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# Spatial Differences and Socioeconomic Determinants of Health Poverty

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The study aims to develop health poverty index (HPI) using the Alkire Foster (AF) Method for Pakistan based on district representative data obtained from Pakistan Social and Living Standards Measurement (PSLM) 2012-13. Using HPI, this study investigates the spatial differences of health poverty at sub-national level and explores the socioeconomic determinants. The analysis reveals that the headcount health poverty is 41 percent in Pakistan. Further, the ratio is very high in rural areas (50 percent) as compared to urban areas (22 percent). Provincial analysis shows that Punjab is the least poor province (36 percent) while Balochistan is the poorest province (62 percent). The majority of the households are deprived in term of cost of health services, post-natal care and child immunisation. Empirical analysis shows that income, regional variation, education and awareness play very important role in explaining health poverty. To eradicate health deprivation, area and dimension specific policies are required to make efficient use of scarce resources.

*JEL Classification:* I12, I32, J18
*Keywords:* Health Poverty, Spatial Analysis, Alkire Foster Method

## 1. INTRODUCTION

It is evident that Pakistan has succeeded in reducing the headcount poverty from 64.4 percent in 2000-01 to 29.5 percent in 2013-14[1] [Pakistan (2016)]. In contrast, there is no significant improvement in social indicators such as health.[2] Pakistan has not succeeded to reduce significantly both the maternal mortality and child mortality rates over time. The maternal mortality ratio is very high as compared with other countries in

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[1]These estimates are based on new poverty line calculated using Cost of Basic Need (CBN) approach. Using CBN approach, the poverty line is Rs 3030 per adult equivalent per month using HIES 2013-14 data. While using old Food Energy Intake (FEI) methodology, poverty has declined from 34.4 percent in 2000-01 to 9.3 percent in 2013-14.

[2]There are many other social factors, such as education, sanitation, clean water, housing, violence and empowerment, which do not show significant improvement. This paper only focuses on health issues for detailed analysis.

the region (178 per 100,000 live births) in 2015 against 100 mentioned in MDG targets.[3] Similarly, infant mortality rate is very high in Pakistan (66 per 1,000 live births). Despite various reforms, Pakistan fails to provide health facilities according to MDGs requirements. Apart from low investment in health sector, rapid population growth is resulting in the inadequacy of health care facilities. The inadequacy of healthcare facilities is reflected as there are estimates of 1,038 persons against one Doctor and one Dentist versus 11,513 persons, while the current ratio of population and availability of hospital beds works out at 1,613 persons per bed in 2015-16 [Pakistan (2016)]. Another notable feature of health sector is the existence of inequalities in the provision of health facilities across Pakistan. For example average distance to reach the Basic Health Unit is 16 KM in KPK, 39 KM in Balochistan, 13 KM in Sindh and 8 KM in Punjab.[4]

Due to lack of health facilities and low investment, health poverty becomes a common phenomenon in developing countries like Pakistan. A wide range of factors determine the health status of a population which may give rise to health inequalities. Recently, the Oxford Poverty and Human Development Initiative (OPHI) developed Multidimensional Poverty Index (MPI) to reflect the multiple deprivations that a poor person faces with respect to education, health, and living standards for Pakistan. Health is quantified using access to health clinic, immunisation, ante-natal care and assisted delivery. This index covers limited dimensions of health poverty.

Literature has shown that health and health inequalities are influenced by various factors grouped into "root causes", "intervening factors" and "situation of health" each of which can be viewed at an individual-household level, local level or on a macro scale [Rolfe and Watson (2006)]. Root causes factors such as wealth, income, gender and education; intervening factors such as access to preventive healthcare, life style and home environment; and situation of health factors such as health capital, physical morbidity and premature mortality etc. are important in determining the overall progress in the health sector. It has been acknowledged widely that to measure health poverty, MPI is not an appropriate choice. To address health issue, there is a need to construct health poverty index which covers all possible dimensions of health in term of health provision as well as affordability of health services. This study addresses this gap by constructing a more comprehensive health poverty index for Pakistan.

This study aims to measure the health poverty in Pakistan at the national and sub-national level. Health poverty is a lack of access to health services. It refers to a situation where a household does not have access or cannot afford to have the basic health or health services to achieve sound health. More specifically, this study attempts to analyse the following objectives:

- To construct health poverty index (HPI) for Pakistan.
- To investigate the spatial differences of health poverty at sub-national level, and
- To explore the socio-economic determinants of health poverty.

The HPI, which is very comprehensive in term of indicator employed, provides useful information to identify the regional disparities in health provision and help to

[3]WHO, UNICEF, UNFPA, World Bank Group, and the United Nations Population Division. Trends in Maternal Mortality: 1990 to 2015. Geneva, World Health Organisation, 2015. [http://data.worldbank.org/indicator/SH.STA.MMRT]

[4]http://www.pbs.gov.pk/sites/default/files/aco/publications/pakistan-mouza-census2008/pakistan-tab15-A.pdf

design targeted measures to improve the health provisions in Pakistan. Vision 2025 highlights the importance of social sector development for the revival of sustainable and inclusive growth. This study helps in better allocation of PSDE to remove health inequalities for sustained and inclusive growth. This index can be used as a baseline to further improve MPI.

The rest of the paper is structured as follow: Section 2 presents important findings from existing literature; Section 3 describes data and methodology; Section 4 explains key findings while the last section spells out the important policy implications.

## 2. LITERATURE REVIEW

The available literature primarily uses human development index (HDI) to measure the wellbeing and living standards of people [Greeley (1994); McGillivray (1991)]. The HDI, however, was criticised for not measuring accurately the poverty and development because of its limited scope in covering various aspects of wellbeing. The HDI only uses one health indicator i.e. longevity while ignores the other health related aspects. Recently, attempts have been made to construct Multidimensional Poverty Index (MPI) to measure poverty [Alkire, Conconi, and Roche (2012); Alkire and Santos (2010); Chakravarty and Silber (2008)]. The MPI uses nutrition and child mortality as health indicators. These measures fail to capture health condition in appropriate manner. The government of Pakistan, in collaboration with OPHI and UNDP has developed MPI for Pakistan using three dimensions; health, education and standard of living. Health dimension is further expanded by including access to health clinic, immunisation, ante-natal care, and assisted delivery. Using PSLM data, the headcount of multidimensional poverty was 38.8 percent in 2014-15. Antony and Laxmaiah (2008) conclude that the HDI is not an appropriate measure to determine development, because despite improvement in the living condition, under-nutrition is still amongst the major health issues in India. To address the health issues, this study concludes that further research is required to developed comprehensive measure of health poverty. Few attempts have been made to construct Health Poverty Index (HPI) using several social, economic, medical and resource factors [Laudicella, Cookson, Jones, and Rice (2009); Spinakis, *et al.* (2011)]. Spinakis, *et al.* (2011) use standardised death rate, life expectancy at birth and self-perceived health to develop health inequality index. Nandi, *et al.* (2008) and Lasser, Himmelstein, and Woolhandler (2008) measured poverty based on the accessibility to health service along with other social and economic indicators like insurance, cost etc. This study further extends the use of indictors in constructing health poverty index including use and cost of health services, quality of health services and maternal and child health.

Empirical literature shows that various socio-economic factors contribute to health poverty, including demographic characteristics, occupation and income status, regional disparities, and infrastructure facilities [Claeson, Bos, Mawji, and Pathmanathan (2000); Drèze and Murthi (2001); Hughes and Dunleavy (2000); Navarro and Shi (2001); Pritchett and Summers (1996); Rutstein, Johnson, and Gwatkin (2000); Wagstaff (2002)]. Education plays significant role in improving health. Mirowsky and Ross (2003) argue that education influences the health outcome through factors of livelihood like occupation and income. Educational attainment leads to high income, better employment and quality living conditions hence improved health outcomes [Bloom (2007)].

Additional, infrastructure of cities, high density of houses, provision of and access to local public facilities and increased reliance on cars is causing population to become physically inactive and thus is the source of poor health [Friel, Chopra, and Satcher (2007)]. Wang (2002) investigated factors that affect health in low income countries disaggregated by geographic location. This study found a significant difference in health services between urban and rural areas, with high rate of mortality in rural areas. Further, evidence suggests that poor are concentrated in rural areas, therefore increase in health expenditure, vaccination and availability of basic necessities can reduce the health related poverty. Ramachandran, Kumar, and Viswanathan (2006) found that nutrition and health status are influenced by various socio-economic factors, include education, social infrastructure and quality of diet. Further this study shows that these factors contribute differently across rural and urban areas.

Poor health in rural areas is due to the fact that cost of seeking treatment is high in rural areas due to large distances, time and travel costs incurred, to reach the nearest health centre [Andersen and Newman (2005); Mwabu (2007)]. Difference in the health poverty level is also due to the regional difference based on the access to medical facilities that depend of the technological, human and drug resources, that are rarely available in the rural area [Barua (2013); Zhang and Kanbur (2005)]. Another study considered the distance and the time need to travel to the nearest health faculty as a contributing factor in increasing the health poverty [Schuurman, Fiedler, Grzybowski, and Grund (2006); Shen and Hsia (2010)]. This shows that geographical difference plays a major role in understanding the dynamics of health, and the causes and spread of disease [Parker and Campbell (1998); Sasaki, Comber, Suzuki, and Brunsdon (2010)]. Quality of health service broadly depends on the infrastructure, location of the health centre, availability of focal person, process and others. Attitude of individual to seek health care is also an important determinant of health poverty. Individual's predisposition also depends on the income and the possession of wealth. Many studies have investigated the effect of income on health seeking behaviour, individual choice for health care and health expenditure, whereas other studies investigated the effect on demand for health due to poverty [Awiti (2014)].

