

## Catastrophic Health Expenditure and Poverty in Pakistan

SHUJAAT FAROOQ and FAHAM MASUD

The current study has estimated the incidences, intensity and impacts of catastrophic health expenditures for Pakistan. For the analysis, two thresholds are used to define catastrophic health payments (1) if health expenditures are 10 percent or above of household consumption, and (2) if they are 40 percent or above of household non-food consumption expenditures. The Pakistan Panel Household Survey (PPHS) 2010/11 is used for the analysis. The findings reveal that a significant proportion of the population in Pakistan has been facing catastrophic health payment issues. The presence of children, the elderly and sick/disabled persons in the home raises the risks of catastrophic health payments. The availability of improved drinking water sources and toilet facilities reduces the risk of catastrophic health payments. Households with female heads incur more catastrophic payments as compared to households headed by males. Across the provinces, Khyber Pakhtunkhwa and Balochistan have faced a higher incidence of catastrophic payments. Catastrophic health payments have an impoverishing impact on headcount poverty, measured under various methods of propensity score matching.

*JEL Classifications:* I13, I14, I32

*Keywords:* Out-of-pocket Payments, Health, Consumption, Poverty, Health Policy

### 1. INTRODUCTION

The prime function of a country's health system is to provide preventive and curative services, and protect the population from the catastrophic impacts of illness, accidents, and chronic diseases by providing equitable health facilities (Rahman, Gilmour et al. 2013). Less developed countries, including Pakistan, lack well-structured health facilities and universal health coverage, especially for the poorer segments of the population. As a result, the population has to deal with a high prevalence of illness, which creates a financial burden and undermines their future earnings. Out-of-pocket (OOP) payments are the main source of health financing in the majority of underdeveloped countries, and this can be considered a barrier to establishing an equitable health system (Palmer, Mueller et al. 2004). In addition, high out-of-pocket (OOP) payments cause households to reduce their spending on other basic needs and sometimes even prevent them from seeking health care due to non-affordability (Cavagnero, Carrin et al. 2006).

Developed countries protect their population from catastrophic spending by providing adequate health facilities, health insurance, and tax-based health systems.

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However, the majority of the developing countries lack systematic risk pooling mechanisms, especially for the poor who pay from their own pockets. It may not only raise their current vulnerability, but also push them into chronic poverty and force them to compromise and forgo treatment (Bredenkamp, Mendola et al. 2010). Evidence from various countries suggests that heavy health payments compel the poor and lower middle classes to take loans, go into debt, cut down on food and non-food expenditures, and curtail schooling for their children as a coping mechanism (Krishna 2004).

The welfare losses due to catastrophic health payments have now received attention from policy-makers and many countries have started to subsidise health facilities for the poor masses through social safety nets and health insurance programmes (Honorati, Gentilini et al. 2015). The rising interest is also due to the recent trends of privatisation and liberalisation in developing countries, which cause a serious problem for those who struggle to afford health services. Rising economic and natural shocks could be another reason to protect people from catastrophic expenses (O'Donnell, Van Doorslaer et al. 2007).

Pakistan, with a population of 210 million, is responsible for providing basic necessities to all its citizens (Article 38d of the Constitution). Despite health care being a fundamental human right, the state lacks sufficient resources to provide equitable health facilities to all members of the population. The country has been facing a twofold burden where, on the one hand budgetary allocations for health services are insufficient (only 0.6 percent of GDP) and, on the other hand, around two-thirds of the population finances their health expenses themselves (GoP, 2013). Most of the health insurance and subsidised health facilities are limited to formal sector jobholders, excluding the poor due to the lack of adequate health services. The 2005 National Social Protection Strategy (2005) was alarmed that more than 70 percent of poor households faced shocks and two thirds of them reported catastrophic health expenditures as one type of shock.

Various studies in Pakistan have observed out-of-pocket health expenditures (Malik and Syed 2012), but the analysis is quite limited on the impacts of out-of-pocket health expenditures on poverty. The present study is unique, as it has undertaken an in-depth analysis on out-of-pocket health expenditures and their impact on poverty. The findings will help policy-makers to establish an equitable health policy and to target the vulnerable segments of society who suffer the most from catastrophic health expenditures.

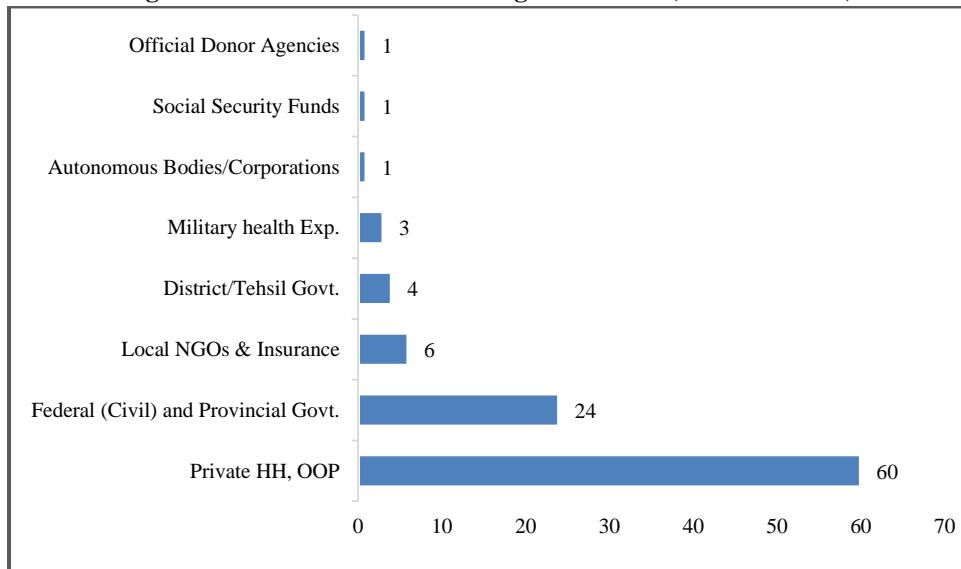
The present study comprises of seven sections.

- Section 2: Health financing facts in Pakistan.
- Section 3: Literature review.
- Section 4: Conceptual framework.
- Section 5: Data and methodology.
- Section 6: Findings over the incidences and intensity of catastrophic health expenditures by socio-demographic and economic profile of households.
- Section 7: A brief analysis on welfare impact of catastrophic health expenditures on headcount poverty.
- Section 8: Conclusion.

