot	21.7	Vehari	9.7
Lower Dir	14.0	Mianwali	22.7	Kashmore	10.0
Kashmore	15.3	Nushki	24.0	Toba Tek Singh	10.3
Haripur	18.0	Washuk	29.0	Khanewal	10.7

Table A6: Public Healthcare Services Availability Index by Districts-2016

Name	Ranking	Name	Ranking	Name	Ranking
Umerkot	18.0	Swabi	29.7	Tando Allah Yar	11.0
Kohistan	18.0	Kohistan	34.0	Tharparkar	12.0
Swabi	22.3	Harnai	36.0	Swabi	16.3
Qambar Shahdaddock	1.243318	Sialkot	2.139432	Sargodha	3.060388
Kashmore	1.292057	K.Saifullah	2.156896	Bannu	3.073408
Badin	1.341947	Gujranwala	2.175447	Sahiwal	3.07379
Karachi	1.350453	Dadu	2.199592	Nushki	3.073948
Nasirabad	1.368838	Umerkot	2.221825	Jaffarabad	3.118151
Ghotki	1.375695	N.Feroze	2.260492	Mianwali	3.122882
Sanghar	1.384623	Mardan	2.271774	Kohat	3.123205
Tharparkar	1.39444	Hangu	2.275822	Faisalabad	3.170098
Muzaffargarh	1.451564	Swabi	2.300023	S.Benazirabad	3.322512
K.Abdullah	1.485801	Shikarpur	2.312129	Zhob	3.392153
T.M.Khan	1.590066	Kohistan	2.346069	Haripur	3.42604
Khanewal	1.622324	T.T.Singh	2.364715	Awaran	3.436412
Chiniot	1.626719	Buner	2.371731	Gwadar	3.450075
Sheerani	1.670762	Las Bela	2.409166	Rawalpindi	3.456237
Kasur	1.693758	D.I.Khan	2.411374	Jhelum	3.508498
Rajanpur	1.723805	D.G.Khan	2.430078	Musakhel	3.603964
Sheikhupura	1.757033	Layyah	2.468971	Tank	3.621461
Jacobabad	1.7842	Batagram	2.485356	Kachhi	3.789056
Lodhran	1.795986	Matari	2.50453	Mastung	3.799554
Sukkur	1.851319	Thatta	2.521452	Ziarat	4.071609
Khuzdar	1.851376	Shangla	2.588484	Karak	4.15239
T.Allah Yar	1.879732	Upper Dir	2.613897	Chagai	4.193162
Okara	1.891992	Panjour	2.641247	Bahawalpur	4.240601
Mirpur Khas	1.897553	Nankana	2.649724	Larkana	4.241935
Pishin	1.905901	Attock	2.681191	Sujawal	4.275264
Pakpattan	1.910066	Bhakkar	2.683321	Kohlu	4.37099
Charsadda	1.918922	R.Y.Khan	2.686937	Malakand PA	4.488746
Vehari	1.93551	Kalat	2.721802	Abbottabad	4.502923
M.Bahauddin	1.999122	Lakki Marwat	2.744796	Chitral	4.585298
Dera Bugti	1.999882	Swat	2.74493	Harnai	5.061468
Narowal	2.009963	Lower Dir	2.798954	Hyderabad	5.089991
Nowshera	2.033818	Washuk	2.807011	Jhal Magsi	5.158501
Barkhan	2.051992	Khushab	2.889238	Loralai	5.169711
Jhang	2.061492	Mansehra	2.893597	Kharan	5.581823
Hafizabad	2.079808	Chakwal	2.898055	Peshawar	5.704706
Khairpur	2.098554	Gujrat	2.927172	Lahore	6.253607
Kech	2.124039	Jamshoro	2.974816	Quetta	6.604298
Bahawalnagar	2.137941	Multan	3.014782	Sibi	8.453212

Note: For table notes please consult table 2.10.

