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Spatial Differences and Socio-economic Determinants of Health Poverty

Nasir Iqbal
Saima Nawaz

PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS

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Nasir Iqbal
Pakistan Institute of Development Economics, Islamabad

and

Saima Nawaz
COMSATS Institute of Information Technology, Islamabad

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Pakistan Institute of Development Economics
Islamabad, Pakistan

E-mail: publications@pide.org.pk
Website: http://www.pide.org.pk
Fax: +92-51-9248065

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ABSTRACT

This study has three objectives: first, to construct a health poverty index (HPI) for Pakistan using household data from Pakistan Social and Living Standards Measurement (PSLM) survey 2012-13; second, to investigate the spatial differences of health poverty at sub-national level; and third, to find the socio-economic determinants of health poverty using the logistic regression model. Health poverty is defined as lack of access to health services. Five different dimensions are used to construct the HPI using the Alkire Foster (AF) Method. Results show that the head count 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 of the provinces (36 percent) while Balochistan is the poorest (62 percent). The majority of the households are deprived in terms of cost of health services, post-natal care and child immunisation. Empirical analysis shows that various socio-economic variables such as income, regional variation, education and awareness are important in explaining health poverty. To eradicate health deprivation, areas-specific and dimension-specific policies are required to make efficient use of scarce resources.

Highlights

- This study constructs a health poverty index (HPI) based on five health dimensions and eight health indicators for Pakistan.
- HPI estimates show that 13 percent households (16 and 6 percent rural and urban respectively) are multidimentionally poor as well as deprived health wise in Pakistan.
- Majority of the households are deprived in respect of cost of health services, maternal care and child immunisation dimensions.
- To eradicate health deprivation, areas and dimension-specific policies are required.
- Efforts are required to be made to increase awareness regarding the use of health services to eliminate health poverty.

1. INTRODUCTION

It is evident that Pakistan has succeeded in reducing the poverty headcount from 34.4 percent in 2000-01 to 12.4 percent in 2010-11. However, there has been no significant improvement in health[1] as a social indicator. No significant improvement has been made in maternal as well as child mortality rates overtime. The maternal mortality rate is very high at 260 (per 1000 births) in 2010-11 against 140 mentioned in MDG targets. Similarly, infant mortality rate is very high in Pakistan. Despite the various reforms introduced from time to time Pakistan has not been able so far to provide health facilities according to MDGs requirements. Apart from low investment in health sector, rapid population growth is rendering available health care facilities inadequate: there are 1,099 persons against one Doctor and one Dentist versus 13,441 persons; the current ratio of population and availability of hospital beds works out at 1,647 persons per bed [Pakistan, (2014)]. Another notable feature is the existence of inequalities in the provision of health facilities across Pakistan. For example, the average distance to reach a Basic Health Unit is 16 KM in KPK, 39 KM in Balochistan, 13 KM in Sindh and 8 KM in Punjab.[2]

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 that may give rise to health inequalities. Recently, the Oxford Poverty and Human Development Initiative (OPHI) developed the Multidimensional Poverty Index (MPI) to reflect the multiple deprivations that a poor person faces with respect to education, health, and living standards. The health dimension is used in the construction of the

Acknowledgements: The study completed with the financial support from the GIZ, Health Sector Support Programme, Pakistan.

[1]There are many other social factors such as education, sanitation, clean water, housing, violence and empowerment etc. do not show significant improvement. But, in this paper we only focus on health issue to align with the theme of call for paper "Understanding and Managing Health in Pakistan"

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

index[3]. Health is quantified by using nutrition and child mortality. However the coverage of the index is limited.

Literature indicates that health and health inequalities are influenced by various factors grouped into "root causes", "intervening factors" and the "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)]. The root cause factors include wealth, income, gender and education; intervening factors include access to preventive healthcare, life style and home environment; and the situation of health factor comprise health capital, physical morbidity and premature mortality etc. These factors 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 need to construct a health poverty index which covers all possible dimensions of health in terms 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 at measuring health poverty in Pakistan at the national and sub-national levels. Health poverty is 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 facilities or health services to achieve a sound health condition. More specifically, this study attempts

- To construct a health poverty index for Pakistan
- To investigate the spatial differences of health poverty at sub-national level in Pakistan
- To find the socio-economic determinants of health poverty in Pakistan

2. SIGNIFICANCE OF STUDY

The HPI aims to provide an overall picture of health poverty in Pakistan and incorporates a range of measures relating to both 'root causes' and 'intervening factors' that influence health and health inequalities. This study contributes to literature by constructing a health poverty index for Pakistan at the national and sub-national level which is more comprehensive in term of methodology used and indicators employed. Secondly, this this study helps to identify the regional disparities in health provision and suggests targeted measures to improve health provisions in Pakistan. Thirdly, this study tries to improve the MPI which the government of Pakistan is developing in collaboration with the UNDP. Fourthly, this study helps in better allocation of PSDE to remove health inequalities for sustained and inclusive growth as highlighted in Vision 2025.