## 2. HEALTH FINANCING FACTS IN PAKISTAN

Pakistan is a welfare state and the government is responsible for providing the necessities of life to all citizens irrespective of their sex, caste, creed or race (Article 38 of Pakistan). Despite being a fundamental right, health is treated as a commodity in Pakistan and the majority of the population finances health services from their own pockets (Malik and Syed 2012). The formal employed population may avail themselves of health insurance, subsidies and other forms of health protection, but the poor and informal workers mostly lack such incentives. As a result, 60 percent of health expenditures are private, only 33 percent come from the government, and a minor percentage falls under social safety nets and corporate sectors (Figure 1).

**Fig. 1. Sources of Health Financing in Pakistan (% distribution)**



Source: Pakistan National Health Accounts, Government of Pakistan, 2013.

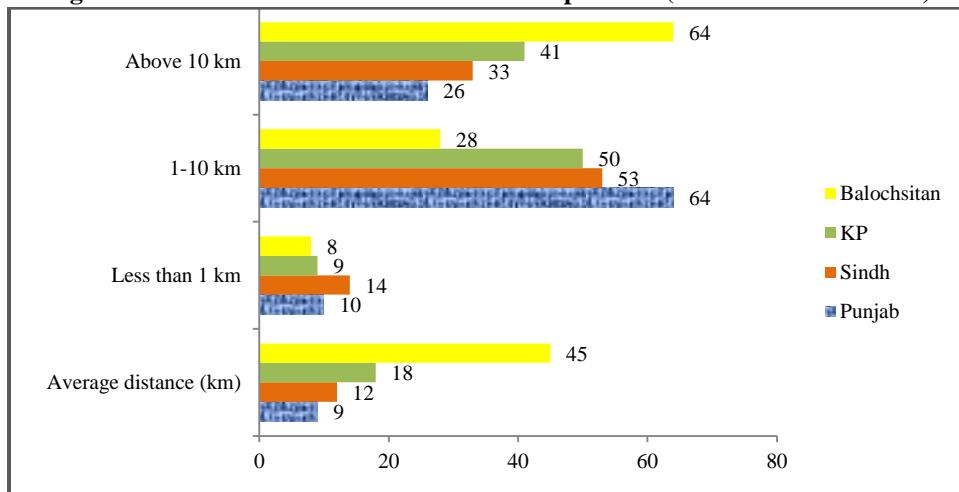
The question arises, then: *why does the majority of the population finance health expenditures from their own pockets?* The reasons are manifold, including both the demand and supply factors. The factors on the demand side include affordability, willingness to pay, socio-economic status, etc., whereas on the supply side, factors include the availability and quality of health services. There is a mixed and multi-tiered health care delivery system in Pakistan, including public, private and non-profit organisations. Although public spending has increased in nominal terms, the range and ratio of health expenditure to gross domestic product has varied between 0.4–0.9 percent since 1972 (Siddiqui et al. 1995 and Appendix Table 1). The ratio has declined over time (Khalid and Sattar 2016). Lower health spending is common among all the South Asian countries and requires drastic improvement (Appendix Table 2).

Providing better quality health services depends on conditions and the availability of a basic health infrastructure. The data shows that health facilities have increased over time in Pakistan. However, rapid population growth has negated the benefits of this increase (Appendix Table 3). Due to limited capacity, Basic Health Units (the primary

tier) are not fully functional and outreach capacity remains low. As a result, tertiary hospitals are unable to manage the patient load and some of them (i.e., Tehsil-level hospitals) lack better quality health services. The National Health Policy of 2010 has not materialised after the 18th Constitutional Amendment. Overall, poor public performance in the health sector may be attributed to the sub-optimal allocation of budgets, internal and external economic and non-economic challenges (including natural catastrophes), institutional, administrative and political changes, and a lack of capacity or willingness to carry out health reforms (Khaliq and Ahmad, 2016).

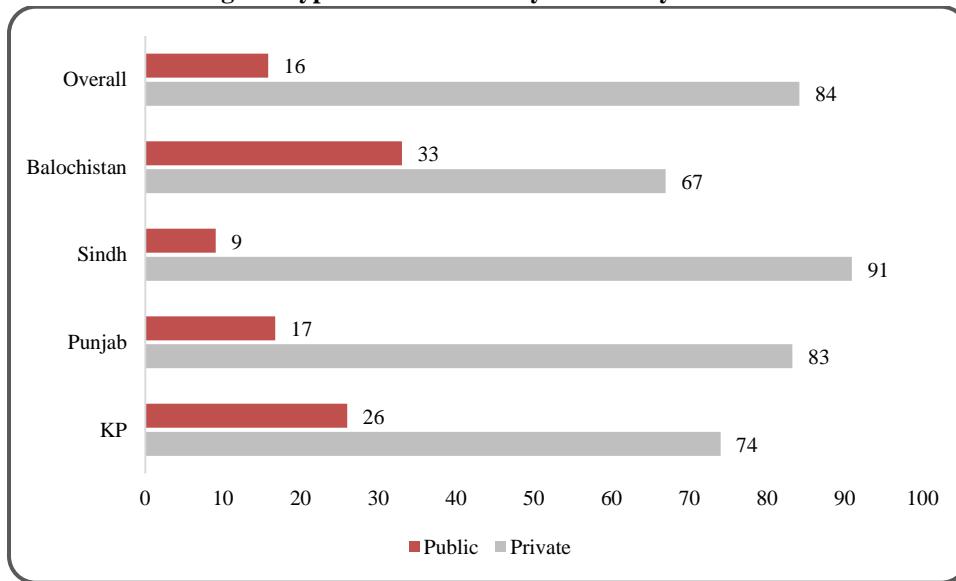
In spite of rapid growth in health infrastructure, access to health facilities is constrained by the rising cost of medical services and medicines, unequal distribution of health facilities between urban and rural areas, and inefficient utilisation of available health resources. When a person goes to a government hospital, he has to pay for the various costs, including user fees, medicine, etc., besides unofficial payments (Malik and Syed, 2012). In many cases, the infrastructure was available but could not be fully utilised because of the shortage of funds i.e., negligence, staff shortages in public hospitals and rapid growth in the number of private practitioners (Siddiqui et al. 1995). Across the provinces, access to hospitals is fair in Punjab and Sindh, but challenges remain in Khyber Pakhtunkhwa and Balochistan (Figure 2).

**Fig. 2. Access to Health Centers for Rural Population (Distance in Kilometer)**



Source: Mouza Statistics, Pakistan Bureau of Statistics (PBS), GoP (2008).

Currently, 84 percent of the population in Pakistan uses private health facilities. The access to, and quality of government hospitals may induce the public to avail health facilities from the private sector. Affordability, income, awareness and age structure could be the other factors that determine health expenditures (Toor and Butt, 2005). Possibly this is why the population of Punjab and Khyber Pakhtunkhwa has availed itself of private health facilities, as both these provinces are comparatively better off than Sindh and Balochistan. The greater utilisation of public health facilities in Balochistan province could be due to its limited private health infrastructure as well as poverty in the province (Figure 3).