Various studies have used GIS based measure to investigate the geographical and spatial based factors to determine the effectiveness of health based resource allocation [Boulos (2004); McLafferty (2003)]. Ur-Rehman and Zimmer (2010) reveal that health poverty based spatial differences are clearly visible across Pakistan using GIS, even though the information available through internet is limited to certain social classes and groups. It is a general perspective that households with more favourable income situation enjoy better health [Shams (2013, 2014)]. Various studies have investigated the relationship between health and income, and conclude that the income inequality negatively affects health of the lower income group in society [Mellor and Milyo (2002); Shams (2014); Smith (1999); Wagstaff and Van Doorslaer (2000)]. Gerdtham and Johannesson (2004) considered morality as a contributing factor to measure health poverty. Ur-Rehman and Zimmer (2010) measured child health using maternal literacy, poverty, water and sanitation, nutritional level, vaccination coverage and mother's education. A study by Nawaz-ul-Huda, Burke, and Azam (2011) analysed the socio-economic disparities in Balochistan using multivariate analysis. Shams (2013) used

various socioeconomic factors like gender, education, income and age to measure health. This study aims to fill the gap in existing literature as few studies measured health poverty. This study explicitly examines the spatial differences across regions focusing on the health deprivation.

## 3. DATA AND METHODOLOGY

### 3.1. Data

To analyse the objectives stated above, this study uses various data sources including Pakistan Social and Living Standards Measurement (PSLM) Survey 2012-13 and MOUZA Statistics 2008. Health indicators have been taken at district level from PSLM Survey 2012-13 conducted by the Pakistan Bureau of Statistics (PBS). The PSLM survey is one of the main mechanisms for monitoring the implementation of the development projects and tracking of the MDGs. It provides a set of district level representative estimates of social indicators. The universe of survey consists of all urban and rural areas of the four provinces and Islamabad excluding military restricted areas. A Two-stage stratified sample design has been adopted in this survey. Population of all provinces is considered as the universal sample. Under the framework of PLSM each city/town was sub divided in to enumeration blocks. Each enumeration block comprises of 200-250 households and categorises into low, middle and high-income groups**.** Urban areas were divided into 26698 blocks and rural areas comprised of 50588 blocks. The sample size is 75,516 households, which is expected to produce reliable results at the district level. The area and province wise distribution is given below in Table 1.

Table 1

*Sample Distribution*

| | Sample SSUs | | |
|---|---|---|---|
| Province/Area | Urban | Rural | Total |
| Punjab | 12937 | 18979 | 31916 |
| Sindh | 8122 | 11358 | 19480 |
| KPK | 3133 | 9340 | 12473 |
| Balochistan | 2406 | 9241 | 11647 |
| Total | 26598 | 48918 | 75516 |

*Source:* PBS (2015).

### 3.2. Methodology

#### 3.2.1. *Construction of Health Poverty Index (HPI)*

To construct HPI, we have used Alkire, *et al.* (2012) methodology—recently used for the construction of MPI. The stepwise brief description of methodology is given below:

***Step 1: The Choice of Appropriate Indicators for Measuring HPI***

To quantify HPI, we have used indicators from five different health dimensions: include D1) use of health services; D2) quality of health services; D3) cost of health services; D4) maternal health; and D5) child health. To measure these dimensions, we

have used eight different health indicators.[5] D1 is determined by using two indicators, i.e. IND1) Doctor consulted during sick or injury and IND2) Assisted delivery. D2 is quantified by employing two indicators include IND3) Satisfaction with the use of health services and IND4) Institutional delivery. D3 is measured using one indicator, i.e. IND5) Time cost. D4 is determined using two indicators include IND6) Pre-natal care and IND7) Post-natal care. D5 is measured using one indicator IND8) Immunisation.

### *Step 2: Choosing the Indicators' Deprivation Cut-offs and Assigning the Weight to each Dimension and Indicator*

HPI requires a deprivation cut off for each indicator. The indicators' deprivation cut offs are noted as $z_i$, so that household $i$ is considered deprived if its achievement in that indicator $x_i$ is below the cut off, that is if $x_i < z_i$. Well founded reasons are needed to determine each cut-off. For this purpose global practices, national priorities, culture norms, and empirical evidences are used to define cut-offs. After selecting indicators and their corresponding cut-offs, the next task is to define the weight that each indicator will have in the measure. In the HPI five dimensions are equally weighted, so each of them receives a 1/5 weight. The indicators within each dimension are also equally weighted. Thus, each indicator within the D1, D2 and D4 dimension receives a 1/10 [1/5÷2] weight and each indicator within the D3 and D5 dimension receive 1/5. The Table 2 below provides the definition of each indicator with deprivation cut-off and their relative weights.[6] Here we note the indicator $i$ weight as $w_i$ with $\sum_1^8 w_i = 1$.

Table 2

*Weights and Deprivation Cut-off for each Indicator*

| Dimension | Indicator | Deprivation Cut-off | W |
|---|---|---|---|
| D1: Use of Health Services | IND1: Doctor consulted during sick or injury | Deprived if any person in the hh did not consult doctor during sickness or injury. hh with no sickness or injury non-deprived. | 1/10 |
| | IND2: Assisted delivery | Deprived if any woman has given birth in the hh (last 3 years) with untrained personnel (family member, friend, tba, etc.) or hh with no women that has given birth non-deprived. | 1/10 |
| D2:Quality of health services | IND3: Satisfaction with the use of health services | Deprived if person in hh did not use due to unsatisfactory quality or access constraints of health services. hh with not required is non-deprived | 1/10 |
| | IND4: Institutional delivery | Deprived if any woman has given birth in the hh (last 3 years) with inappropriate facility (home, other) - hh with no women that has given birth non-deprived. | 1/10 |
| D3: Cost of health services | IND5: Time cost | Hh is deprived if more than 30 minutes are required to reach the Health clinic/Hospital | 1/5 |
| D4: Maternal health | IND6: Pre-natal care | Deprived if any woman that has given birth in the hh (last 3 years) did not received prenatal check-ups - hh with no women that has given birth non-deprived. | 1/10 |
| | IND7: Post-natal care | Deprived if any woman that has given birth in the hh Did not receive post-natal care within 6 weeks after this delivery—hh with no women that has given birth non-deprived. | 1/10 |
| D5: Child health | IND8: Immunisation | Deprived if any child under 5 not fully immunised according to vaccinations calendar—hh with no children under 5 non-deprived. | 1/5 |

*Source:* Author's Own.

[5]The choice of indicators is restricted primarily due to availability of indicators from PSLM dataset and qualifying as an outcome variable not an input variable. Nutrition, life expectancy and child mortality are important indicators for measuring health poverty, but due to non-availability of data in PSLM, we did not include these variables in the construction of HPI.

[6]Appendix Table 1 provides the list of questions used in defining each indicator.

***Step 3: Choosing the Poverty Cut-off (to Identify the Poor)***

In this step, we assigned a deprivation score to household according to its deprivations in the component indicators. The deprivation score for each household is calculated by taking a weighted sum of the number of deprivations, so that the deprivation score for each household lies between 0 and 1. The score increase as the number of deprivations of the household increases and reaches its maximum of 1 when the household is deprived in all component indicators. A household, which is not deprived in any indicator, receives a score equal to 0. Formally:

$$c_i = w_1 IND_1 + w_2 IND_2 + w_3 IND_3 + w_4 IND_4 + w_5 IND_5 + w_6 IND_6 + w_7 IND_7 + w_8 IND_8$$

Or

$$c_i = \sum_1^8 w_i IND_i$$

Where $IND_i = 1$ if the household is deprived in indicator $i$ that is if $x_i < z_i$ and $IND_i = 0$ otherwise and $w_i$ is the weight attached to indicator $i$ with $\sum_1^8 w_i = 1$. A cut-off or threshold is used to identify the multidimensionally health poor, which in the AF methodology is called the poverty cut-off. In this study, we define the poverty cut-off as the share of (weighted) deprivations a household must have in order to be considered poor, and we will note it with $k$. Hence, a household is considered poor if its deprivation score is equal or greater than the poverty cut-off i.e. a household is poor if $c_i \geq k$. For those whose deprivation score is below the poverty cut-off, even if it is non-zero, this is replaced by a "0"; what we call censoring in poverty measurement. To differentiate between the original deprivation score from the censored one, we use of the censored deprivation score the notation $c_i(k)$. When $c_i \geq k$, then $c_i(k) = c_i$, but if $c_i \leq k$, then $c_i(k) = 0$. $c_i(k)$ is the deprivation score of the poor.

***Step 4: Computing the HPI***

According to this methodology, the HPI combines two key pieces of information: (1) the proportion or incidence of people (within a given population) who experience multiple deprivations, and (2) the intensity of their deprivation: the average proportion of (weighted) deprivations they experience. Formally, the first component is called the Health Poverty headcount ratio:

$$H = \frac{q}{n}$$

Where $q$ is the number of household who are multidimensional health poor and $n$ is the total number of households. The second component is called the intensity (or breadth) of poverty. It is the average deprivation score of the multidimensional health poor and can be expressed as:

$$A = \frac{\sum_{i=1}^{n} c_i(k)}{q}$$

Where $c_i$ ($k$) is the censored deprivation score of household $i$ and $q$ is the number of household who are multidimensional health poor. The HPI is calculated by multiplying the incidence of poverty by the average intensity across the poor:

$$HPI = H * A$$

### 3.2.2. *Spatial Differences based on Geographical Information System (GIS)*

To analyse the spatial difference, Geographical Information System (GIS) is used. The GIS method helps to design targeted policies to eradicate health poverty. Poverty mapping through GIS helps to find the determinants of poverty including natural capital and infrastructure, and access to public services. A district level data has been prepared based on the HPI constructed using AF method in section 3.2.1. Mapping software called ADePT Maps developed by the World Bank is used to produce maps at district level.[7] For GIS analysis, the districts are divided into four groups based on the incidence of health poverty including high deprivation, moderate deprivation, low deprivation and very low deprivation. Following steps are involved in creating the maps:

(i) Construction of district level data: HPI data is converted from households to district level. Similarly distance variable is obtained from MOUZA statistics at the district level. Each district has been assigned unique code similar to the code available in the shape file.