[3]MPI captures three dimensions include: (i) health; (ii) education; and (iii) living standard.

3. LITERATURE REVIEW

The available literature primarily uses the human development index (HDI) to measure the wellbeing and living standards of the people [Greeley (1994); McGillivray (1991)]. The HDI, however, was criticised for not measuring poverty and development accurately because of its limited scope in covering various aspects of human wellbeing. The HDI uses only one health indicator i.e. longevity ignoring other health related aspects. Recently, attempts have been made to construct a 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 too fail to capture the health condition appropriately. Antony and Laxmaiah (2008) conclude that the HDI is not an appropriate measure to determine development because despite the improvement in the living conditions, under-nutrition is still among the major health issue in Indias. To address the health issues, this study concludes that further research is required to develop a comprehensive measure of health poverty. Few attempts have been made to construct a 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 the 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 the use of cost of health services, quality of health services and maternal and child health.

A large number of studies have used empirical data to measure and identify the determinants of health poverty. Cross sectional as well as cross regional data have been used to measure inequality in health services [Drèze and Murthi (2001); Navarro and Shi (2001); Pritchett and Summers (1996); Rutstein, Johnson, and Gwatkin (2000)]. Various studies have used household level data for this purpose [Claeson, Bos, Mawji, and Pathmanathan (2000); Hughes and Dunleavy (2000);Wagstaff (2002)]. These studies found various determinants of health poverty such as education, occupation, income, gender, ethnicity (individual characteristics), household characteristics, malnutrition and others geographical and social factors. Additionally, the 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 which is another factor affecting health [Friel, Chopra, and Satcher (2007)]. Wang (2002) investigated the 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 the poor are concentrated in rural areas, therefore increase in health

expenditure, vaccination and availability of basic necessities there can reduce health related poverty. Ramachandran, Kumar, and Viswanathan (2006) found that nutrition and health status are influenced by various socio-economic factors including 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 fact that cost of seeking treatment is high in rural areas due to distances, time and travel cost incurred to reach the nearest health center [Andersen and Newman (2005); Mwabu (2007)]. Difference in the health poverty level is also due to regional differences based on the access to medical facilities that depend on the technological, human and drug resources that are rarely available in rural areas [Barua (2013); Zhang and Kanbur (2005)]. Another study considered the distance and the time needed to travel to the nearest health facility as the contributing factor in increasing 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 diseases [Parker and Campbell (1998); Sasaki, Comber, Suzuki, and Brunsdon (2010)]. The quality of health service broadly depends on the infrastructure, location of the health centre, availability of focal person and others. The attitude of the individual to seek health care is also an important determinant of health poverty. The individual's predisposition also depends on the income and wealth status. Many studies has investigated the effect of income on health seeking behaviour, individual choice for health care and health expenditure, whereas some other studies investigated the effect on demand for health due to poverty [Awiti (2014)].

Various studies have used GIS-based measures to investigate the geographical and spatial 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 obvious 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 the health of the lower income group [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) analyses 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 at filling the gap in existing literature as few studies have measured health poverty as a whole. This study explicitly examines the spatial differences across regions focusing on health deprivation.

4. DATA AND METHODOLOGY

4.1. Data

To analyse the above stated objectives, 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 2013 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. The 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 about 200-250 households and is categorised into low, middle and high-income group**.** The urban areas were divided into 26698 blocks and rural areas into 50588 blocks. The sample size was 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).

4.2. Methodology

4.2.1. *Construction of Health Poverty Index (HPI)*

To construct the 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: these 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[4]. D1 is determined by using two indicators i.e. IND1) Doctor consulted during sickness or injury and IND2) Assisted delivery. D2 is quantified by employing two indicators including 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 including 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 cutoff for each indicator. The indicators' deprivation cutoffs are noted as z_i, so that household i is considered deprived if its achievement in that indicator x_i is below the cutoff, that is if $x_i < z_i$. Well founded reasons are needed to determine each cutoff. For this purpose global practices, national priorities, culture norms, and empirical evidences are used to define cutoffs. After selecting indicators and their corresponding cut-offs, the next task is to define the weights 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 receives 1/5. The table 2 below provides the definition of each indicator with deprivation cut off and their relative weights.[5] Here we note the indicator i weight as w_i with $\sum_1^8 w_i = 1$.

[4]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

[5]Appendix Table 1 provides the list of questions used in defining each indicator and the methodology used for the construction of the indicator.