**Fig. 3. Type of Health Facility Availed by Province**

Source: National Health Account Survey 2013/14, GOP (2013).

Pakistan has been facing an unacceptably high infant and maternal mortality rate, a double burden of diseases, and inadequate facilities given the pace of population growth. As shown in the Pakistan Demographic and Health Survey (2017), the country has been facing alarming high rates of malnutrition (37.6 percent stunting rates), poor health and well-being (skilled birth attendants attended only 69.3 percent women). As more than one quarter of the population is below the poverty line, the poor masses may further fall into chronic and intergenerational poverty if adequate health coverage is not provided. There is an immediate need for reforms at the provincial level in order to modify the health care system according to modern needs and requirements, focusing mainly on primary health care as well as investing in advanced health care. There should be a focus on building existing staff capacity, as well as ensuring their skill development in clinical practice, leadership, planning, and monitoring (Ather and Sherin, 2014).

### 3. LITERATURE REVIEW

Many underdeveloped countries lack equitable financing systems for health services, i.e. easy access and outreach, and lack of pre-payment mechanisms, such as tax and health insurance. As a result, a majority of the population, especially the poor, finances health expenditures from their own pocket and hence face risks of incurring heavy medical expenditures. This uninsured risk ultimately reduces their current and future wellbeing i.e. heavy out-of-pocket health payments disrupts the material living of the household including consumption, investments, and assets. If health expenses are high relative to available resources, the disruption to living standards may be considered catastrophic (O'donnell, Van Doorslaer et al. 2007).

Catastrophic health expenditure (CHE) refers to any expenditure for medical treatment that can pose a threat to a household's financial ability to maintain its

subsistence needs (Xu, Evans et al. 2005). Various studies use different thresholds for catastrophic spending, ranging from 5 to 20 percent of income and expenditures (O'donnell, Van Doorslaer et al. 2007) and sometimes up to 40 percent of the non-food expenditures (Xu, Evans et al. 2007). However, all levels suggest that a household must reduce its expenditure on basic necessities when it spends a large amount of its budget on health care and will have adverse effects on its livelihood (Chuma and Maina, 2012).

A substantial amount of literature suggests that incidences of catastrophic health payments in developing countries have been pushing millions of people into poverty annually (Rahman, Gilmour et al. 2013). Not all high health care costs can be regarded as catastrophic. A heavy bill for cardiac surgery may not cause economic burden for an affluent family who can afford the procedure, or has some health insurance. On the other hand, a low cost procedure can be financially disastrous for a poor family having no insurance coverage (Xu, Evans et al. 2003). Wagstaff, Flores et al. (2018) analysed 133 countries and found that incidences of catastrophic payments varied across countries and increased over time. At the 10 percent threshold, incidences ranged from 0.3 percent in Zambia to 44.9 percent in Lebanon with a mean value of 9.2 percent for the entire sample. The incidences of catastrophic payments are positively associated with income inequality and negatively with social security and public health infrastructure.

At a micro level, determinants could be the presence of an elderly, handicapped or chronically ill person in the home (Choi, Kim et al. 2016). Household size and age composition, i.e. presence of a higher number of children and elderly in the household, increases the probability of spending more on health care (Lee and Yoon, 2019). In addition, education brings awareness and may lead to either a decrease, or an increase, in catastrophic health expenditures (O'donnell, Van Doorslaer et al. 2007). Chronic diseases (Kashyap, Singh et al. 2018) and hospitalisation duration have a positive impact on catastrophic payments (Haakenstad, Coates et al. 2019). The probability of catastrophic payments is high among households with no health insurance and lower among those who receive medical care benefits (Lee and Yoon, 2019).

High OOP payments have three negative consequences. First, untreated illness may cause the issue of financial affordability among the lower income groups. Second, it may cause reduction in access to health care (Segall, Tipping et al. 2000). Third, households may fall into chronic poverty as people buy health services for their future welfare, and heavy health expenditures can make them take on debt and reduce their assets, including productive assets (Hao, Suhua et al. 1997).

The structure of health financing affects socio-economic wellbeing. Using multiple thresholds of share of health expenditures to consumption, various studies have found negative impacts on consumption (Chuma and Maina, 2012). Taking the data of 11 Asian countries, Van Doorslaer, O'Donnell et al. (2007) found that an increase in health payments caused a commensurately large increase in poverty. Findings from rural India suggest that illness and health care expenses are one of three main factors responsible for 85 percent of poverty (Krishna, 2004). Similar findings were found for Bangladesh (Rahman, Gilmour et al. 2013) and for many other countries e.g. (Wagstaff and Doorslaer, 2003) for Vietnam and (Xu, Evans et al. 2003) for 59 other countries.

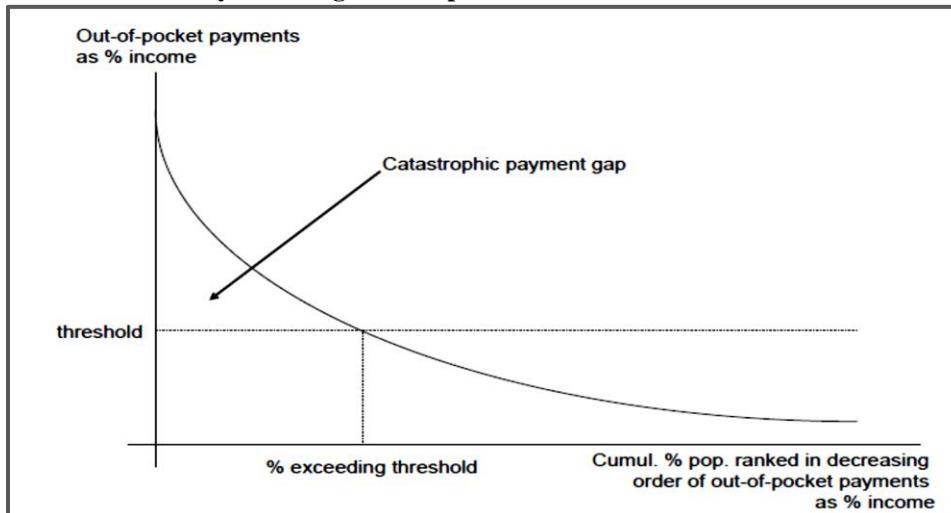
#### 4. CONCEPTUAL UNDERPINNINGS

The concept of catastrophic health payments rests on the theoretical foundations of insurance and the economic value of uncertainty or financial risk of being exposed to large healthcare costs (Berki, 1986). An equitable public health system reduces the risks of healthcare costs. Alternatively, health insurance, whether run by governments or commercial companies, seeks to reduce this risk when a country's health financing arrangements fail to provide this coverage. The concerns of catastrophic health payments are their negative affect on economic wellbeing in the case of high OOP payments, as for example when an individual forgoes consumption of other necessities (e.g. food) to pay for health (Wagstaff, Flores et al. 2018).