Appendix Chapter 3

Table B1: Characteristics of PSLM survey data set (2008-2015)

Variable/Information	Characteristics of PSLM survey data set			
	2008-09	2010-11	2012-13	2014-2015
Individuals	499739	499215	492632	513009
Households	75188	76546	75516	78635
Number of Districts	110	114	114	114
Public Healthcare utilization	24.22%	24.60%	24.56%	25.69%
Basic Healthcare unit utilization	68.46%	61.03%	52.28%	59.09%
Public Healthcare utilization for Prenatal care	28.27%	33.11%	31.71%	32.28%
Public Healthcare utilization for Childbirth	10.05%	12.87%	16.07%	13.96%
Public Healthcare utilization for Postnatal care	21.10%	25.13%	28.01%	28.10%

Table B2: List of Districts

1	Abbotabad	32	Jafarabad	63	Mardan	94	Sukkur
2	Attock	33	Jamshoro	64	Mastung	95	Swabi
3	Awaran	34	Jhal magasi	65	Matiari	96	Swat
4	Badin	35	Jhang	66	Mianwali	97	Toba Tek Singh
5	Bahawalnagar	36	Jhelum	67	Mirpurkhas	98	Tando Allahyar
6	Bahawalpur	37	Kalat	68	Multan	99	Tando Muhammad Khan
7	Bakhar	38	Karachi	69	Muzzafargarh	100	Tank
8	Bannu	39	Karak	70	Nankana	101	Tharparkar
9	Barkhan	40	Kashmore	71	Narowal	102	Thatta
10	Batagram	41	Kasur	72	Naseerabad	103	Upperdir
11	Bolan/kech	42	Khairpur	73	Naushahro feroze	104	Vehari
12	Buner	43	Khanewal	74	Nowshera	105	Washuk
13	Chagai	44	Kharan	75	Nushki	106	Zhob
14	Chakwal	45	Khusahab	76	Okara	107	Ziarat
15	Charsada	46	Khuzdar	77	Pakpattan		
16	Chitral	47	Killa abdullah	78	Peshawar		
17	D.G.Khan	48	Killa saifullah	79	Pishin		
18	D.I.Khan	49	Kohat	80	Quetta		
19	Dadu	50	Kohistan	81	Rahimyar		
20	Dera bugti	51	Kohlu	82	Rajanpur		
21	Faisalabad	52	Lahore	83	Rawalpindi		
22	Ghotki	53	Lakki marwat	84	Sahiwal		
23	Gujranwala	54	Larkana	85	Sanghar		
24	Gujrat	55	Lasbela	86	Sargodha		
25	Gwadar	56	Layyah	87	Shahdadkot		
26	Hafizabad	57	Lodran	88	Shaheed benazir abad		
27	Hangu	58	Loralai	89	Shangla		
28	Haripur	59	Lowerdir	90	Sheikupura		
29	Hyderabad	60	Malakand	91	Shikarpur		
30	Islamabad	61	Mandibhuddin	92	Sialkot		
31	Jacobabad	62	Manshera	93	Sibbi		

Table B3: Within, Between and overall variations

Variables		Mean	Std. Dev.	Min	Max	No of Dist
Public Healthcare utilization	Overall	0.30	0.18	0.00	0.97	428.00
	Between		0.14	0.08	0.67	107.00
	Within		0.11	-0.13	0.75	4.00
Basic Healthcare unit utilization	Overall	0.65	0.22	0.09	1.00	428.00
	Between		0.18	0.21	0.93	107.00
	Within		0.13	0.13	1.00	4.00
Public Healthcare utilization for Prenatal care	Overall	0.36	0.19	0.00	0.96	428.00
	Between		0.16	0.07	0.69	107.00
	Within		0.11	-0.12	0.78	4.00
Public Healthcare utilization for Postnatal care	Overall	0.30	0.21	0.00	1.00	428.00
	Between		0.16	0.05	0.76	107.00
	Within		0.13	-0.19	0.93	4.00
Public Healthcare utilization for childbirth	Overall	0.14	0.11	0.00	0.50	428.00
	Between		0.09	0.01	0.48	107.00
	Within		0.06	-0.06	0.37	4.00
Distance from the Nearest Healthcare Facility	Overall	1.31	0.22	1.00	1.97	428.00
	Between		0.19	1.00	1.92	107.00
	Within		0.11	0.93	1.75	4.00
Population	Overall	159.95	184.17	11.59	1486.19	428.00
	Between		184.31	12.06	1378.31	107.00
	Within		13.61	55.70	267.83	4.00
Household Size	Overall	7.99	1.16	5.51	13.31	428.00
	Between		1.04	6.16	11.47	107.00
	Within		0.52	4.76	9.88	4.00
Dependency ratio	Overall	1.14	0.16	0.72	1.82	428.00
	Between		0.14	0.75	1.40	107.00
	Within		0.09	0.63	1.56	4.00
Education	Overall	0.41	0.12	0.10	0.73	428.00
	Between		0.12	0.15	0.71	107.00
	Within		0.03	0.31	0.53	4.00
Income	Overall	4.88	2.89	0.03	16.67	428.00
	Between		2.30	0.20	11.02	107.00
	Within		1.76	-1.02	12.82	4.00
luminosity/Development	Overall	6.25	6.45	0.00	39.33	428.00
	Between		6.39	0.02	36.63	107.00
	Within		1.02	2.12	9.90	4.00
Conflict related incidents	Overall	0.43	0.50	0.00	1.00	428.00
	Between		0.39	0.00	1.00	107.00
	Within		0.31	-0.32	1.18	4.00
Natural Disasters	Overall	0.16	0.37	0.00	1.00	428.00
	Between		0.22	0.00	0.75	107.00
	Within		0.29	-0.59	0.91	4.00