Table 2

Weights and Deprivation Cutoff for Each Indicator

Dimension	Indicator	Deprivation Cutoff	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:Qualty 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.

Step 4: Choosing the poverty cut-off (to identify the poor)

In this step, we assigned a deprivation score to a household according to its deprivations in the component indicators. The deprivation score of 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 increases 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 cutoff 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 cutoff i.e. a household is poor if $c_i \geq k$. For those whose deprivation score is below the poverty cutoff, 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 make 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 5: 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 which are multidimensionally 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 multidimensionally 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 households which are multidimensionally health poor. The HPI is calculated by multiplying the incidence of poverty by the average intensity across the poor:

$$HPI = H * A$$

4.2.2. *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 remove health poverty. Poverty mapping through GIS helps to find the determinants of poverty including natural capital and infrastructure, and access to public services.

4.2.3. *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:

$$P = f(economicfactors, socialfactors, regionalfactors)$$

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

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

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

Where X represents the matrix of demographic variables including gender, age, education and marital status of the head of the household and overall household size; E represents matrix of the variable to 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. Table 3 below provides the detailed definition of each variable. Dependent variable is defined using health poverty index: 1 if the 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 of being a poor individual and with what proportion as compared to the reference category.

Table 3

Variable Definition

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: Primary [class 1 to class 5] (1 if yes otherwise 0) Matric [class 6 to class 10] (1 if yes otherwise 0) Bachelor [class 11 to class 14] (1 if yes otherwise 0) 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 person 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 earn 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 person 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: Punjab (1 if yes otherwise 0) Sindh (1 if yes otherwise 0) 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)

5. RESULTS AND DISCUSSION

5.1. Incidence of Health Poverty

Table 4 shows both the incidence or head count ratio (H) of health poverty and the average intensity (A) of their poverty and health poverty index (HPI) at different poverty K-Cutoff. The result shows that as we move from 10 percent to 100 percent poverty cutoff, the head count ratio keeps on decreasing. The average intensity (A) has an increasing pattern, it is due to the fact that in the Censored Weighted Deprivation Matrix the percentage of poverty cutoff increases the

household with more deprivations that are censored as poor, and the Average Intensity of the poverty is the average of the MD poor people. At the initial poverty cutoffs, the **A** is low and with the increase in poverty cutoff the percentage of **A** keeps on increasing. The results show that as we move from 10 percent to 100 percent poverty cutoff, the health poverty index keeps on decreasing.

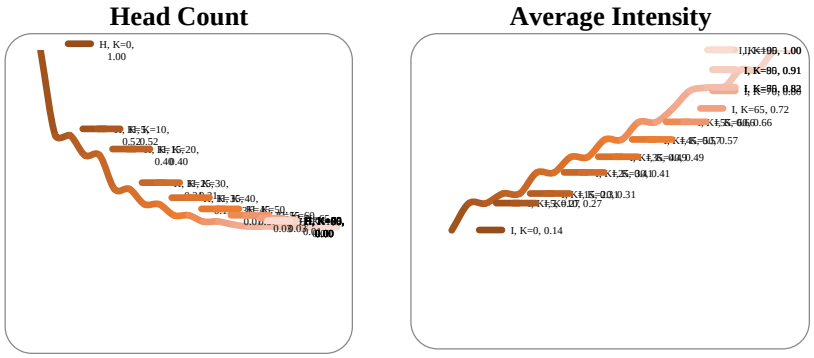
Table 4

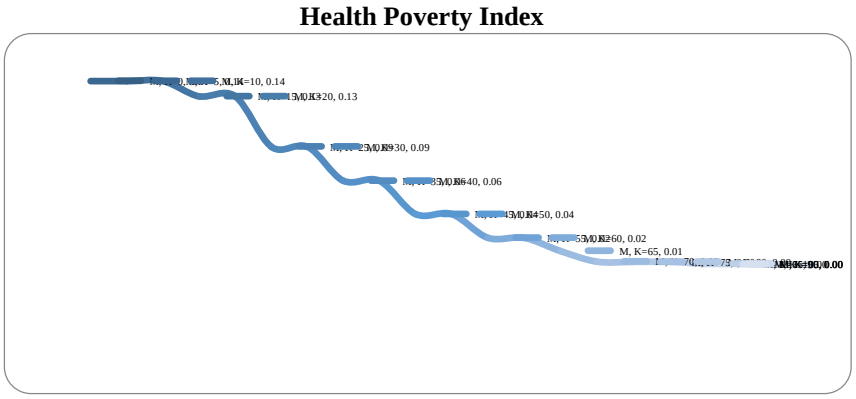
Head Count, Average Intensity and Health Poverty Index at Different K-Cutoffs

K- Cutoff (percent)	Head Count (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 cutoff goes on increasing, the H has a decreasing trend, A has increasing trend while HPI has also a decreasing trend.