(ii) ADePT Maps operates in Stata for Windows, works with Stata's native datasets and produces the resulting images in a graphic format commonly supported by 'The Office' applications. After loading a Stata dataset, start ADePT Maps,[8] select a shape file (map), specify a regional variable in the data and the shape file and specify the variable of interest like HPI.

### 3.2.3. *Determinants of HPI: Logistic Regression Analysis*

Various factors determine the incidence of health poverty. To measure the effect of these factors, binomial logistic regression model is used in which the dependent variable is dichotomous: 0 when a household is above and 1 when below the health poverty line. The generalised form of the model is given below:

$$P = f(\textit{economic factors, social factors, regional factors})$$

where $P$ represents poor household (1 if poor otherwise 0).

Explanatory variables such as income, wealth, gender, education, housing structure, housing services such as gas, telephone, sewerage, electricity, and water supply and occupation are used for analysis. Generalised functional form of the model is as under:

[7] Installation package of ADePT Maps is located at: http://siteresources. worldbank.org/ INTPOVRES/Resources/ADePT_Map.exe. For more details see http://siteresources.worldbank.org/ INTPOVRES/Resources/477227-1184622288835/4002237-1219247341749/ADePT_Maps2.pdf. To produce district level maps, district level *shape file* has been obtained from DIVA-GIS website (http://www.diva-gis.org/datadown).

[8] ADePT Map can be launched by typing *a map* in the Stata command line.

$$P = \alpha + \beta X + \gamma E + \delta R + \pi A + \sigma T + \in$$

Where $X$ represents the matrix of demographic variables include gender, age, education and marital status of the head of the household and overall household size; $E$ represents matrix of variable capture the economic status of the households such as income, number of earners and status of employment of the head of the household; $R$ captures the regional variation such as provincial and rural urban; $A$ indicates the availability of information and $T$ uses to capture the availability of personal transport facility. The Table 3 below provides the detailed definition of each variable. Dependent variable is defined using health poverty index: 1 if household is poor otherwise 0. The results will not be interpreted through the coefficients but we use the odd ratios in logistic regression to see that the occurrence of any particular event will increase or decrease the probability being poor of individual and with what proportion as compared with the reference category.

To further ensure the robustness of results, logistic model with district fixed effect is also estimated. This helps to control the district level heterogeneity which may leads to spatial autocorrelation among explanatory variables and health poverty. Robust standard errors are used in estimation to improve regression outcome.

Table 3

*Variables' Definitions*

| Variables | Definition |
|---|---|
| **Demographic Characteristics** | |
| Gender | Gender of the head of the household: Dummy (1=Male,0= Female) |
| Age | Age of the head of the household: Continuous (number of years) |
| Education | Education is defined as the individual's highest educational attainment. Categorical (Illiterate, Primary, Matric, Bachelor and Master and Above including professional degree: Illiterate is used a reference category): Following dummies are used:<br>Primary [class 1 to class 5] (1 if yes otherwise 0)<br>Matric [class 6 to class 10] (1 if yes otherwise 0)<br>Bachelor [class 11 to class 14] (1 if yes otherwise 0)<br>Master and others [class 15 and above including professional degree] (1 if yes otherwise 0) |
| Marital Status | Marital status of the head of the household: Dummy (1=Married,0= otherwise) |
| Household Size | Total number of persons in the household: Continuous (number) |
| **Economic Status** | |
| Income | Log per capita income which include income from all sources such as from first and second occupation, other work, income in kind, pension, rental income and remittances earned over the last one year: Continues (Rs) |
| Land Ownership | Personal agriculture land: Dummy (1 if yes otherwise 0) |
| Livestock | Livestock in personal possession or Sheep, goat in personal possession: Dummy (1 if yes otherwise 0) |
| No of earners | Total number of persons currently employed: Continuous (number) |
| Employment | Employment status of the head of the household: Dummy (1=Employed,0= otherwise) |
| **Regional Variations** | |
| Province | Provincial dummies. KPK is used a reference category Following dummies are used:<br>1. Punjab (1 if yes otherwise 0)<br>2. Sindh (1 if yes otherwise 0)<br>3. Balochistan (1 if yes otherwise 0) |
| Region | Regional dummies: (1 for Urban and 0for Rural) |
| **Awareness** | |
| Use of Media | Use of TV or other media sources: Dummy (1 if used otherwise 0) |
| **Availability of Personal Transport** | |

| | |
|---|---|
| Transport | Availability of personal transport facilities such as motorcycle, car etc: Dummy (1 if available otherwise 0) |

*Source:* Author's own.

## 4. RESULTS AND DISCUSSION

### 4.1. Incidence of Health Poverty

The Table 4 shows both the incidence or headcount ratio (H) of health poverty and the average intensity (A) of their poverty and health poverty index (HPI) at different poverty K-Cut-off. The results shows that as we move from 10 percent to 100 percent poverty cut-off, the headcount ratio keep on decreasing. The average intensity (A) has the increasing pattern, it is due to the fact that in the Censored Weighted Deprivation Matrix as the percentage of poverty cut-off increases the household with more deprivations are censored as poor, and the Average Intensity of the poverty is the average of the multidimensional (MD) poor people. At the initial poverty cut-offs the A is low and with the increase in poverty cut-off the percentage of A keeps on increasing. The results show that as we move from 10 percent to 100 percent poverty cut-off, the health poverty index keeps on deceasing.

Table 4

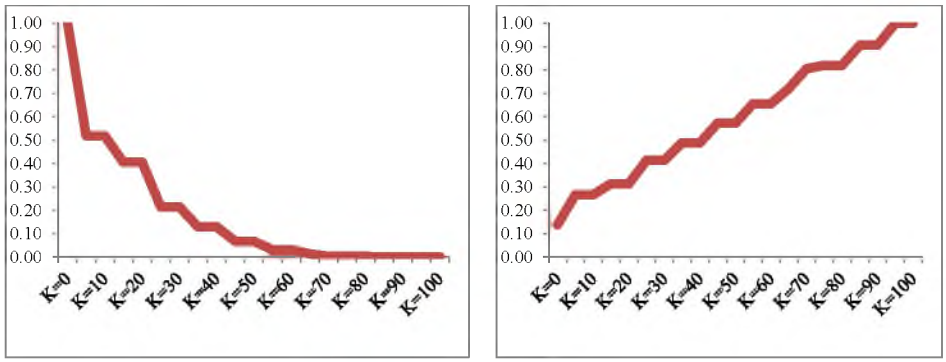
*Headcount, Average Intensity and Health Poverty Index at Different K_Cutoffs*

| K- Cutoff (percent) | Headcount (H) | Average Intensity (A) | Health Poverty Index (HPI) |
|---|---|---|---|
| 0 | 1.000 | 0.138 | 0.138 |
| 10 | 0.519 | 0.266 | 0.138 |
| 20 | 0.405 | 0.313 | 0.127 |
| 30 | 0.215 | 0.413 | 0.089 |
| 40 | 0.129 | 0.488 | 0.063 |
| 50 | 0.066 | 0.572 | 0.038 |
| 60 | 0.031 | 0.655 | 0.020 |
| 70 | 0.003 | 0.804 | 0.002 |
| 80 | 0.002 | 0.820 | 0.002 |
| 90 | 0.000 | 0.905 | 0.000 |
| 100 | 0.000 | 1.000 | 0.000 |

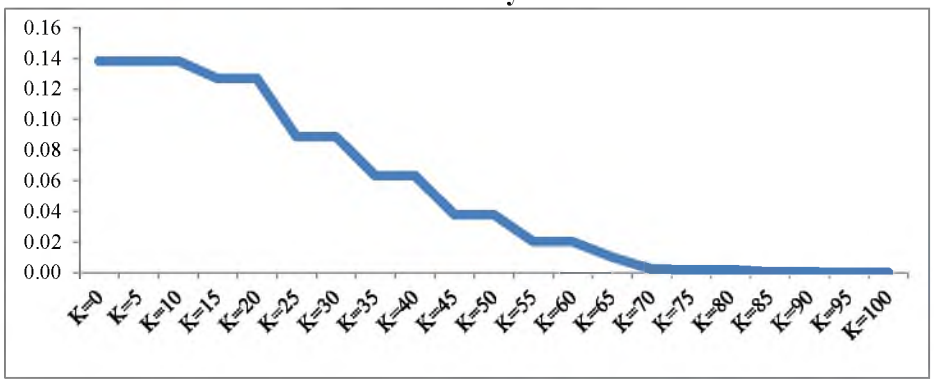
Figure 1 graphically shows the trend of H, A and HPI. The figure indicates that as the poverty cut-off goes on increasing, the H has a decreasing trend, A has increasing trend while HPI has also decreasing trend.

**Fig. 1. Trend in Headcount, Intensity and Health Poverty across Different K-Cutoff**

**Headcount** **Average Intensity**




**Health Poverty Index**




For further analysis, this study set the K-cut-off at 20 percent. We have declared household as a poor household in health if the household has deprived in one dimension out of five dimensions i.e. 5th quintile.[9] The incidence of health poverty for the poverty cut-off K=20 percent is reported in Table 5. The results show that the headcount 41 percent households are below the poverty cut-off across the Pakistan. Further, the ratio is very high in rural area of Pakistan (50 percent) when compared with urban areas of Pakistan (22 percent). Provincial analysis shows that Punjab is the least poor province of Pakistan in term of health poverty (36 percent) while Balochistan is the poorest province in Pakistan (62 percent). The statistics shows that health poverty is high in rural areas in comparison with the urban areas. Similar trends have been observed across all provinces (Table 5).