There are two methodological choices in measuring catastrophic health payments. The first is to define household resources available to pay for health services. The second is the threshold used to identify health expenditures as catastrophic. In the 'budget share approach', household resources are defined in relation to a household's total budget. However, the approach fails to distinguish between populations that barely manage to meet subsistence needs with little or nothing left for discretionary expenditures (Hsu, Flores et al. 2018). In other words, dealing with both the rich and the poor at the same threshold level is not rational as rich households are more likely to exceed the threshold of minimum resources (Wagstaff and Doorslaer, 2003).

The 'capacity-to-pay (CTP) approach' addresses this limitation, recognising that poorer households spend a higher proportion of available resources on essential items than richer households do. Therefore, the method defines it by using total expenditures. To avoid this puzzle, it has been argued that OOP expenditures can be defined in terms of a household's capacity to pay (Xu, Evans et al. 2003). It is worth mentioning that all approaches consider OOP health payments as involuntary with a negative impact on the welfare of the household (Wagstaff, Flores et al. 2018).

**Fig. 4. Share of Health Payments beside Cumulative Percentage of Households Ranked by Reducing Consumption Share**

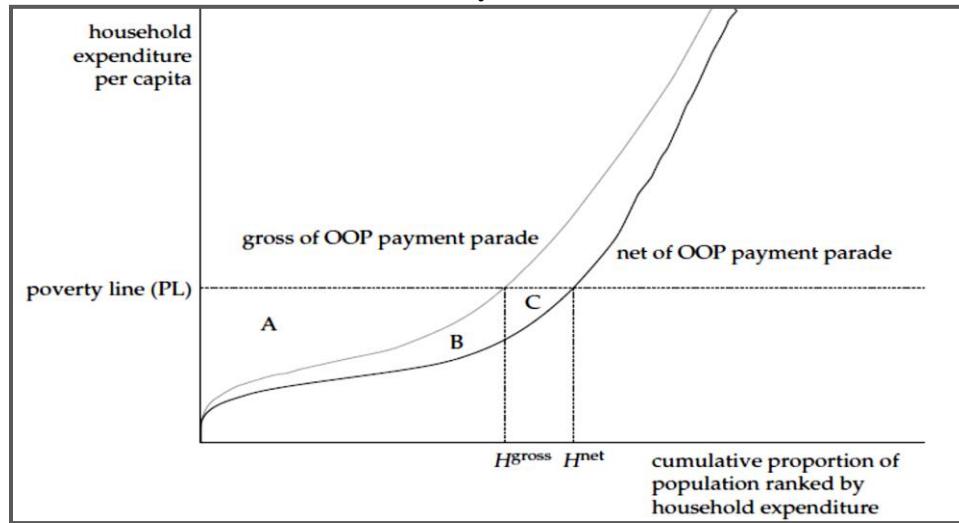


Source: Wagstaff and Doorslaer, 2003.

The prevalence and intensity of catastrophic health expenses and the headcount poverty and poverty gaps are measured in similar methodology. The incidence of catastrophic health expenses are calculated from the fraction or percentage of a sampled household with health care costs as a share of total consumption or non-food consumption, exceeding the selected threshold. As shown in Figure 4, the cumulative fraction of households ordered by the ratio of OOP expenditures to total household expenditures is on the horizontal axis in descending order. After defining the threshold i.e. 10 percent of OOP of total consumption, one can estimate the incidences of catastrophic health payments, or the percentage of households with health care expenditure whose share goes above the threshold. The indicator is 1 if the share of health expenditure exceeds the threshold which is otherwise 0.

Figure 5 provides a simple framework for examining the impact of out-of-pocket payments on the two basic measures of poverty—the headcount and the poverty gap. The figure is a variant on Pen's Parade. The two parades plot household expenditure gross and net of OOP payments on the y-axis against the cumulative proportion of individuals ranked by expenditure on the x-axis. The point on the x-axis at which a curve crosses the poverty line gives the fraction of people living in poverty. This is the poverty head count ratio. This measure does not capture the “depth” of poverty, i.e. the amount by which the poor households fall short of reaching the poverty line. A measure that does consider those is the poverty gap, defined as the area below the poverty line but above the parade.

**Fig. 5. Pen's Parade for Household Expenditure Gross and Net of OOP Health Payments**



Source: O'donnell, Van Doorslaer et al. 2007.

## 5. DATA DESCRIPTION AND METHODOLOGY

### 5.1. Data Description

To analyse the incidences, determinants, and impacts of catastrophic health payments on poverty, we have used the Pakistan Panel Household Survey (PPHS)

2010/11, conducted by the Pakistan Institute of Development Economics (PIDE). The 2010 round covers 4142 households in total, 2800 from rural areas and 1342 from urban areas. The PPHS 2010 has collected detailed information on each household's socio-demographic and economic profile, including detailed modules on education, health, employment, shocks, subjective well-being, food security, migration and many others. The survey has captured information on food and non-food consumption, sufficient to calculate headcount poverty (consumption based) by following official methodology (Nayab and Arif, 2012).

The female questionnaire has captured detailed health information, including access to and outreach from health services, illness and injuries, women's reproductive health, immunisation and children's health status. The health module of illness and injury has gathered information on episodes of illness, the nature of each sickness, who was consulted, hospitalisation and out-of-pocket (OOP) health expenditures made by households for all those family members who faced any illness or injury during the last 12 months. The expenditures include consultation fees for doctors, treatment costs or expenditures on medicines, and hospitalisation, diagnostic tests, and other charges, etc. It is worth mentioning that despite 755 households reporting that they had not made any health expenditures during the last year, we still included them in the analysis. The final analysis was carried out for 4023 households (2756 rural and 1267 urban households). Only 119 households were dropped because they lacked information on headcount poverty.

It is worth mentioning that the PPHS non-food module has also captured overall medicine expenditures made by households during the last twelve months. We found that medicine expenditures reported in non-food items were under-reported, as they were not linked with any individual members' illnesses and lacked detailed segregated information as captured in the health module (detailed above). To improve accuracy, we have refined the total household consumption expenditures by subtracting medicine expenditures (mentioned in non-food module) and adding health expenditures detailed in the health module.