Table B4: Hausman Test For Model Selection (FE vs RE)

For General Healthcare consultation model

Test: Ho: difference in coefficients not systematic

$$\text{chi2}(12) = (b-B)'[(V_b-V_B)\hat{(-1)}](b-B)$$

72.35

Prob χ^2 = 0.0000
(V_b-V_B is not positive definite)

For Primary Healthcare consultation

Test: Ho: difference in coefficients not systematic

$$\text{chi2}(12) = (b-B)'[(V_b-V_B)\hat{(-1)}](b-B)$$

21.86

Prob χ^2 = 0.0391
(V_b-V_B is not positive definite)

Appendix Chapter 4

Table C1: First Stage Results

Average over all remittances in a psu excluding the ith household	0.14***		
	0.0050		
Average Foreign remittances in a psu excluding the ith household		0.067***	
		0.0032	
Average Domestic remittances in a psu excluding the ith household			0.12***
			0.0038
F-stat	160.17	78.78	90
Prob	0.00	0.00	0.00
Adjusted R-square	0.327	0.1918	0.2127
Observations	43,904	43,904	43,904
Controls	Yes	Yes	Yes

Note: First Stage estimates for the instruments used in the analysis

Table C2: Baseline estimates- Effects of Remittances on Private Healthcare Use-Full table

Variables	OLS			IV-poisson			IV-Reg		
	1	2	3	4	5	6			
Remittance	1.25357 (0.13104)***	1.11931 (0.15534)***	0.22332 (0.00508)***	0.20501 (0.00849)***	9.52996 (0.52257)***	10.8096 (1.30496)***			
Location		1.69311 (0.64063)***		-0.24202 (0.01356)***		0.79742 -0.67959			
Education		4.79388 (0.51906)***		0.03773 (0.01277)***		4.13987 (0.54863)***			
Maratial-status		2.28975 (0.98773)**		-0.08086 (0.02203)***		-3.34634 (1.27946)***			
Gender		-4.49012 (1.14050)***		0.48315 (0.03395)***		13.50153 (2.68801)***			
Income		0.35423 (0.07551)***		0.03893 (0.00224)***		1.56959 (0.18260)***			
Age		-0.01208 -0.01921		0.00352 (0.00055)***		-0.11445 (0.02455)***			
Household Size		0.45471 (0.09382)***		0.08053 (0.00245)***		0.11699 -0.11012			
Dependency Ration		-0.33165 -0.29368		0.11083 (0.00652)***		-0.24851 -0.30773			
Distance		-1.83236 (0.50889)***		0.05225 (0.01255)***		-1.59847 (0.53128)***			
Constant	63.6496 (0.27149)***	54.50583 (3.37924)***	-1.69491 (0.01037)***	-2.98593 (0.04761)***	58.26291 (0.43967)***	20.05342 (5.82515)***			
District Dummies	No	Yes	No	No	No	Yes			
Observations	45475	43904	160041	143086	45475	43904			

Note: For table notes please see table 4.3

Table C3: Effects of Foreign and Domestic Remittances on Private Healthcare Use-Full Table