Table 5

*Health Poverty at 20 Percent Cut-off*

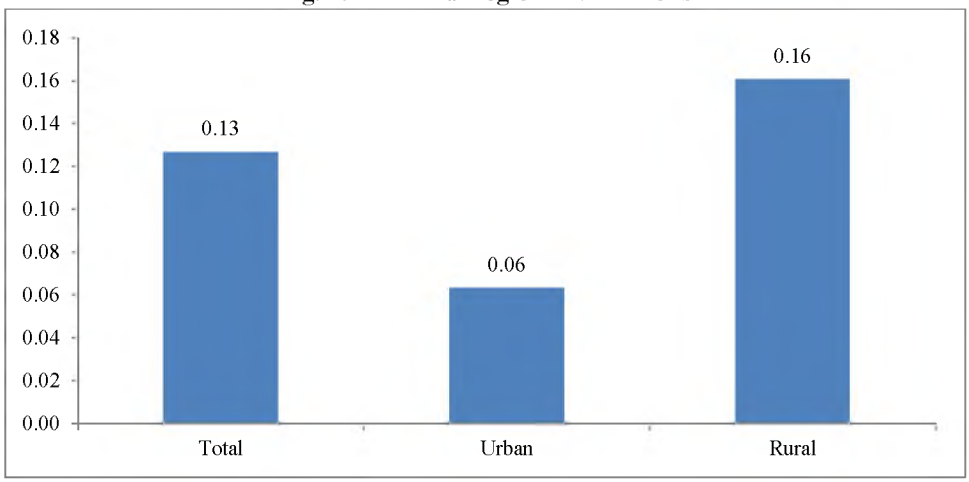
| | Headcount (H) | | | Average Intensity (A) | | | Health Poverty Index (HPI) | | |
|---|---|---|---|---|---|---|---|---|---|
| Region | Total | Urban | Rural | Total | Urban | Rural | Total | Urban | Rural |
| Pakistan | 40.49 | 22.30 | 50.21 | 31.30 | 28.36 | 32.00 | 0.13 | 0.06 | 0.16 |
| KPK | 54.31 | 30.16 | 59.39 | 33.71 | 30.41 | 34.07 | 0.18 | 0.09 | 0.20 |

[9] The definition of health poor (a household is health poor if deprived in at least one dimension) is align with the MPI in which a household is poor is deprived in one dimension.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Punjab | 35.56 | 21.54 | 42.23 | 29.47 | 27.90 | 29.85 | 0.10 | 0.06 | 0.13 |
| Sindh | 41.64 | 21.07 | 64.05 | 32.08 | 28.32 | 33.42 | 0.13 | 0.06 | 0.21 |
| Balochistan | 61.53 | 34.85 | 70.03 | 36.76 | 30.27 | 37.79 | 0.23 | 0.11 | 0.26 |

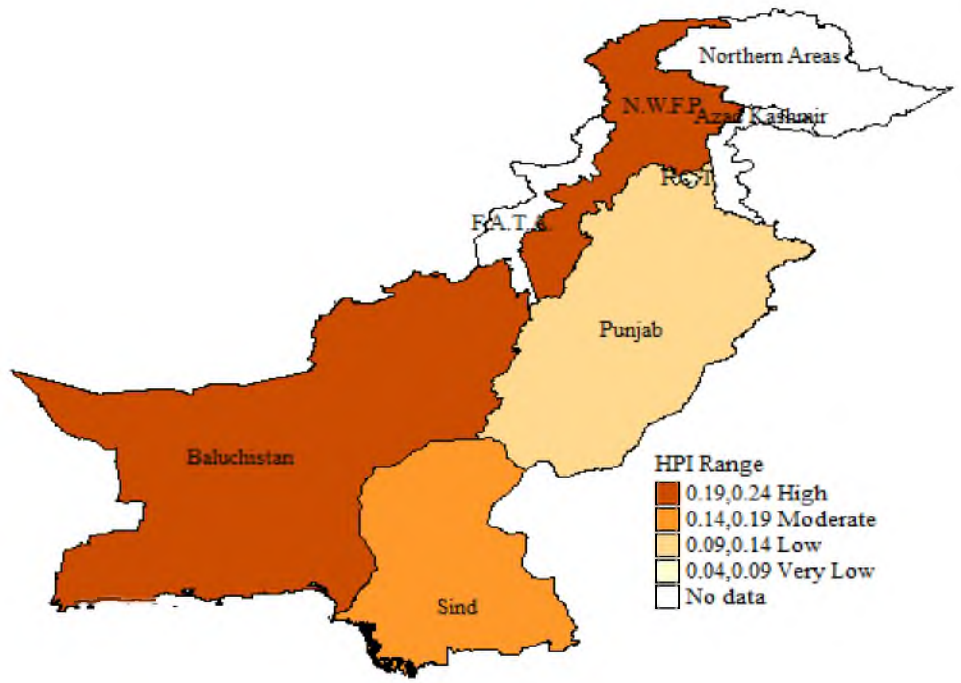
The Figure 2 shows that the value of health poverty index (HPI) is 0.13 which is the product of H and A. It is the percentage of those households which are multidimensional poor as well as being deprived at the same time. This indicates that 13 percent households are multidimensional poor in health across the Pakistan. Regional analysis shows that 16 percent households are multidimensional poor in health in rural areas in comparison with 6 percent in urban areas of Pakistan.

**Fig. 2. HPI and Regional Variations**




To further investigate the depth of health deprivation, we form four categories of health deprivation based on Health Poverty Index (HPI), include (i) very low deprivation; (ii) low deprivation; (iii) moderate deprivation; and (iv) high deprivation. Provincial analysis shows that based on HPI, Punjab falls in the category of low health deprivation, Sindh in moderate health deprivation while KPK and Balochistan are in high health deprivation (Map 1) category.

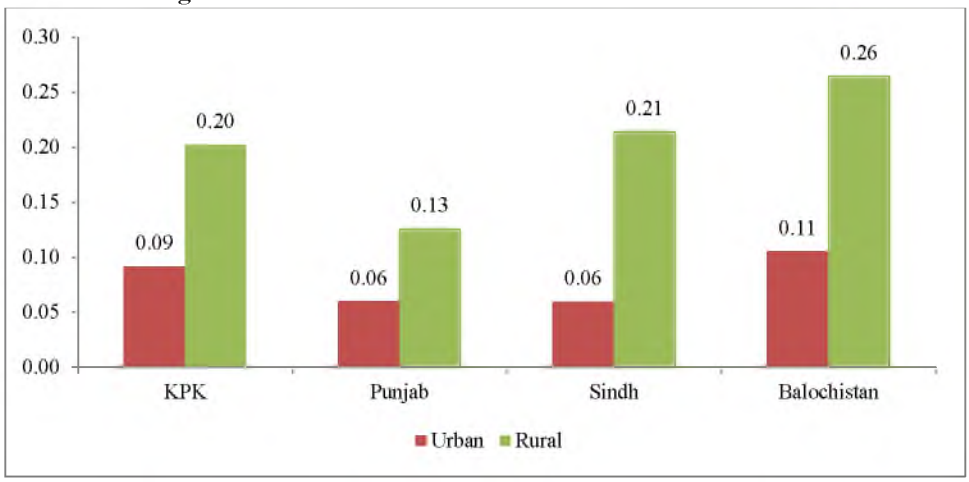
**Map 1. Health Deprivation at Provincial Level**




*Source*: Author's own based on HPI data using ADePT and DIVA-GIS.

Provincial analysis exhibits similar pattern across rural urban areas. Balochistan is the most deprived as well as multidimensional poor in health province in Pakistan while Punjab is the least deprived as well as multidimensional poor in health (Figure 3).

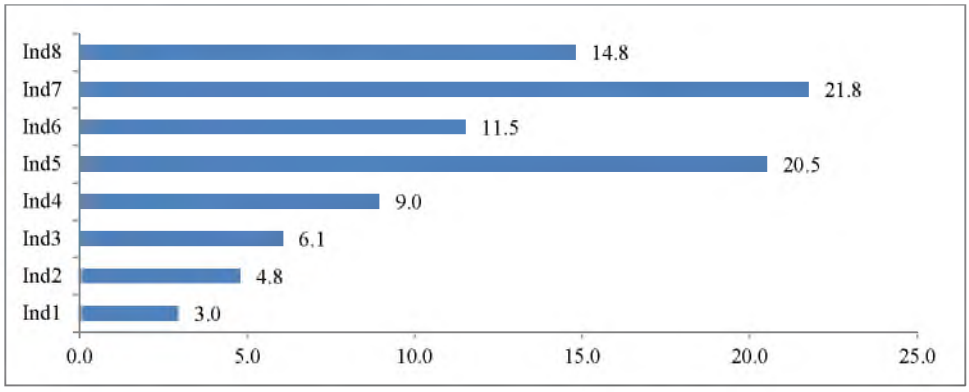
**Fig. 3. HPI and Provincial Variations across Rural Urban**




The HPI uses 8 indicators to measure poverty in five dimensions. Figure 4 reports the proportion of the households that are poor and also deprived in each indicator. The results show that only 3.0 and 4.8 percent households deprived in indicator 1—doctor consulted during sick or injury— and indicator 2—assisted delivery —respectively. Around 6.1 and 9