## **5.2. Definition and Measurement of Catastrophic Health Expenditures**

Health expenditures are '*catastrophic*' if they constitute a large share of the household budget and affect the household's ability to maintain its standard of living. The share of out-of-pocket health expenditures can be defined as:

$$\text{OOP} = \frac{\text{T}}{\text{TE}} * 100 \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

OOP = percentage share of health expenditure in total household income/expenditures

T = household expenditure on health

TE = total income/expenditures of a household

Various researchers have used different thresholds of income or consumption to define catastrophic health expenditures. The present study has defined catastrophic expenditures by both approaches. Catastrophe-1: OOP payments over 10 percent of total household expenditure; and Catastrophe-2: OOP payments over 40 percent of non-food consumption expenditures. It is worth mentioning that we have measured headcount poverty under the Food Energy Intake (FEI) method and PKR1671.89 per adult

equivalent per month is used as the poverty line. The household is the unit of analysis; however, the data have been weighted by household size for poverty estimation (Arif and Farooq, 2014).

Following Wagstaff and Doorslaer (2003) and O'Donnell, Van Doorslaer et al. (2007), suppose T is expenditures on health care, TE is total household expenditure and/or Y is nonfood or non-discretionary expenditure. A household would incur catastrophic expenditures if  $T/TE$  or  $T/[TE-Y]$  would exceed the defined threshold ( $z_{cat}$ ), i.e., 10+ percent of household expenditures, etc. The value of the threshold represents the point at which further expenses on health care force a household to sacrifice its other necessities, borrow money, sell assets or descend into poverty. The catastrophic headcount can be calculated as:

$$H = 1/N \sum_{i=1}^N E_i \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

An indicator, E equals 1 if  $T_i/TE_i > z_{cat}$  and zero otherwise, where N is the sample size. However, catastrophic headcount does not capture the degree to which households actually exceed the threshold. For this purpose, the *catastrophic payment gap* (CPG) is calculated, which shows the average amount by which OOP payments (as a proportion of total expenditures) exceed the threshold. It is measured as:

$$CPG = 1/N \sum_{i=1}^N O_i \text{Where } O_i = E_i[(T_i/TE_i) - z_{cat}] \quad \dots \quad \dots \quad \dots \quad (3)$$

However, both incidence (H) and intensity (O) are related through the mean positive overshoot, which is defined as follows:

$$MPO = O/H \quad \dots \quad (4)$$

As mentioned earlier, the PPHS 2010 round covers detailed food and non-food consumption expenditures, as well as health expenditures sufficient to calculate incidence and intensity. Regarding the determinants, catastrophic health expenditures are influenced by many socio-economic and demographic factors. To find the determinants, we have undertaken both bi-variate and multivariate analyses to examine the relationship between a set of covariates of catastrophic health expenditures. The following equation has been used for multi-variate analysis to estimate the determinants of catastrophic health payments:

$$CHE_{1i} = \alpha_0 + \alpha_1 Ch_i + \alpha_2 Ed_i + \alpha_3 El_i + \alpha_4 X_i + \mu_i$$

The dependent variable is the incidence of catastrophic health payments, having two outcomes: 1 if a household is facing a catastrophe health payment issue and 0 otherwise. On the right-hand side,  $Ch_i$  represents the presence of a child in a household,  $Ed_i$  denotes the education status of the household's head and  $El_i$  is the presence of an elderly person in the household.  $X_i$  represents the vector of other control variables, including the household head's working status, household size, presence of a disabled person in home, water and sanitation, and provincial and regional dummies.

In order to analyse the impact of catastrophic health expenditures on headcount poverty, we have developed Pen's Parade Graph (Wagstaff and Doorslaer, 2003) by plotting pre and post health payments after adjusting for total consumption expenditures, along with the poverty line, against the cumulative distribution of households by per capita consumption (ranked in ascending order).

To quantify impacts, the present study has used the propensity score matching (PSM) technique. The PSM technique is applied to avoid selection biases, as characteristics of catastrophe and non-catastrophe households vary (Rosenbaum and Rubin 1983).

To overcome the issue of selective biases, PSM is ideal because it compares catastrophe households with non-catastrophe households, who possess similar socio-demographic and economic characteristics. The basic idea is to find a comparison group having a similar profile (socio-demographic) to the catastrophe-incurring group in all aspects except one, that being that the comparison group does not incur catastrophic health expenditures. The method actually balances the observed covariates between the incurring (catastrophic) group and non-incurring catastrophic group based on the similarity of their predicted probabilities that they will experience catastrophic health expenditures, named as their propensity scores (Ravallion 2003).

$$P(X_i) = \text{prob}(D_i = 1 | X_i) = E(D | X_i)$$

where

$$P(X_i) = F(h(X_i))$$

$F(h(X_i))$  can have a normal or logistic cumulative distribution.

$D_i = 1$  if the household is facing catastrophic expenditures and 0 otherwise.

$X_i$  is a vector of pre-treatment characteristics.

Catastrophe households are matched to non-catastrophe households based on propensity score. Using Equation 6, the propensity scores are calculated first through the logistic regression and then the *Average Treatment on the Treated* (ATT) effect is estimated as:

$$\begin{aligned} \text{ATT} &= E(Y_{1i} - Y_{0i}) \\ &= E(\text{ATE} | D_i = 1) \\ &= E[Y_{1i} | D_i = 1] - E[Y_{0i} | D_i = 1] \end{aligned}$$

Where:

$Y_{1i}$  is the potential outcome if the household is facing a catastrophe and

$Y_{0i}$  is the potential outcome if the household is not facing a catastrophe.

ATE is the Average Treatment Effect

In order to make the sample comparable, it has been restricted to only those units (households) with probabilities that lie within the region known as the common support; that is, the area where there are enough of both control and treatment observations for comparison. After calculating propensity scores, the welfare impact of *Average Treatment on the Treated* (ATT) effect is estimated by the four PSM methods: Kernel method, Nearest Neighbour method, Radius method and Stratification Matching method.

- The Kernel method matches all the treated households with the weighted average of all the non-treated households where weights are inversely proportional to the distance between the propensity scores of treated and non-treated households.

- In Nearest Neighbour matching, each treated household is matched with the non-treated households having the closest propensity score with replacement.
- The Radius method imposes a limit on maximum propensity score distance, called radius.
- The Stratification matching method, which consists of dividing the range of propensity score variations in a set of intervals such that, within each interval, the treated and non-treated households have, on average, the same propensity score.

For details on the PSM methodology, see Nayab and Farooq, 2014.