Fig. 1. Trend in Head Count, Intensity and Health Poverty Across Different K-Cutoff





For further analysis, this study set the K-cutoff at 20 percent. We have declared a household as a poor household in health if the household is deprived in one dimension out of five dimensions i.e. 5th quintile.[6] The incidence of health poverty for the poverty cutoff K=20 percent is reported in Table 5. The results show that the head counts of 41 percent households are below the poverty cutoff across Pakistan. Further, the ratio is very high in rural areas of Pakistan (50 percent) as compared to urban areas of Pakistan (22 percent). Provincial analysis shows that Punjab is the least poor province of Pakistan in terms of health poverty (36 percent) while Balochistan is the poorest province in Pakistan (62 percent). The statistics show that health poverty is high in rural areas as compared to urban areas. A similar trend has been observed across all provinces (Table 5).

Table 5

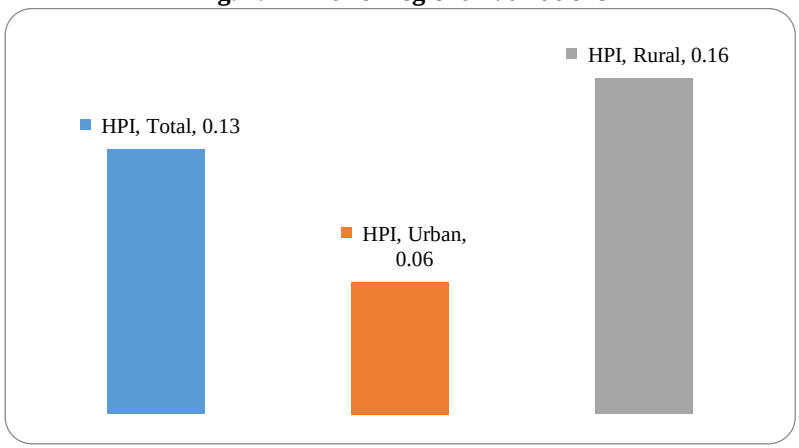
Health Poverty at 20 Percent Cutoff

	Head Count (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
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

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

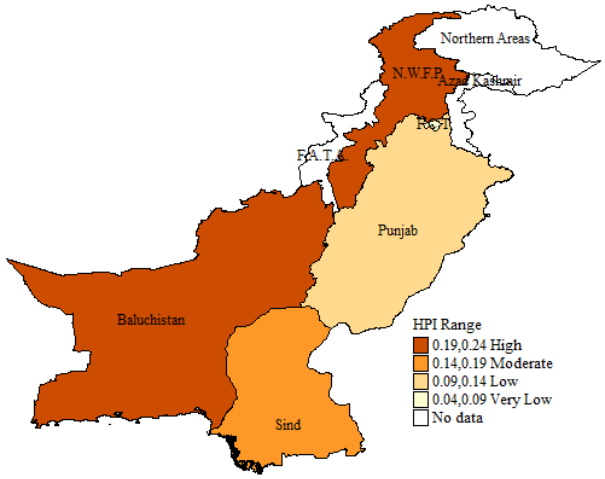
[6]The definition of health poor (a household is health poor if deprived in altleast one dimension) is align with the MPI in which a household is poor is deprived in one dimension.

Fig. 2. HPI and Regional Variations



To further investigate the depth of health deprivation, we form four categories of health deprivation based on the Health Poverty Index (HPI) that 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 in high health deprivation (Map 1).

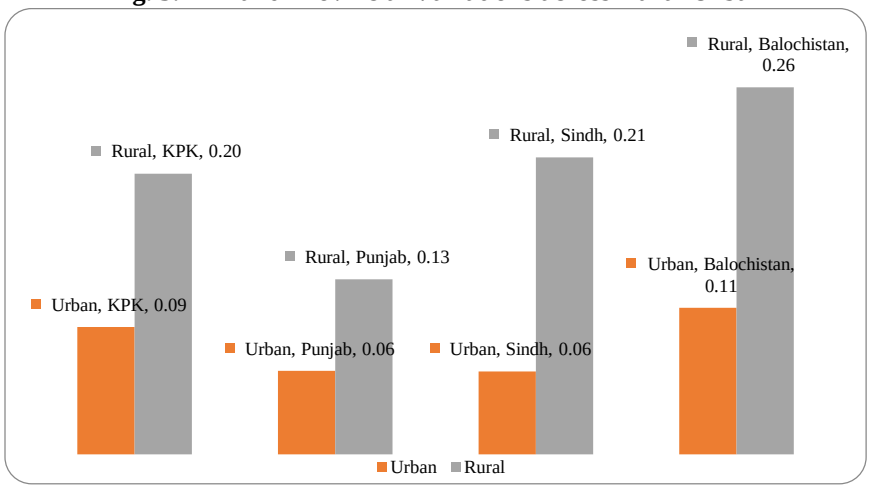
Map 1: Health Deprivation at Provincial Level