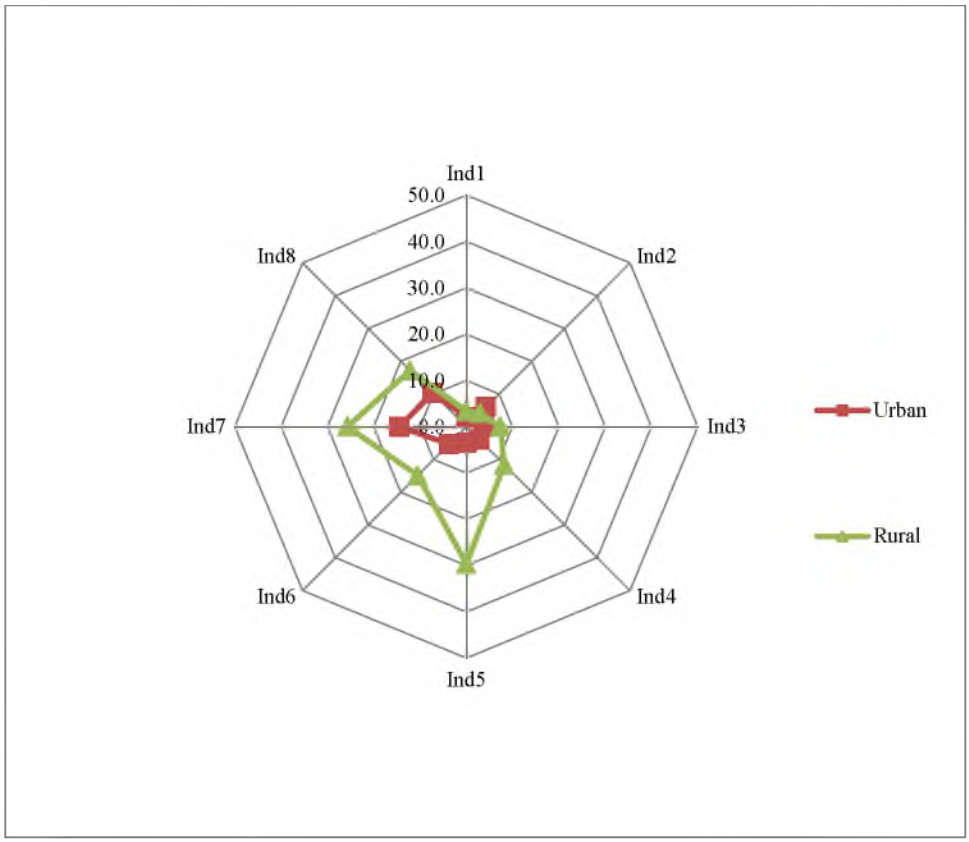
percent are deprived in indicator 3—satisfaction with the use of health services and indicator 4—institutional delivery, respectively. Around 20.5 percent households are deprived in indicator 5 that measures the cost of health facilities in term of time to reach/obtain health facilities. Maternal health situation reveals that around 11.5 percent households are deprived in pre-natal care facilities— indicators 6— and 21.8 percent households are deprived in post-natal care facilities—indicator 7. Child immunisation indicator (IND 8) shows that 14.8 percent households are deprived in child immunisation.

**Fig. 4. Percentage of the Households who are HPI Poor and Deprived in Each Indicator**




The Figure 5 reports the proportion of the households that are poor and also deprived in each indicator across rural urban divide. It compares the performance of rural areas and urban areas with that of the national aggregate. Similar patterns have been observed across rural and urban areas as we explained for the national aggregate. However, the average population deprived in each indicator is low in urban areas as compared to rural areas.

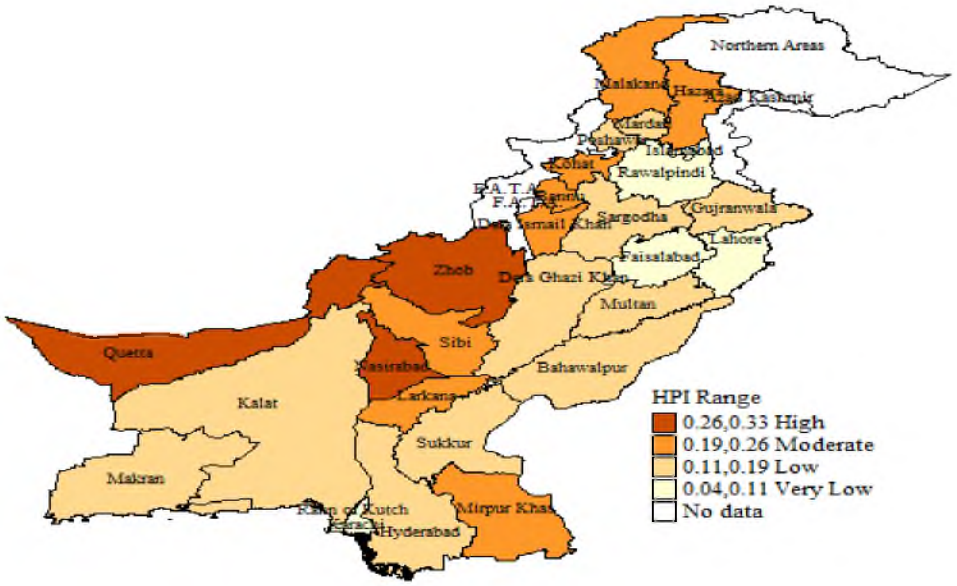
**Fig. 5. Percentage of the Households who are HPI Poor and Deprived in Each Indicator across Rural and Urban Areas**




### 4.2. Spatial Differences: A District Level Analysis using Geographical Information System (GIS)

To further look into the regional differences in health deprivation, we conduct analysis at division and district level. The division level analysis shows that Islamabad, Karachi, Rawalpindi, Lahore and Faisalabad fall in very low health deprivation categories. Multan, Gujranwala, Peshawar, Sargodha, Bahawalpur, Hyderabad, Kalat, Mardan, Dera Ghazi Khan, Sukkur, Makran and Kohat division fall in low health deprivation category. While Mirpur Khas, Dera Ismail Khan, Bannu, Larkana, Hazara, Malakand and Sibi show moderate health deprivation and Zhob, Quetta and Nasirabad show high health deprivation (Map 2).

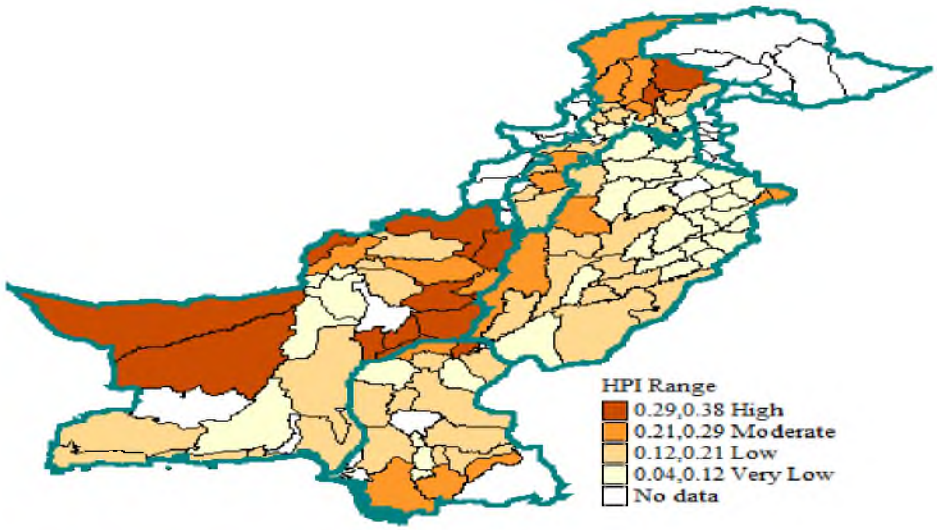
**Map 2. Health Deprivation at Divisional Level**




*Source:* Author's own based on HPI data using ADePT and DIVA-GIS.

Map 3 shows the ranking of districts based on HPI. The district analysis shows that districts from North Punjab including Gujrat, Lahore, Gujranwala, Faisalabad, Chakwal, Sargodha, Rawalpindi and Jhelum are least deprived in health. Most of the districts from Balochistan including Jafarabad, Kharan, Musakhel, Kholu, Zhob, Dera Bugti, Qilla Abdullah, Chagai, Nasirabad and Jhal Magsi and KPK including Shangla and Kohistan categories as highly deprived districts on Pakistan.

**Map 3. Health Deprivation at District Level**




*Source:* Author's own based on HPI data using ADePT and DIVA-GIS.

The obvious question, why are few districts highly deprived as compared with other districts, even in the same division or province? One possible reason could be the unavailability of health services in the vicinity. The MOUZA statistics shows that the average distance from MOUZA to basic health services is very high in highly deprived districts as compared with low deprived districts. The average distance for hospital/dispensary from MOUZA is 17 KM in Pakistan [Punjab (10KM), Sindh (14KM), KPK (12KM), Balochistan (32)]. Similar patterns have been observed for Basic Health Unit (BSU), Rural Health Centre (RHC), Child and Mother Care Centre (CMCC), Population Welfare Centre (PWC), N.G.O. Dispensary (NGOD), Private Doctor and Midwife Facility Centre (MFC) across the provinces (see Appendix Map 1 to Map 6). Distance acts as a binding constraint in availing health facility due to lack of public transport and high cost of private transportation. To reduce health deprivation, availability of health facilities in the vicinity is crucial. Provision of health services at the door step should be the top priority of the government to reduce health poverty.

### 4.3. Determinants of HPI: Logistic Analysis

This section provides the key determinants that explain health deprivation. Various social-economic factors explain the variation in health poverty across the Pakistan as well as at regional level. Table 6 presents the logistic regression results at national and regional level. The results of logistic regression with district fixed effect are reported in Appendix Table 4.

The results show that education of the head of the household plays a significant role in eradicating health poverty. With successive (higher) level of education, the chance to decrease the likelihood of being health poor has an increasing pattern. It is observed that the attainment of primary, matriculation, bachelors and professional (masters or above qualification) will decrease the likelihood of being poor by 17 percent, 29 percent, 36 percent, and 33 percent respectively, compared with their reference category of illiterate. Similar pattern has been observed in urban and rural areas (Table 6). This shows that as we increase the educational qualification of individuals their chances of being non-poor increases or we can say that the probability of being poor declines vigorously. Gender of the head of the household has surprising results. The results indicate that the likelihood of being poor increased by 37 percent as the gender of the head of the household changes from female to male. However, logically, the results are convincing because, the health of the household members especially children and mother is primarily influenced by the active role played by the female. Males, primarily are concerned with earning, to smooth the consumption of households, while female, especially wife of the head of the household manage the use of basic facilities like health and education. In this way, the role of female is very important in improving the health conditions of the household. Increasing the household size increases the chances to fall into poverty (Table 6). This is because distribution of limited resources among the household members causes shortage of resources to obtain health services.