## 6. RESULTS

### 6.1. Out-of-Pocket Health Payments

The respondents of the 2010 PPHS survey reported that only 3 percent of the surveyed households had ever financed their health expenses from insurance and social assistance, and the rest took care of these expenses from their own pockets. Within health expenditures, medicine was the main source of health expenses with a 74 percent share, followed by doctors' consultations (17 percent) and diagnostic tests (9 percent). As shown in Table 1, per capita OOP health expenses are strongly linked with household socio-demographic and economic characteristics. Rural households, on average, incurred less per capita health expenses than their urban counterparts. That could be due to both demand and supply factors, including limited access, outreach and awareness, as well as a lack of private health facilities in rural areas.

Female headed households are associated with higher OOP health expenses in both the rural and urban areas, as a female householder may be more cautious about her family, or it could be due to comparatively affluent households being headed by females due to overseas migration. In case of widows running female-headed households, they might be financed by someone else, as in charitable donations or under social safety net transfers, either formal or informal. Household size has a negative association with OOP per capita health expenses, suggesting that per capita health expenditures decline as household sizes increase. The negative association could be due to the poverty factor and the larger households' inability to incur more health expenditures. Affluent households, on average, have 2.5 times more health expenses than poor households (Table 1).

Table 1

*Average Per Capita Annual Health Expenditures by Household Characteristics (in PKR)*

Characteristics	Rural	Urban	Overall
Overall	2275	2940	2485
<i>Sex of Head of Household</i>			
Female	2835	2775	2815
Male	2252	2947	2470
<i>Household Size (category)</i>			
Upto 4 members	3039	4931	3583
5–7 members	2222	2699	2402
8–9 members	2038	2422	2164
10+members	1891	1966	1908
<i>Headcount Poverty</i>			
Poor	1067	1163	1091
Non-poor	2565	3216	2780

Source: Estimated from PPHS 2010 micro dataset.

The analysis reveals that average health expenditures are 6.2 percent of total monthly consumption expenditures, lower in rural areas (6.1 percent) than urban areas (6.3 percent). In both regions, on average, the bottom quintile (20 percent of the population) has endured more health expenditures as a share of household consumption, thus reflecting that they are facing more burdens and catastrophic risks (Table 2).

Table 2

*Share of Health Expenditures in Total Monthly Consumption (in %)*

Quintile	Overall	Rural	Urban
Bottom Quintile	6.7	6.5	7.2
2 <sup>nd</sup> Quintile	6.1	6.1	6.1
3 <sup>rd</sup> Quintile	6.0	6.2	5.6
4 <sup>th</sup> Quintile	6.4	6.2	7.0
5 <sup>th</sup> Quintile	5.7	5.5	6.2
Overall	6.2	6.1	6.3

*Source:* Estimated from PPHS 2010 micro dataset.

*Note:* Quintiles are established by using monthly household consumption.

## 6.2. Incidences and Intensity of Catastrophic Payments

Before explaining the results, it is worth mentioning that we have defined catastrophic health payments by two thresholds: OOP health payments are 10+ percent of the total household consumption expenditures, or 40+ percent of the total non-food expenditures. Table 3 shows that 22 percent and 16 percent of the households have catastrophic health payments when OOP health expenditures have a 10 percent and higher share in total consumption, and a 40 percent and higher share in total non-food consumption, respectively. Rural households are facing slightly higher catastrophic health payment issues than their urban counterparts, and that could be due to more poverty in rural areas with higher travel costs due to the lack of health facilities in rural regions. The lower percentage of intensity/overshoot in rural areas suggests that, overall both health expenditures and consumption expenditures (both food and non-food) are comparatively less variable than urban households (see details in Appendix Table 4 at various thresholds).

Table 3

*Incidences and Intensity of Catastrophic Health Expenditures (%)*

Catastrophic Payment Measures	Overall	Rural	Urban
<i>OOP 10+ % share in total consumption</i>			
Headcount (H %)	22.4	20.7	19.4
Overshoot (O %)	3.4	2.7	4.8
Mean Positive Overshoot (MPO %)	16.5	13.1	24.9
<i>OOP 40+ % share in non-food consumption</i>			
Headcount (H %)	15.9	17.5	15.7
Overshoot (O %)	9.1	7.4	12.5
Mean Positive Overshoot (MPO %)	63.8	53.3	85.0

*Source:* Estimated from PPHS 2010 micro dataset.

Various household characteristics are likely having an impact on catastrophic health expenditures. Table 4 shows that households with female heads have incurred more catastrophic payments, which could be due to more cautious behaviour. Therefore, financial support from someone else due to poverty (in case of the former), and affordability (for overseas migrants) may support these results. Demographic variables such as the presence of children, senior citizens, and household size, have shown a health burden on households. Although there is less of a variation due to the presence of children and various categories of household size, a larger difference can be observed due to the presence of senior citizens in the home. It suggests that a household has to bear double the burden in case of seniors since there is (1) high dependency with no earning and (2) repetitive medical treatments for them.

Table 4

*Incidence of Catastrophic Health Expenditures (%) by Household Characteristics*

Characteristics	OOP 10 and above % Share in Total Consumption	OOP 40 and above % Share in Non-food Consumption
<i>Sex of Head of Household</i>		
Female	25.9	22.9
Male	20.1	13.3
<i>Presence of child under age 5</i>		
No	21.0	14.9
Yes	23.2	16.2
<i>Household Size (in categories)</i>		
Upto 4 members	18.4	12.1
5–7 members	19.7	13.8
8–9 members	20.1	12.6
10 and above members	21.8	14.1
<i>Presence of chronic sick or disable at home*</i>		
No	15.1	10.4
Yes	31.0	21.4
<i>Presence of elder (65 and above age) at home</i>		
No	22.5	16.0
Yes	28.5	17.3
<i>Distance to the health facility (in Kilometers)*</i>		
Upto 2km	21.5	14.3
>2–10km	22.6	15.4
Above 10 km	24.8	18.2
<i>Safe Drinking Water</i>		
No	25.2	16.9
Yes	21.5	15.2
<i>Toilet Facility</i>		
No	24.4	16.7
Yes	20.8	14.9
<i>Status of hospitalised of any household member</i>		
No	15.4	10.6
Yes	52.0	36.3
<i>Headcount Poverty</i>		
No	19.4	12.6
Yes	22.4	16.3
<i>Provinces</i>		
Punjab	17.7	9.5
Sindh	20.9	16.4
Khyber Pakhtunkhwa	27.3	18.9
Balochistan	29.6	20.2

Source: Estimated from PPHS 2010 micro dataset.

\* chronic illness includes respiratory issues, heart problem, mental illness, diabetes and disability.

\*\* it includes government hospital, rural health centre, basic health unit, private hospital and private doctor.