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

Provincial analysis exhibits similar pattern across rural/ urban. Balochistan is the most deprived as well as multidimentionally poor in health of provinces in Pakistan while Punjab is the least deprived (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 result shows that only 3.0 and 4.8 percent households are 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 and 4 respectively. In indicator 5 that measures the cost of health facilities in terms of time taken to reach, 20.5 percent households are deprived. 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 – indicators 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

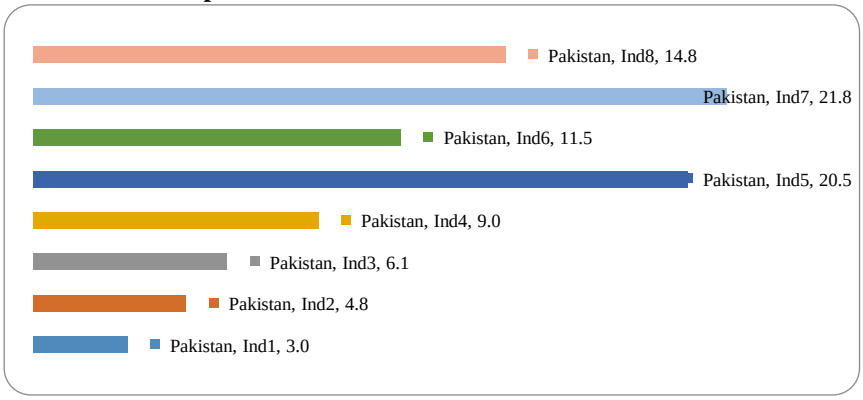
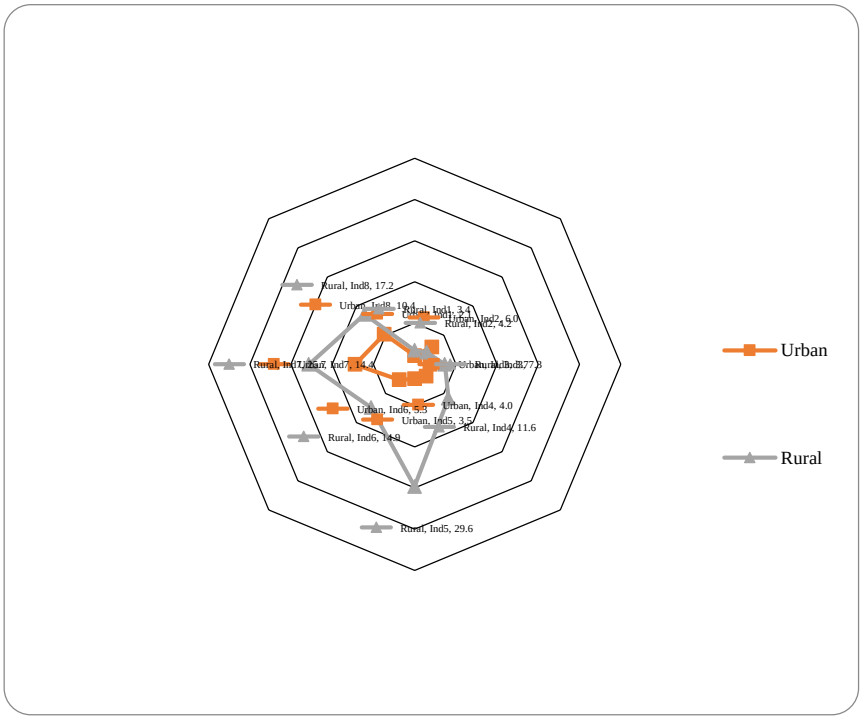


Figure 5 reports the proportion of the households that are poor and also deprived in each indicator across the rural urban divide. It compares the performance of rural areas and urban areas with that of the national aggregate. Similar pattern has been observed across rural and urban areas *vis à vis* the national aggregate. However, the average population deprived in each indicator is low in urban areas as compared to rural areas.