Economic status of the household has a significant role in determining the health outcomes. Per capita income has a negative and significant impact on the health poverty. The results have shown that the likelihood of being poor is decreased by 25 percent income level increased by one percent. This association holds for both rural and urban

areas. Number of earner and employment status of the head of the household is also negatively related to the health deprivation (Table 6). Availability of household assets like land ownership and livestock, on the other hand, are not supportive of removing health deprivation and can even increase health deprivation. The obvious question is: why assets fail to reduce health poverty? Agriculture land and livestock are primarily owned by the rural households. These households use these assets as the prime source of their income to finance their livelihood. The income generated from these sources is seasonal. This creates the problem of shortage of income during off seasons. Hence, these households are less prone to finance their health needs, because their prime focus is to finance their basic need such as food and cloths etc. This pushes the household into the health poverty.

Regional variations have a significant impact of health poverty. We have used three dummies to capture provincial variations and one dummy to capture rural urban variation. The results show that that the likelihood of being health poor is decreased by 41 and 10 percent in Punjab and Sindh respectively when compared with their reference KPK. On the other hand, the likelihood of being health poor is increased 38 percent in Balochistan in compared with their reference KPK. Similar pattern has been observed in rural and urban areas. Movement from rural to urban areas has decreased 62 percent, the likelihood of being health poor.

Information availability has a very important role in eradicating health poverty. To gauge the role of information in removing poverty, we have used "use/availability of media" as a proxy. The results show that the availability of media has a significant impact on health poverty. Awareness about the use and importance of health facilities creates the demand for health services. The results show that that the likelihood of being health poor is decreased by 25 among the household using different media sources in comparison with the household not using media at aggregate level. Similar behaviour has been observed at sub-national level i.e. rural and urban levels.

Role of transportation is very important in availing health facilities. Availability of personal transport not only reduces the transportation cost but also reduces the waiting time involved in the arranging public transport especially in rural areas. To quantify the impact of availability personal transport, we use the "availability of motorcycle, car etc. in the household" as a proxy. We find that the availability personal transport has a significant impact on health poverty. The results show that that the likelihood of being health poor is decreased by 8 among the households having personal transport facility in comparison with the households not having this facility. Similar behaviour has been observed at sub-national level i.e. rural and urban levels

To further gauge the role these socio-economic variables on health poverty, we bifurcate the national sample into sub-national units i.e. provinces. We estimate the impact of these variables on health poverty for each province. The results are reported in the Table 7. Most of the outcomes remains same as reported and discussed at national level. In sum, socio-economic variables such as the income, regional variation, education and awareness play a very important role in explaining health poverty.

Table 6

*Determinants of HPI: Logistic Regression Analysis*
*(Dependent Variable HPI: 1 if Household Poor Otherwise 0)*

| Variables | National | Urban | Rural |
|---|---|---|---|
| **Demographic Characteristics** | | | |
| Gender of HH | 1.370*** | 1.389*** | 1.325*** |
| | (0.05) | (0.11) | (0.06) |
| Age of HH | 0.970*** | 0.964*** | 0.972*** |
| | (0.00) | (0.00) | (0.00) |
| Education of HH | | | |
| Primary | 0.827*** | 0.893** | 0.809*** |
| | (0.02) | (0.04) | (0.02) |
| Matric | 0.710*** | 0.755*** | 0.704*** |
| | (0.02) | (0.03) | (0.02) |
| Bachelor | 0.642*** | 0.656*** | 0.657*** |
| | (0.02) | (0.03) | (0.03) |
| Master and above | 0.672*** | 0.581*** | 0.976 |
| | (0.06) | (0.07) | (0.14) |
| Marital Status of HH | 1.194*** | 1.276*** | 1.175*** |
| | (0.04) | (0.08) | (0.05) |
| HH Size | 1.212*** | 1.291*** | 1.176*** |
| | (0.00) | (0.01) | (0.01) |
| **Economic Status** | | | |
| Income | 0.752*** | 0.811*** | 0.737*** |
| | (0.01) | (0.02) | (0.01) |
| Land Ownership | 1.159*** | 1.072 | 1.193*** |
| | (0.03) | (0.06) | (0.03) |
| Livestock | 1.495*** | 1.391*** | 1.524*** |
| | (0.03) | (0.08) | (0.03) |
| No of Earner | 0.969*** | 0.959** | 0.969*** |
| | (0.01) | (0.02) | (0.01) |
| Employment of HH | 0.804*** | 0.684*** | 0.867*** |
| | (0.02) | (0.04) | (0.03) |
| **Regional Variations** | | | |
| Province | | | |
| Punjab | 0.598*** | 0.794*** | 0.523*** |
| | (0.01) | (0.04) | (0.01) |
| Sindh | 0.908*** | 0.798*** | 0.984 |
| | (0.02) | (0.04) | (0.03) |
| Balochistan | 1.380*** | 1.081 | 1.463*** |
| | (0.04) | (0.07) | (0.05) |
| Urban | 0.465*** | | |
| | (0.01) | | |
| **Awareness** | | | |
| Use of Media | 0.744*** | 0.791*** | 0.743*** |
| | (0.01) | (0.03) | (0.02) |
| **Personal Transport** | | | |
| Use of Personal Transport | 0.936*** | 0.873*** | 0.961 |
| | (0.02) | (0.03) | (0.02) |
| Constant | 43.32*** | 6.877*** | 59.23*** |
| | (7.10) | (2.09) | (11.74) |
| Observations | 75,321 | 26,538 | 48,783 |
| Wald chi2 (Prob > chi2) | 12199.98 (0.00) | 2369.95 (0.00) | 5564.18 (0.00) |

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Table 7

*Determinants of HPI at Sub-National Level (Dependent Variable HPI: 1 if Household Poor Otherwise 0)*

| Variables | KPK | Punjab | Sindh | Balochistan |
|---|---|---|---|---|
| **Demographic Characteristics** | | | | |
| Gender of HH | 1.261*** | 1.304*** | 0.890 | 1.265 |
| | (0.09) | (0.07) | (0.13) | (0.33) |
| Age of HH | 0.971*** | 0.975*** | 0.965*** | 0.961*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Education of HH | | | | |
| Primary | 0.735*** | 0.886*** | 0.780*** | 0.806*** |
| | (0.05) | (0.03) | (0.04) | (0.05) |
| Matric | 0.616*** | 0.740*** | 0.722*** | 0.737*** |
| | (0.03) | (0.02) | (0.03) | (0.05) |
| Bachelor | 0.561*** | 0.702*** | 0.633*** | 0.598*** |
| | (0.04) | (0.04) | (0.04) | (0.05) |
| Master and above | 0.627** | 0.565*** | 0.564*** | 1.253 |
| | (0.12) | (0.10) | (0.10) | (0.22) |
| Marital Status of HH | 1.314*** | 1.111** | 1.553*** | 1.141 |
| | (0.10) | (0.05) | (0.14) | (0.14) |
| HH Size | 1.175*** | 1.248*** | 1.209*** | 1.169*** |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| **Economic Status** | | | | |
| Income | 0.826*** | 0.738*** | 0.727*** | 0.728*** |
| | (0.03) | (0.02) | (0.02) | (0.03) |
| Land Ownership | 1.262*** | 1.215*** | 1.325*** | 0.789*** |
| | (0.06) | (0.04) | (0.06) | (0.04) |
| Livestock | 1.965*** | 1.369*** | 1.343*** | 1.575*** |
| | (0.09) | (0.05) | (0.05) | (0.08) |
| No of Earner | 1.108*** | 0.949*** | 0.993 | 0.897*** |
| | (0.03) | (0.01) | (0.02) | (0.02) |
| Employment of HH | 0.888** | 0.820*** | 0.766*** | 0.448*** |
| | (0.05) | (0.04) | (0.06) | (0.04) |
| **Regional Variations** | | | | |
| Urban | 0.491*** | 0.614*** | 0.354*** | 0.305*** |
| | (0.02) | (0.02) | (0.01) | (0.02) |
| **Awareness** | | | | |
| Use of Media | 0.887*** | 0.697*** | 0.653*** | 0.835*** |
| | (0.04) | (0.02) | (0.03) | (0.04) |
| **Personal Transport** | | | | |
| Use of Personal Transport | 0.818*** | 1.022 | 0.980 | 0.905** |
| | (0.05) | (0.03) | (0.04) | (0.04) |
| Constant | 10.58*** | 22.77*** | 110.7*** | 433.3*** |
| | (3.96) | (5.31) | (38.46) | (246.63) |
| Observations | 12,420 | 31,809 | 19,454 | 11,638 |
| Wald chi2 (Prob > chi2) | 1837.09 | 3616.94 | 3715.32 | 1537.43 |
| | (0.00) | (0.00) | (0.00) | (0.00) |

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

## 5. CONCLUDING REMARKS AND POLICY OPTIONS

The present study has constructed the health poverty index (HPI) for Pakistan using households data from Pakistan Living and Standard Measurement (PSLM) survey 2012-13 based on the Alkire Foster (AF) Method. Five different dimensions and eight different indicators with equal weights have been used in the construction of HPI. To further find the regional disparities in the health poverty, district level analysis has been carried out using GIS. To find the socio-economic determinants of health poverty, this study has employed logistic regression model.