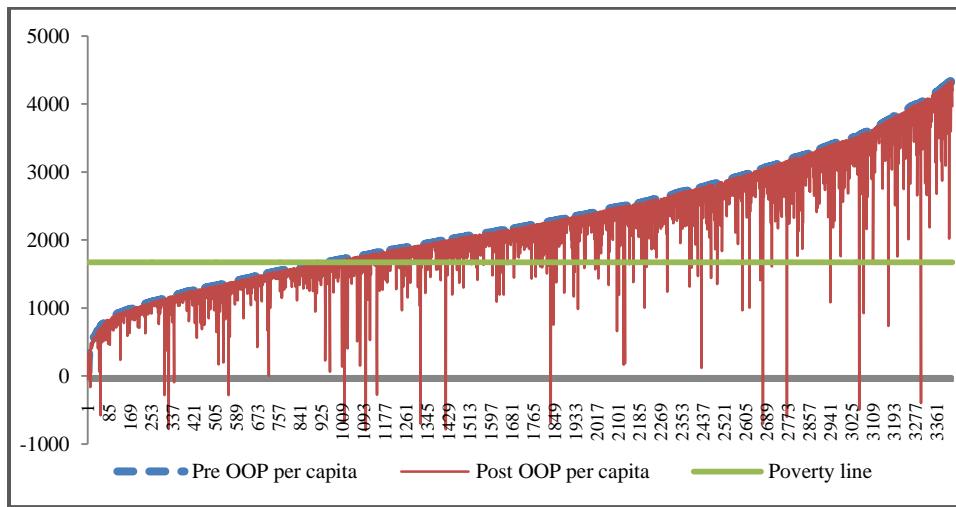
The presence of chronic sickness or permanent disability in the home also raises household vulnerability. Catastrophic health payment issues are almost double among such households as they usually face permanent health shocks, and require consistent medical treatment and permanent extra care of other adult members. Increase in distance to medical facilities also raises catastrophic payment issues as the majority of the population resides in rural areas while medical facilities are located in urban areas, making transportation cost one of the factors that raises health payments for the rural population (Table 4).

The impact of catastrophic health payments is higher for poor households, which could be due to overall lower household consumption and allocation of a higher share of income for health expenses. Although most health expenses raise the risk of poverty and vulnerability, hospitalisation is one of the leading factors of catastrophic payments. The catastrophic health payment impacts for these vulnerable households are more than triple where hospitalisations occurred in the previous 12 months.

Regional characteristics have an influence on catastrophic payments. High catastrophic payments affected Khyber Pakhtunkhwa (KP) and Balochistan provinces the most and were the lowest in Punjab. The low expenditures in Punjab could be due to low rates of headcount poverty, better affordability to pay for health services, and better health facilities that are easier to access since they are located closer to homes. Balochistan is the most vulnerable and least developed province of Pakistan in terms of education and access to basic health facilities (Table 4).

Figure 6 shows the effect of OOP health payments on household consumption. The figure can be called Pen's Parade graph or a "paint drop chart" (Wagstaff and Doorslaer, 2003). The per capita consumption expenditures, including per capita health expenditures (pre OOP per capita), and per capita consumption expenditures, excluding per capita health expenditures (post OOP per capita), along with the poverty line, are plotted by ranking per capita consumption expenditures in ascending order. The vertical bar shows

**Fig. 6. Impact of OOP Health Expenditures on Household Consumption Distribution**



Source: Estimated from PPHS 2010 micro dataset.

that some households are pushed into poverty due to health payments. A few households' post per capita consumption (after deducting health expenditures) even went into the negative. It is also evident from the graph that health expenditures are greater at higher values of consumption expenditures, but it is mostly households at the middle and lower end of the graph that are dragged into poverty due to health expenses.

## 7. CATASTROPHIC PAYMENTS: A PSM ANALYSIS

As detailed in the methodology section, the propensity score matching (PSM) method is applied to estimate the effect of catastrophic health payments on headcount poverty. Following the first step of the technique, we have estimated the propensity scores through logistic regression, for which two conditions must be met: the balancing property and the unconfoundedness property. After calculating propensity scores, the *Average Treatment on the Treated* (ATT) effect is estimated using four different methods: Nearest Neighbour; Kernel, Radius and Stratification Matching.

Following the first step of the PSM technique, Table 4 presents results over the determinants of catastrophic health payments by incorporating the correlates on which both the balancing and unconfoundedness properties conditions are satisfied. The dependent variable is binary in nature, even if the household faces catastrophic health payments, based on 10+ percent of total consumption expenditures, and 40+ percent of non-food consumption expenditure. Odds ratios are reported in Table 5.

Table 5

*The Determinants of Catastrophic Health Expenditures—Logistic Regression Model*

Correlates	OOP 10+ % Share in Total Consumption		OOP 40+ % Share in Non-food Consumption	
	Odds Ratio	Std. Error	Odds Ratio	Std. Error
Sex of household head (male=1)	0.893	0.196	0.516***	0.117
Presence of a child (yes=1)	1.022	0.102	1.102	0.127
Presence of an elderly person (yes=1)	1.265***	0.127	1.135**	0.132
Household size (up to 4 members as reference)				
5-7 members	1.063	0.143	1.018	0.158
8-9 members	1.046	0.165	0.871	0.159
10+ members	1.778**	0.131	0.599***	0.117
Presence of chronically sick and/or disabled person (yes=1)	1.411***	0.038	1.409***	0.044
HH member is hospitalised (yes=1)	6.717***	0.683	5.460***	0.611
Distance to health facility (in km)	1.004*	0.002	1.006**	0.003
Literacy of HH head (literate=1)	0.827**	0.079	0.759**	0.084
Number of persons per room	1.597**	0.368	1.209*	0.332
Improved water (yes=1)	0.818	0.116	0.880	0.141
Toilet facility (yes=1)	0.577***	0.063	0.643***	0.079
Region (urban=1)	0.896**	0.128	0.821***	0.173
Province (Punjab as reference)				
Sindh (yes=1)	1.246**	0.140	2.050***	0.268
Khyber Pakhtunkhwa (yes=1)	2.246***	0.299	2.733***	0.430
Balochistan (yes=1)	1.260**	0.229	2.297***	0.458
Constant	0.321***	0.098	0.253***	0.085
Pseudo-R <sup>2</sup>		0.150		0.139
Number of Observations (N)		3949		3949

Source: Estimated from PPHS 2010 micro dataset.

\*\*\*significant at 1 percent, \*\* significant at 5 percent, \* significant at 10 percent.

The demographic variables show that the household head's sex is significant only in model 2 (OOP as a percentage of non-food consumption) where households with male heads are less likely to incur catastrophic payments compared to households with female heads. The presence of a child does not make a statistical difference; however, the presence of an old person in the home raises the likelihood of catastrophic health expenditures. Similarly, the presence of a chronically ill or disabled person in the home also raises the probability that the home will end up liable for catastrophic health payments. Various dummies of household size show that only large households (having 10 or more members) face issues surrounding catastrophic health payments as compared to smaller households (up to 4 members).