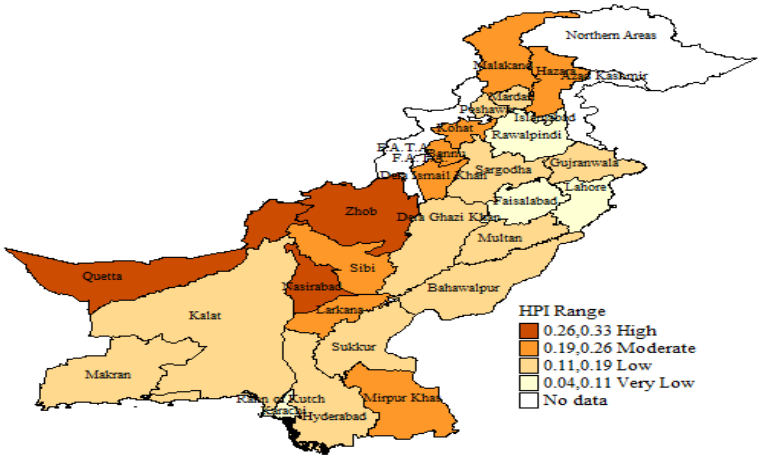
Fig. 5. Percentage of the Households which are HPI Poor and Deprived in Each Indicator Across Rural and Urban Areas



5.2. 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 the division and district levels. 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 MirpurKhas, Dera Ismail Khan, Bannu, Larkana, Hazara, Malakand and Sibi show moderate health deprivation and Zhob, Quetta and Nasirabad show high health deprivation (Map 2).

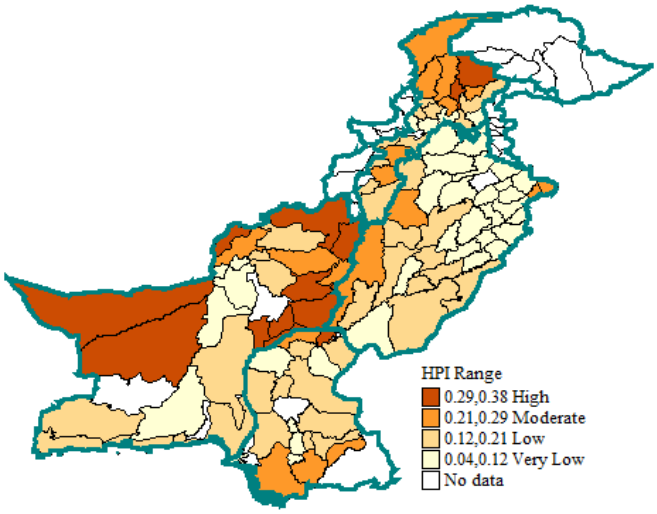
Map 2: Health Deprivation at Divisional Level



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, DeraBugti, Qilla Abdullah, Chagai, Nasirabad and JhalMagsi and KPK including Shangla and Kohistan categorise 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 to 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 show that the average distance from MOUZA to basic health services is very high in highly deprived districts as compared to low deprived districts. The average distance for hospital/dispensary from MOUZA is 17 KM in Pakistan [Punjab (10KM), Sindh (14KM), KPK (12KM), Balochistan (32 KM)]. Similar pattern has 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.

5.3. 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 Pakistan as well as at the regional level. Table 6 presents the logistic regression results at national and regional levels. The results show that education of the head of the household plays significant in eradicating health poverty. With the successive level of education the chances to decrease the likelihood of being health poor has a 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 as compared to 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. The 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 changed 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. The male is primarily concerned with making a living for the household while the female, especially the wife of the head of the household, manages the use of basic facilities like health and education. In this way, the role of the female is very important in improving the health conditions of the household. Increasing household size increases the chances to fall into poverty (Table 6). This is because of distribution of limited resources among the household members causing shortage of resources to obtain health services.

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)***	(0.15)
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
	(0.02)***	(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	43.315	6.877	59.226
	(6.91)***	(2.09)***	(11.28)***
Observations	75,321	26,538	48,783

The economic status of the household has a significant role in determining the health outcomes. Per capita income has a negative and significant impact on health poverty. The results have shown that the likelihood of being poor is decreased by 25 percent as income level increased by one percent. This association holds for both rural and urban areas. The number of earner and employment status of the head of the household also negatively relates with health deprivation (Table 6). Availability of household assets like land ownership and livestock, on the other hand, are not supportive to remove health deprivation or even increase health deprivation. The obvious question is: why assets fail to reduce health poverty? Agriculture land and livestock are primarily owned by 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 the off season. 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 clothes etc. This pushes the household into health poverty.

Regional variations have a significant impact on 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 as compared to their reference KPK. On the other hand, the likelihood of being health poor is increased 38 percent in Balochistan as compared to its reference KPK. Similar pattern has been observed in rural and urban areas. The movement from rural to urban areas has decreased 62 percent of the likelihood of being health poor.