The results have shown that the headcount health poverty is 41 percent in Pakistan. Further, the ratio is very high in rural area (50 percent) as compared with urban areas (22 percent). Provincial analysis has shown that Punjab is the least poor province (36 percent) while Balochistan is the poorest province (62 percent). The value of health poverty index is 0.13 which is the product of the headcount and average intensity. It is the percentage of those households which are multidimensional poor as well as being deprived at the same time. This indicates that 13 percent of households are multidimensional poor in health across the Pakistan. Regional analysis has shown that 16 percent households are multidimensional poor in health in rural areas, compared to 6 percent in urban areas of Pakistan. Provincial analysis has exhibited similar patterns across rural and urban areas. Balochistan is the most deprived as well as multidimensional poor province in Pakistan while Punjab is the least deprived as well as multidimensional poor province. The results have shown that 20.5 percent of households are deprived in indicator that measures the cost of health facilities in terms of time to reach/obtain health facilities. Maternal health situation has revealed that around 11.5 percent households are deprived in pre-natal care facilities and 21.8 percent households are deprived in post-natal care facilities. Child immunisation indicator has shown that 14.8 percent households are deprived in child immunisation. Empirical analysis has shown that various socio-economic variables such as income, regional variation, education and awareness play very important roles in explaining health poverty.

To eradicate health deprivation, areas specific and dimension specific policies are required. More specifically following important policy implications have emerged from the study:

(1) The GIS analysis reveals that most of the districts from Balochistan, KPK, interior Sindh and Southern Punjab lack availability of basic healthcare services. Provincial governments should focus on these districts as their top priority to increase basic health facilities. Based on district ranking, it can be identified which district lack which facility, hence targeted framework may be designed to meet the area specific needs.

(2) Analysis reveals that females can play pivotal role in eliminating health poverty. It is suggested that government should focus females in their health policies/interventions for better outcome of health interventions. There is evidence that empowering females can improve the social indicators of the households. Benazir Income Support Programme (BISP) is the best example of this. BISP provides financial assistance to females only. The evidence shows that BISP is associated with an increase in expenditure on health.[10]

[10] http://www.bisp.gov.pk/Others/BISPFirstImpactEvaluationReport.pdf

(3) There are two reinforcing outcome of the analysis; one, significant contribution of education in eliminating health poverty and two, awareness of the use of health facilities in breaking health deprivation nexus. Improvement in literacy will also help to create awareness among the poor segment of the society of the use of health services. Education can also induce people to use better food and medical services to keep them healthy. Provision of education should be the prime focus of national and sub-national governments. Following the 18th Constitutional Amendment, it is the duty of provincial governments to ensure 100 percent literacy not only to improve health conditions but also to achieve Sustainable Development Goals (SGDs).

(4) Well targeted communication strategies should be devised to highlight the importance of health. For this media can play very significant role. Health deprivation is very high in underdeveloped regions of the country as noted in spatial analysis. Communication strategy should target these areas with strong social mobilisation. Radio, TV and mobile messages can be used to create awareness in these regions.

(5) Availability of transportation system will also help to eliminate health poverty. Efforts are required to promote public transport especially in rural areas of Balochistan and Southern Punjab.

In essence, targeted efforts are required to increase the provision of services especially public transport, availability of affordable medical facilities in the vicinity, qualified doctors, proper physical infrastructure and awareness about the use of health services to eliminate health poverty in Pakistan.

## APPENDIX

Appendix Table 1

*List of Questions Used in Defining Each Indicator*

| Indicator | Questions from HIES/PSLM | Q Code in Data |
|---|---|---|
| IND1: Doctor consulted during sick or injury | Section D. Health<br>1.Had he/she been sick or injured during the last two weeks?<br>2.Did anyone consulted for this illness? | sdq01<br>sdq02 |
| IND2: Assisted delivery | Section I. Ever Married women (age 15 to 49 years)<br>1.Did she given birth to a child during last 3 years?<br>9.Who assisted with delivery? | siq01<br>siq09 |
| IND3: Satisfaction with the use of health services | Section D. Health<br>5.Did he/she faced any problem at time of visit____?<br>6.Why he/she did not seek medicines/medical facilities during the last two weeks? | sdq05<br>sdq06 |
| IND4: Institutional delivery | Section I. Ever Married women (age 15 to 49 years)<br>1.Did she given birth to a child during last 3 years?<br>8.Where did she give birth (Last Pregnancy)? | siq01<br>siq08 |
| IND5: Time cost | Section: G. Detail of the Family<br>10. How much time is spent in reaching to the most near place of facility:<br>Option: Health clinic/Hospital | sgq10_71 |
| IND6: Pre-natal care | Section I. Ever Married women (age 15 to 49 years)<br>1.Did she given birth to a child during last 3 years?<br>2. Did she receive any pre-natal care during this pregnancy? | siq01<br>siq02 |
| IND7: Post-natal care | Section I. Ever Married women (age 15 to 49 years)<br>1.Did she given birth to a child during last 3 years?<br>10.Did she receive post-natal care within 6 weeks after this delivery? | siq01<br>siq10 |
| IND8: Immunisation | Section: H. Vaccination and Diarrhoea (for children under 5)<br>3. Has the child ever been immunised? | shq03==2 |

Appendix Table 2

*Divisional Ranking*

| Division | Region/Province | HPI |
|---|---|---|
| **Very Low Health Deprivation** | | |
| Islamabad | F.C.T. | 0.040 |
| Karachi | Sindh | 0.053 |
| Rawalpindi | Punjab | 0.083 |
| Lahore | Punjab | 0.084 |
| Faisalabad | Punjab | 0.097 |
| **Low Health Deprivation** | | |
| Multan | Punjab | 0.118 |
| Gujranwala | Punjab | 0.119 |
| Peshawar | KPK | 0.122 |
| Sargodha | Punjab | 0.140 |
| Bahawalpur | Punjab | 0.146 |
| Hyderabad | Sindh | 0.155 |
| Kalat | Balochistan | 0.157 |
| Mardan | KPK | 0.160 |
| Dera Ghazi Khan | Punjab | 0.176 |
| Sukkur | Sindh | 0.180 |
| Makran | Balochistan | 0.183 |
| Kohat | KPK | 0.189 |
| **Moderate Health Deprivation** | | |
| Mirpur Khas | Sindh | 0.204 |
| Dera Ismail Khan | KPK | 0.206 |
| Bannu | KPK | 0.208 |
| Larkana | Sindh | 0.213 |
| Hazara | KPK | 0.214 |
| Malakand | KPK | 0.231 |
| Sibi | Balochistan | 0.243 |
| **High Health Deprivation** | | |
| Zhob | Balochistan | 0.266 |
| Quetta | Balochistan | 0.269 |
| Nasirabad | Balochistan | 0.335 |

## Appendix Table 3

*District Ranking*

| District | Region/Province | HPI | District | Region/Province | HPI |
|---|---|---|---|---|---|
| **Very Low Health Deprivation** | | | **Low Health Deprivation** | | |
| Islamabad | F.C.T. | 0.040 | Sialkot | Punjab | 0.122 |
| Karachi | Sindh | 0.053 | Layyah | Punjab | 0.129 |
| Gujrat | Punjab | 0.056 | Khuzdar | Balochistan | 0.133 |
| Lahore | Punjab | 0.057 | Sibi | Balochistan | 0.134 |
| Gujranwala | Punjab | 0.058 | Khanewal | Punjab | 0.138 |
| Faisalabad | Punjab | 0.058 | Kohat | KPK | 0.140 |
| Chakwal | Punjab | 0.059 | Mardan | KPK | 0.141 |
| Hyderabad | Sindh | 0.064 | Vehari | Punjab | 0.141 |
| Sahiwal | Punjab | 0.070 | Jhang | Punjab | 0.142 |
| Rawalpindi | Punjab | 0.071 | Haripur | KPK | 0.142 |
| Kasur | Punjab | 0.075 | Charsadda | KPK | 0.144 |
| Hafizabad | Punjab | 0.077 | Bahawalpur | Punjab | 0.145 |
| Khushab | Punjab | 0.083 | Jamshoro | Sindh | 0.145 |
| Sheikhupura | Punjab | 0.084 | Dadu | Sindh | 0.146 |
| Pakpattan | Punjab | 0.086 | Muzaffargarh | Punjab | 0.156 |
| Jhelum | Punjab | 0.088 | Malakand P.A. | KPK | 0.156 |
| Toba Tek Singh | Punjab | 0.091 | Mianwali | Punjab | 0.162 |
| Okara | Punjab | 0.094 | Mansehra | KPK | 0.163 |
| Multan | Punjab | 0.099 | Ziarat | Balochistan | 0.166 |
| Abbottabad | KPK | 0.099 | Kech | Balochistan | 0.173 |
| Nankana Sahib | Punjab | 0.100 | Hangu | KPK | 0.174 |
| Sargodha | Punjab | 0.100 | Lodhran | Punjab | 0.176 |
| Peshawar | KPK | 0.104 | Tando M. Khan | Sindh | 0.176 |
| Awaran | Balochistan | 0.105 | Bahawalnagar | Punjab | 0.178 |
| Kalat | Balochistan | 0.108 | Qilla Saifullah | Balochistan | 0.179 |
| Matiari | Sindh | 0.109 | Shikarpur | Sindh | 0.180 |
| Tando Allahyar | Sindh | 0.112 | Lasbela | Balochistan | 0.187 |
| Attok | Punjab | 0.112 | Sanghar | Sindh | 0.189 |
| Quetta | Balochistan | 0.113 | Gwadar | Balochistan | 0.193 |
| Mastung | Balochistan | 0.113 | Naushahro Firoz | Sindh | 0.195 |
| Rahimyar Khan | Punjab | 0.116 | Mirphurkhas | Sindh | 0.199 |
| Sukkur | Sindh | 0.117 | Khairpur | Sindh | 0.201 |
| Swabi | KPK | 0.118 | Rajan Pur | Punjab | 0.203 |
| Nowshera | KPK | 0.119 | Bannu | KPK | 0.205 |
| Larkana | Sindh | 0.120 | Tank | KPK | 0.206 |
| **Moderate Health Deprivation** | | | **Dera Ismail Khan** | **KPK** | **0.206** |
| Bhakkar | Punjab | 0.213 | Ghotki | Sindhh | 0.206 |
| Dera Ghazi Khan | Punjab | 0.215 | Lakki Marwat | KPK | 0.210 |
| Chitral | KPK | 0.216 | High Health Deprivation | | |
| Swat | KPK | 0.216 | Jafarabad | Balochistan | 0.295 |
| Buner | KPK | 0.220 | Kharan | Balochistan | 0.297 |
| Umerkot | Sindh | 0.225 | Kashmore | Sindh | 0.302 |
| Barkhan | Balochistan | 0.229 | Musakhel | Balochistan | 0.313 |
| Narowal | Punjab | 0.231 | Kholu | Balochistan | 0.326 |
| Dir | KPK | 0.237 | Zhob | Balochistan | 0.327 |
| Thatta | Sindh | 0.242 | Shangla | KPK | 0.328 |
| Badin | Sindh | 0.243 | Dera Bugti | Balochistan | 0.345 |
| Jakobabad | Sindh | 0.250 | Qilla Abdullah | Balochistan | 0.349 |
| Karak | KPK | 0.254 | Chagai | Balochistan | 0.349 |
| Pishin | Balochistan | 0.264 | Nasirabad | Balochistan | 0.353 |
| Loralai | Balochistan | 0.283 | Jhal Magsi | Balochistan | 0.356 |
| Battagram | KPK | 0.285 | Kohistan | KPK | 0.379 |