	Foreign Remittance				Domestic Remittances			
	OLS	IV-Reg	IV-Reg	OLS	OLS	IV-Reg	IV-Reg	OLS
	1	2	3	4	5	6	7	8
Remittance	1.76755	1.77199	11.9947	16.5652	0.72298	0.22566	10.6373	8.03146
	(0.18717)***	(0.20414)***	(0.95155)***	(2.45752)***	(0.16849)***	-0.1838	(0.68768)**	(1.29160)***
Location	1.77053	(0.64006)***	1.55308	(0.67791)**	1.77903	(0.64128)***	1.17227	(0.65978)*
Education	4.72466	(0.51883)***	3.51609	(0.57872)***	4.87263	(0.51922)***	4.98353	(0.52963)***
Marital-status	2.51202	(0.98532)**	-1.0672	-1.2237	2.86411	(0.98929)***	0.21273	-1.0981
Gender	-5.1935	(1.10758)***	6.2844	(2.27975)***	-6.3244	(1.12190)***	2.11194	-1.8062
Income	0.32571	(0.07417)***	1.25959	(0.17544)***	0.2279	(0.07360)***	0.71413	(0.11122)***
Age	-0.0079	-0.0192	-0.072	(0.02320)***	-0.0017	-0.0192	-0.0503	(0.02110)**
Household Size	0.43372	(0.09392)***	-0.1328	0.15093	(0.09374)***	-0.346	0.48577	(0.09623)***
Dependency Ration	-0.2935	-1.8792	(0.50881)***	-0.3214	-2.0444	(0.53580)***	-0.511	(0.30432)*
Distance	63.9987	56.3003	61.2977	38.058	64.1859	57.9614	-1.5758	(0.51911)***
Constant	(0.25806)***	(3.33966)***	(0.36524)***	(4.82026)***	(0.26248)***	(3.36522)***	60.3515	39.8347
District Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Observations	45475	43904	45475	43904	45475	43904	45475	43904

Note: For table notes please see table 4.4

Table C4: Effects of Remittances on Private Healthcare Use (Allopathic Consultation)–Full table

	OLS			IV-poisson			IV-Reg		
	1	2	3	4	5	6			
Remittance	0.94439 (0.13872)***	1.20323 (0.16263)***	0.22332 (0.00508)***	0.20501 (0.00849)***	7.07253 (0.54847)***	11.2706 (1.35102)***			
Location		5.0717 (0.66758)***		-0.242 (0.01356)***		3.94763 (0.71677)***			
Education		5.09768 (0.54535)***		0.03773 (0.01277)***		4.2808 (0.58078)***			
Maratial-status		2.91533 (1.04561)***		-0.0809 (0.02203)***		-2.841 (1.33741)**			
Gender		-4.8411 (1.20046)***		0.48315 (0.03395)***		13.1956 (2.71736)***			
Income		0.43302 (0.07978)***		0.03893 (0.00224)***		1.70124 (0.19074)***			
Age		-0.0138 (0.00203)		0.00352 (0.00055)***		-0.12 (0.02578)***			
Household Size		0.5127 (0.10027)***		0.08053 (0.00245)***		0.18859 (0.1162)			
Dependency Ration		-0.2779 (0.53289)***		0.11083 (0.01255)***		-0.2312 (0.55848)***			
Distance		-0.3109 (0.53289)***		0.05225 (0.01255)***		-0.3273 (0.55848)***			
Constant	66.2384 (0.28812)***	51.2305 (3.48742)***	-1.6949 (0.01037)***	-2.9859 (0.04761)***	62.2382 (0.46662)***	16.0284 (5.96526)***			
District Dummies	No	Yes	No	No	No	Yes			
Observations	39476	39321	160041	143086	39476	39321			

Note: For table notes please see table 4.5

Table C5: Effects of Foreign and Domestic Remittances on Private Healthcare Use (Allopathic Consultation)-Full Table