Information availability plays 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 availability of media has a significant impact on health poverty. Awareness about the use and importance of health facilities create the demand for health services. The results show that the likelihood of being health poor is decreased by 25 among households using different media sources as compared to household not using media at aggregate level. Similar behaviour has been observed at sub-national level i.e. rural and urban.

The 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 arranging public transport especially in rural areas. To quantify the impact of availability of personal transport, we use the "availability of motorcycle, car etc. in the household" as a proxy. We find that availability of personal transport has a significant impact on health poverty. The results show that the likelihood of being health poor is decreased by 8 among households having personal transport facility as compared to household not having this facility. Similar behaviour has been observed at sub-national level i.e. rural and urban.

To further gauge the role of 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 Table 7. Most of the outcome remains the same as reported and discussed at national level. In sum, socio-economic variables such as income, regional variation, education and awareness play very important role in explaining health poverty.

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)***	(0.12)	(0.34)
Age of HH	0.971	0.975	0.965	0.961
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Education of HH	0.735	0.886	0.780	0.806
Primary	(0.05)***	(0.03)***	(0.04)***	(0.05)***
	0.616	0.740	0.722	0.737
Matric	(0.03)***	(0.02)***	(0.03)***	(0.05)***
	0.561	0.702	0.633	0.598
Bachelor	(0.04)***	(0.04)***	(0.04)***	(0.05)***
	0.627	0.565	0.564	1.253
Master and above	(0.14)**	(0.10)***	(0.11)***	(0.24)
	1.314	1.111	1.553	1.141
Marital Status of HH	(0.10)***	(0.05)**	(0.13)***	(0.13)
	1.175	1.248	1.209	1.169
HH Size	(0.01)***	(0.01)***	(0.01)***	(0.01)***
	1.261	1.304	0.890	1.265
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)***	(0.05)***	(0.04)***
Regional Variations				
Urban	0.491	0.614	0.354	0.305
	(0.03)***	(0.02)***	(0.02)***	(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	10.585	22.772	110.688	433.346
	(3.76)***	(5.33)***	(37.20)***	(236.15)***
Observations	12,420	31,809	19,454	11,638

6. CONCLUDING REMARKS AND POLICY OPTIONS

The present study has constructed the health poverty index (HPI) for Pakistan using household 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 the logistic regression model.

The results have shown that the head count 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 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 head count and average intensity. It is a percentage of those households which are multidimensional poor as well as they are deprived at the same time. This indicates that 13 percent households are multidimensionally poor in health across Pakistan. Regional analysis has shown that 16 percent households are multidimensionally poor in health in rural areas as compared to 6 percent in urban areas of Pakistan. Provincial analysis has exhibited similar pattern across rural urban. Balochistan is the most deprived as well as multidimensionally poor province in Pakistan while Punjab is the least deprived as well as multidimensionally poor province. The results have shown that 20.5 percent households are deprived in the indicator that measures the cost of health facilities in term 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 role in explaining health poverty. To eradicate health deprivation, areas specific and dimension specific policies are required. Efforts are required to increase the provision of services and awareness about the use of services to eliminate health poverty.

APPENDIX

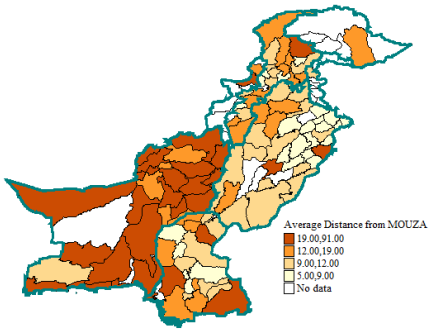
Division	Region/Province	HPI
	Very Low Health Deprivation	
Islamabad	F.C.T.	0.040
Karachi	Sind	0.053
Rawalpindi	Punjab	0.083
Lahore	Punjab	0.084
Faisalabad	Punjab	0.097
	Low Health Deprivation	
Multan	Punjab	0.118
Gujranwala	Punjab	0.119
Peshawar	KPK	0.122
Sargodha	Punjab	0.140
Bahawalpur	Punjab	0.146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