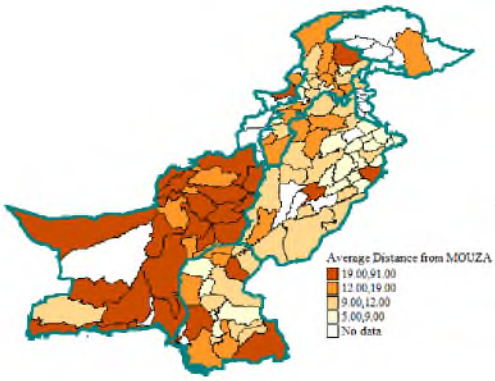
Appendix Table 4

*Determinants of HPI: Logistic Regression Analysis*
*(Dependent Variable HPI: 1 if Household Poor otherwise 0) with District Fixed Effect*

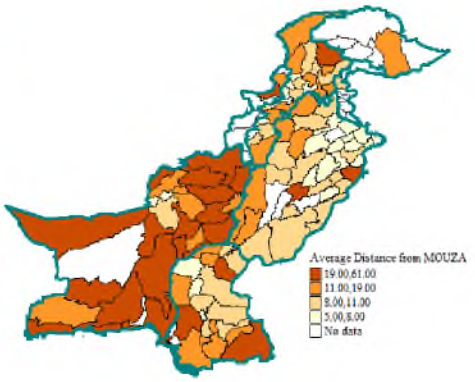
| Variables | National | Urban | Rural | KPK | Punjab | Sindh | Balochistan |
|---|---|---|---|---|---|---|---|
| | | | ***Demographic Characteristics*** | | | | |
| Gender of HH | 1.370*** | 1.432*** | 1.326*** | 1.194** | 1.409*** | 0.935 | 1.246 |
| | (0.06) | (0.11) | (0.06) | (0.09) | (0.08) | (0.13) | (0.34) |
| Age of HH | 0.970*** | 0.962*** | 0.973*** | 0.975*** | 0.974*** | 0.964*** | 0.954*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Education of HH | | | | | | | |
| Primary | 0.803*** | 0.909** | 0.805*** | 0.726*** | 0.835*** | 0.756*** | 0.845** |
| | (0.02) | (0.04) | (0.02) | (0.05) | (0.03) | (0.03) | (0.06) |
| Matric | 0.683*** | 0.746*** | 0.731*** | 0.630*** | 0.706*** | 0.635*** | 0.753*** |
| | (0.02) | (0.03) | (0.02) | (0.04) | (0.02) | (0.03) | (0.05) |
| Bachelor | 0.575*** | 0.638*** | 0.628*** | 0.531*** | 0.624*** | 0.554*** | 0.557*** |
| | (0.02) | (0.03) | (0.03) | (0.04) | (0.03) | (0.03) | (0.05) |
| Master and above | 0.536*** | 0.545*** | 0.834 | 0.586*** | 0.461*** | 0.424*** | 0.901 |
| | (0.05) | (0.07) | (0.12) | (0.12) | (0.08) | (0.08) | (0.17) |
| Marital Status of HH | 1.209*** | 1.242*** | 1.135*** | 1.306*** | 1.076 | 1.586*** | 1.423*** |
| | (0.04) | (0.08) | (0.05) | (0.10) | (0.05) | (0.14) | (0.18) |
| HH Size | 1.216*** | 1.300*** | 1.196*** | 1.196*** | 1.247*** | 1.204*** | 1.174*** |
| | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| | | | ***Economic Status*** | | | | |
| Income | 0.748*** | 0.812*** | 0.781*** | 0.805*** | 0.750*** | 0.688*** | 0.747*** |
| | (0.01) | (0.02) | (0.01) | (0.03) | (0.02) | (0.02) | (0.03) |
| Land Ownership | 1.223*** | 1.002 | 1.110*** | 1.258*** | 1.256*** | 1.475*** | 0.899* |
| | (0.03) | (0.06) | (0.03) | (0.06) | (0.04) | (0.07) | (0.05) |
| Livestock | 1.608*** | 1.177*** | 1.273*** | 1.650*** | 1.442*** | 1.667*** | 2.020*** |
| | (0.03) | (0.07) | (0.03) | (0.08) | (0.05) | (0.07) | (0.11) |
| No of Earner | 0.976*** | 0.969* | 0.957*** | 1.069*** | 0.952*** | 0.996 | 0.964 |
| | (0.01) | (0.02) | (0.01) | (0.03) | (0.01) | (0.02) | (0.02) |
| Employment of HH | 0.789*** | 0.689*** | 0.864*** | 0.826*** | 0.809*** | 0.808*** | 0.543*** |
| | (0.02) | (0.04) | (0.03) | (0.05) | (0.04) | (0.06) | (0.06) |
| | | | ***Awareness*** | | | | |
| Use of Media | 0.680*** | 0.791*** | 0.759*** | 0.714*** | 0.723*** | 0.585*** | 0.702*** |
| | (0.01) | (0.03) | (0.02) | (0.03) | (0.02) | (0.02) | (0.04) |
| | | | ***Personal Transport*** | | | | |
| Use of Personal Transport | 0.951** | 0.907*** | 0.952* | 0.948 | 0.975 | 1.011 | 0.872*** |
| | (0.02) | (0.03) | (0.02) | (0.05) | (0.03) | (0.04) | (0.04) |
| Constant | 30.90*** | 4.545*** | 23.28*** | 9.937*** | 14.79*** | 83.23*** | 215.3*** |
| | (6.17) | (1.81) | (5.60) | (4.09) | (3.75) | (30.47) | (130.25) |
| Observations | 75,321 | 26,538 | 48,783 | 12,420 | 31,809 | 19,454 | 11,638 |

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

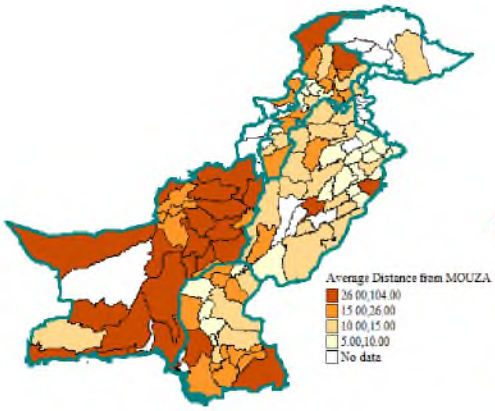
**Appendix Map 1: Mean Distance (Hospital)**



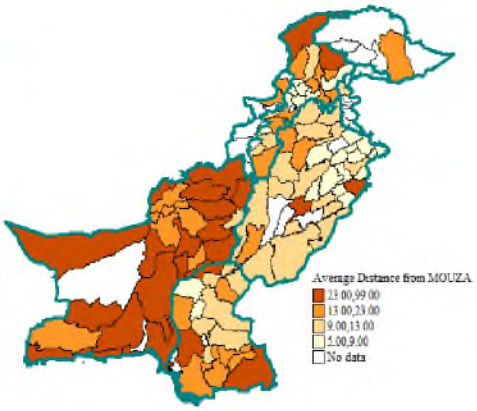

**Appendix Map 2: Mean Distance (BHU)**



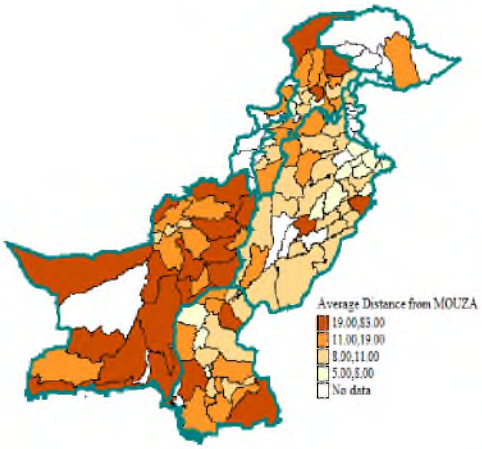

**Appendix Map 3: Mean Distance (CMCC)**



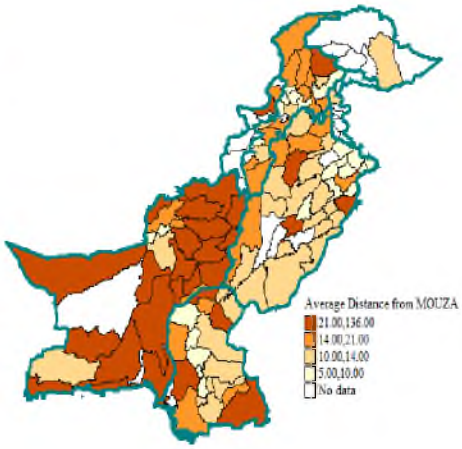

**Appendix Map 4: Mean Distance (PWC)**




**Appendix Map 5: Mean Distance (RHC)**




**Appendix Map 6: Mean Distance (MFC)**



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