	Foreign Remittance				Domestic Remittances			
	OLS	IV-Reg	OLS	IV-Reg	OLS	IV-Reg	OLS	IV-Reg
	1	2	3	4	5	6	7	8
Remittance	1.4983 (0.19510)***	1.95889 (0.21259)***	6.80108 (0.95547)***	17.9613 (2.57147)***	0.39633 (0.18063)**	0.18866 (-0.1939)	7.95429 (0.72807)***	7.63224 (1.34079)***
Location		5.17149 (0.66663)***		4.88919 (0.71376)***		5.1883 (0.66824)***		4.48851 (0.68924)***
Education		5.02584 (0.54518)***		3.64139 (0.61779)***		5.19633 (0.54564)***		5.23633 (0.55474)***
Marital-status		3.09641 (1.04294)***		-1.0445 (-1.3279)		3.54426 (1.04743)***		1.21433 (-1.1419)
Gender		-5.454 (1.16917)***		7.14945 (2.43577)***		-6.8074 (1.18136)***		0.666 (-1.8047)
Income		0.40948 (0.07829)***		1.45543 (0.18932)***		0.29288 (0.07775)***		0.74405 (0.11467)***
Age		-0.0098 (-0.0202)		-0.0808 (0.02481)***		-0.0023 (-0.0202)		-0.0478 (0.02209)**
Household Size		0.48627 (0.10035)***		-0.0461 (-0.1412)		0.55164 (0.10029)***		0.55964 (0.10270)***
Dependency Ration		-0.2322		0.18711		-0.2876		-0.4481
Distance		-0.3106 (0.53275)***		-0.3432 (0.56500)***		-0.3114 (0.53341)***		-0.3211 (0.54240)***
Constant	66.4465 (0.27420)***	52.9239 (3.44825)***	65.0011 (0.38609)***	32.3876 (5.14904)***	66.7042 (0.27823)***	55.0203 (3.47422)***	63.8306 (0.40540)***	38.5451 (4.69952)***
District Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Observations	39476	39321	39476	39321	39476	39321	39476	39321

Note: For table notes please see table 4.6

Table C6: Sub-Sample Estimates base on location

	Urban				Rural			
	OLS	IV-Reg	OLS	IV-Reg	OLS	IV-Reg	OLS	IV-Reg
	1	2	3	4	5	6	7	8
Remittance	1.30491 (0.27912)***	1.53087 (0.31096)***	11.6889 (1.31153)***	18.0301 (2.56639)***	1.50681 (0.14823)***	0.86088 (0.17830)***	10.7184 (0.56350)***	5.74931 (1.60030)***
Education		6.39916 (0.91939)***		4.83499 (1.03531)***		3.96495 (0.62103)***		3.62863 (0.63471)***
Maratial-status		2.19578 -1.704		-4.1518 (2.14712)*		1.6646 -1.1985		-1.0812 -1.5037
Gender		-3.2233		14.7002		-5.4514		5.89
Income		-2.0517 0.40584		(3.66483)*** 2.24271		(1.36262)*** 0.27727		-3.9267 0.90709
Age		(0.13173)*** -0.0135		(0.32362)*** -0.0825		(0.09011)*** -0.0046		(0.22563)*** -0.0815
Household Size		-0.0337 0.59996		(0.04005)** 0.42257		-0.0232 0.38204		(0.03448)** 0.14367
Dependency Ration		(0.16691)*** 0.98506		(0.19401)** 0.69711		(0.11332)*** -1.0035		-0.1386 -0.799
Distance		(0.57834)* -6.311		-0.6413 -5.7596		(0.33251)*** 1.59737		(0.34229)** 1.61124
Constant		67.3936 (0.45029)***	49.3041 (9.63393)***	63.0895 (0.71553)***	-7.4484 -13.96	60.9892 (0.33496)***	53.5734 (0.55640)***	41.6443 (6.89724)***
District Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Observations	14428	14246	14428	14246	31047	29658	31047	29658

Note: For table notes please see table 4.7

Table C7: Sub-Sample Estimates base on Gender of the household Head

	Male				Female			
	OLS	IV-Reg	OLS	IV-Reg	OLS	IV-Reg	OLS	IV-Reg
	1	2	3	4	5	6	7	8
Remittance	1.19092 (0.15656)***	0.98115 (0.16876)***	12.8973 (0.74236)***	12.0162 (1.49998)***	1.30576 (0.34122)***	1.43313 (0.50126)***	2.31029 (0.70763)***	6.05663 (2.46656)***
Location		1.70274 (0.66540)**		1.02654 (-0.7065)		0.93194 (-2.3962)		1.08999 (-2.4645)
Education		4.95313 (0.53694)***		4.27566 (0.57042)***		1.85755 (-2.1543)		1.47345 (-2.0206)
Maratial-status		0.95311 (-1.1542)		2.21704 (1.21899)*		4.1145 (-2.8096)		-6.3554 (-5.9621)
Income		0.44377 (0.08484)***		1.63419 (0.18706)***		0.04507 (-0.1818)		0.53967 (0.28190)*
Age		-0.0017 (-0.02)		-0.1494 (0.02913)***		-0.0592 (-0.0905)		-0.0926 (-0.0845)
Household Size		0.42797 (0.09679)***		0.06158 (-0.116)		0.71191 (0.39726)*		-0.0064 (-0.4408)
Dependency Ration		-0.2003		0.48374		-1.7196		-1.7139
Distance		-0.3257 (-1.7409)		-0.3526 (-1.543)		(0.72588)** (-2.7822)		(0.64253)*** (-2.1897)
Constant	63.6328 (0.27654)***	49.1075 (3.84334)***	58.0502 (0.45361)***	28.448 (5.02346)***	64.0934 (1.42461)***	61.1704 (8.91646)***	61.2209 (2.33350)***	46.6128 (10.38255)***
District Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Observations	42009	40677	42009	40677	3466	3227	3466	3227