Appendix Table 2

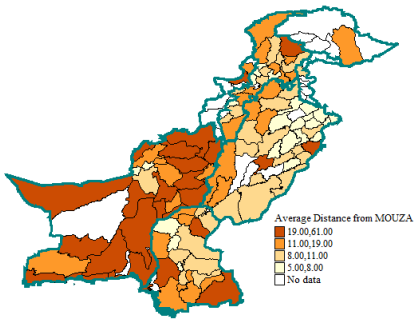
District Ranking

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	Sind	0.053	Layyah	Punjab	0.129
Gujrat	Punjab	0.056	Khuzdar	Baluchistan	0.133
Lahore	Punjab	0.057	Sibi	Baluchistan	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	Sind	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	Sind	0.145
Sheikhupura	Punjab	0.084	Dadu	Sind	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	Baluchistan	0.166
Abbottabad	KPK	0.099	Kech	Baluchistan	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	Sind	0.176
Awaran	Baluchistan	0.105	Bahawalnagar	Punjab	0.178
Kalat	Baluchistan	0.108	QillaSaifullah	Baluchistan	0.179
Matiari	Sind	0.109	Shikarpur	Sind	0.180
TandoAllahyar	Sind	0.112	Lasbela	Baluchistan	0.187
Attok	Punjab	0.112	Sanghar	Sind	0.189
Quetta	Baluchistan	0.113	Gwadar	Baluchistan	0.193
Mastung	Baluchistan	0.113	NaushahroFiroz	Sind	0.195
Rahimyar Khan	Punjab	0.116	Mirphurkhas	Sind	0.199
Sukkur	Sind	0.117	Khairpur	Sind	0.201
Swabi	KPK	0.118	RajanPur	Punjab	0.203
Nowshera	KPK	0.119	Bannu	KPK	0.205
Larkana	Sind	0.120	Tank	KPK	0.206
Moderate Health Deprivation			Dera Ismail Khan	KPK	0.206
Bhakkar	Punjab	0.213	Ghotki	Sindh	0.206
Dera Ghazi Kha	Punjab	0.215	LakkiMarwat	KPK	0.210
Chitral	KPK	0.216	**High Health Deprivation**		
Swat	KPK	0.216	Jafarabad	Baluchistan	0.295
Buner	KPK	0.220	Kharan	Baluchistan	0.297
Umerkot	Sind	0.225	Kashmore	Sind	0.302
Barkhan	Baluchistan	0.229	Musakhel	Baluchistan	0.313
Narowal	Punjab	0.231	Kholu	Baluchistan	0.326
Dir	KPK	0.237	Zhob	Baluchistan	0.327
Thatta	Sind	0.242	Shangla	KPK	0.328
Badin	Sind	0.243	DeraBugti	Baluchistan	0.345
Jakobabad	Sind	0.250	Qilla Abdullah	Baluchistan	0.349
Karak	KPK	0.254	Chagai	Baluchistan	0.349
Pishin	Baluchistan	0.264	Nasirabad	Baluchistan	0.353
Loralai	Baluchistan	0.283	JhalMagsi	Baluchistan	0.356
Battagram	KPK	0.285	Kohistan	KPK	0.379

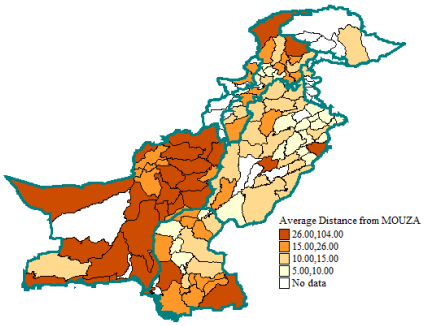
Appendix Map 1: Mean Distance (Hospital)



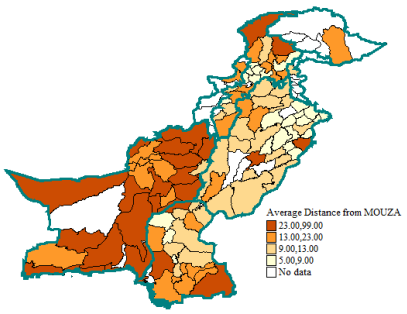
Appendix Map 2: Mean Distance (BHU)



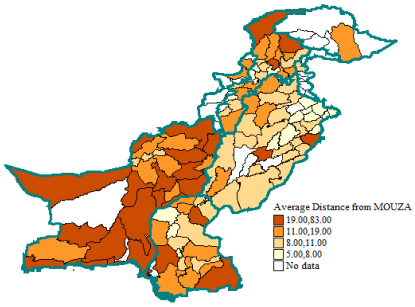
Appendix Map 3: Mean Distance (CMCC)



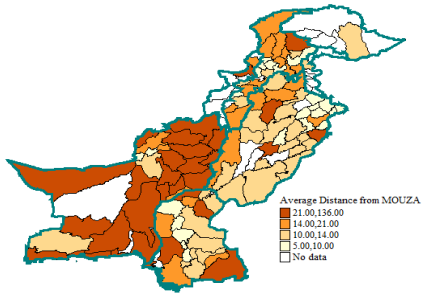
Appendix Map 4: Mean Distance (PWC)



Appendix Map 5: Mean Distance (RHC)



Appendix Map 6: Mean Distance (MFC)



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