Note: For table notes please see table 4.8

Table C7: Sub-Sample Estimates base on Education of the household Head

	Educated				Non-Educated			
	OLS	IV-Reg	OLS	IV-Reg	OLS	IV-Reg	OLS	IV-Reg
	1	2	3	4	5	6	7	8
Remittance	1.36302 (0.18238)***	1.15579 (0.21125)***	10.2122 (0.79481)***	10.7693 (1.73899)***	1.37749 (0.18906)***	0.99834 (0.22988)***	9.03532 (0.67508)***	10.6628 (2.00472)***
Location		0.13544		-0.5748		3.97726		2.77924
		-0.8101		-0.8542		(1.05812)***		(1.12709)**
Maratial-status		2.48224		-0.9566		1.86376		-5.8222
		(1.43963)*		-1.6293		-1.3745		(2.12582)***
Gender		-3.6436		14.4465		-4.8875		13.116
		(1.79718)**		(3.78657)***		(1.52207)***		(4.01202)***
Income		0.38404		1.54047		0.29337		1.53417
		(0.09987)***		(0.23546)***		(0.11601)**		(0.28459)***
Age		-0.0152		-0.093		-0.0196		-0.1518
		-0.0268		(0.03190)***		-0.0279		(0.03963)***
Household Size		0.4984		0.14619		0.42957		0.09605
		(0.13195)***		-0.154		(0.13312)***		-0.1581
Dependency Ration		-0.0241		0.32071		-0.7168		-0.883
		-0.4227		-0.4428		(0.40931)*		(0.43045)**
Distance		-1.9585		-1.8089		-1.6503		-1.2596
		(0.67235)***		(0.70047)***		(0.77583)**		-0.8085
Constant	66.2509 (0.35377)***	55.5639 (4.40086)***	61.3007 (0.57942)***	19.2259 (7.98156)**	59.8608 (0.42210)***	61.5617 (5.21997)***	53.9199 (0.66854)***	27.2528 (9.06049)***
District Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Observations	25263	24473	25263	24473	20116	19431	20116	19431

Note: For table notes please see table 4.9

Table C8: Sub-Sample Estimates for Private or Public

	Overall			Foreign		Domestic		
	1	2	3	4	5	6	5	6
Remittance	10.103 (0.54502)***(1.34085)***(1.00954)***(2.55044)***(0.71513)***(1.34337)***	10.8285	13.0656	16.7313	11.1116	8.05366		
Location		0.66363 -0.7117		1.3244 (0.71019)*		1.06218 -0.6918		
Education		4.16541 (0.57298)***		3.51887 (0.60518)***		5.03958 (0.55385)***		
Marital-status		-3.4731 (1.33314)***		-1.2184 -1.2795		0.18074 -1.1447		
Gender		13.8492 (2.77429)***		6.84311 (2.38852)***		2.31309 -1.8659		
Income		1.54799 (0.18712)***		1.23423 (0.17926)***		0.70248 (0.11605)***		
Age		-0.1162 (0.02552)***		-0.0705 (0.02395)***		-0.0532 (0.02215)**		
Household Size		0.33299 (0.11811)***		0.15282 -0.1392		0.67418 (0.10570)***		
Dependency Ration		-0.3096 -0.3236		0.10678 -0.3376		-0.5698 (0.32068)*		
Distance		-1.633 (0.55433)***		-2.047 (0.55882)***		-1.6224 (0.54206)***		
Constant	58.5751 (0.45651)***(6.00542)***(0.37996)***(5.00213)***(0.40075)***(4.79655)***	19.0313	61.7251	36.8095	60.813	39.0718		
District Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Observations	43293	41733	43293	41733	43293	41733	43293	41733

Note: For table notes please see table 4.10

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