The household head's education level, as measured by literacy rate, is also found to be negatively correlated with the likelihood of incurring catastrophic expenditures. It may be because education can be used as a proxy for future income and imparts its negative influence on health spending through good health. The two health-related indicators show that hospitalisation of a household member raises the probability of catastrophic payments by 5.5 to 6.7 times as measured through both models. Distance to the nearest health facility is another factor that raises catastrophic health expenditures.

Three proxies of hygienic conditions in the home are added in the model, which shows that crowding, as measured through number of persons per room, leads to more catastrophic health payments for the home. Similarly, having a toilet facility also reduces the chances of catastrophic health payments. The impact of improved water is not significant. These hygiene variables mostly act through preventive measures of health care, as households that are more hygienic are less likely to face disease.

Households in urban areas are significantly less likely to incur catastrophic health expenditures. This is because rural areas face difficulties in access and outreach from health facilities, which are widely available in urban areas. Households in Sindh, KP and Balochistan have higher probabilities of incurring catastrophic payments compared to those in Punjab. The lower incidence in Punjab could be due to relatively fewer demand and supply gaps than the rest of the provinces, because people may have more affordable options along with better health services.

This brings us to the final stage of the PSM impact analysis results, presented in Table 6. The table shows the estimated impact of catastrophic payments by displaying the *Average Treatment Effect on the Treated* (ATT) against headcount poverty. The bootstrapped standard error, as well as the number of matching cases treated, and the size of the control group, are also given in Table 6. The impact of catastrophic health expenditures on poverty is statistically significant for all three measures (Table 5). The results show that households incurring catastrophic expenditures have a higher probability of being poor. However, this impact varies across the three measures, ranging from 4.4 to 6.7 percent under the first measure of catastrophic health payments (health expenditures as a fraction of total consumption). The trend is the same but estimates vary under the second measure (health expenditures as a fraction of total non-food consumption), with its range spanning from 7.1 to 9.5 percent, with the lowest value for the Kernel method and the highest for the Radius matching method. Thus, catastrophic payment-incurring households are more likely to be poor than catastrophic non-incurring households with similar characteristics.

Table 6

*ATT Effects of Catastrophic Health Payments on Poverty*

Measures/ATT	OOP 10+ % Share in Total Consumption	OOP 40+ % Share in Non-food Consumption
Nearest neighbour method		
ATT	0.044**	0.071***
N.Treated	765	509
N.Control	550	422
St. error bootstrap	0.022	0.028
t-stat	2.01	2.509
Kernel method		
ATT	0.053***	0.068***
N.Treated	765	509
N.Control	2983	3232
St.error bootstrap	0.016	0.017
t-stat	3.350	4.074
Stratification method		
ATT	0.055***	0.072***
N.Treated	765	509
N.Control	2983	3232
St.error bootstrap	0.018	0.023
t-stat	3.144	3.180
Radius Matching method		
ATT	0.067**	0.095**
N.Treated	368	267
N.Control	759	756
St.error bootstrap	0.038	0.018
t-stat	1.960	2.323

Source: Estimated from PPHS 2010 micro dataset.

\*\*\*significant at 1 percent, \*\* significant at 5 percent, \* significant at 10 percent.

## 8. CONCLUSIONS AND POLICY RECOMMENDATIONS

Health expenditures may become a burden when people have to sacrifice their other basic needs, as they are involuntary payments. The present study has estimated the incidences of catastrophic health expenditures and their impacts on headcount poverty. Two thresholds are used to define catastrophic payments: if health expenditures are 10+ percent of total household consumption, and if health expenditures are 40+ percent of household non-food consumption. The findings reveal that at the former threshold, 22 percent of the households in Pakistan have faced catastrophic health payment issues and 16 percent qualify under the latter cut-off. Rural areas have been facing more issues surrounding catastrophic health payments. The presence of elderly and sick or disabled

persons in the home can raise a household's vulnerability and risks of facing catastrophic health expenditures. Likewise, improved hygienic environments, meaning less crowding and consistent access to a toilet facility, can lower the risk of facing catastrophic payments. While taking the 10+ percent OOP share in consumption expenditures, catastrophic payments lead to increases in headcount poverty by 4.4 to 6.7 percent. The impact on headcount poverty worsens when a 40+ percent OOP share in non-food consumption expenditures is taken. The study, thus, proposes the following recommendations:

- The high share of OOP health expenditures along with the rising demand for private hospitals necessitates that the government enhance the access to, and outreach from, public health services and facilities, both in terms of affordable care and equitable access, and especially to vulnerable households. The public health system requires fundamental reforms to reshape the health care system and make it more efficient and effective. The structural bottlenecks in the health system may not be overcome unless fundamental changes are introduced to improve the system's technical and allocative efficiency, enhance the quality of services, and make the system more equitable.
- Pakistan lacks sufficient spending on health facilities. Communicable and non-communicable diseases and other health issues have over-stretched health facilities. The lack of universal immunisation, alarming levels of malnutrition and rising population pressures are areas of concern. The recent outbreak of dengue fever is one example. There should be much more focus on preventive measures to inform the population about universal immunisation, communicable diseases, nutritional diets, etc. Hygienic and WASH awareness could be key factors the government could use to improve health and nutrition.
- Currently, Pakistan lacks health insurance for poor households. The Prime Minister Health Insurance is a good initiative that aims to target poor households by providing reasonable health insurance (PKR 720,000 to a family per annum). The insurance can be productive for the poor by focusing on availability of medical facilities. Beneficiaries of the scheme must be made aware of it to avoid the likelihood that they will underutilise health services, as had happened earlier in BISP's Waseela-e-Sehat pilot project. Other stakeholders, i.e., NADRA and local governments, must be involved in completing the documents needed to avail the health insurance, including the B-form and CNIC for family members.

Appendix Table 1

*Public Sector Health Expenditure in Pakistan (in Rs. Billion)*

Years	Current Expenditures	Development Expenditures	Total Health Expenditures	Health Expenditure as % of GDP
2000-01	18	6	24	0.7
2002-03	22	7	29	0.6
2004-05	27	11	38	0.6
2006-07	30	20	50	0.6
2008-09	41	33	74	0.6
2009-10	41	38	79	0.5
2010-11	23	19	42	0.2
2011-12	29	26	55	0.3
2012-13	92	33	125	0.6
2013-14	115	59	174	0.7
2014-15	130	69	199	0.7
2015-16	147	78	225	0.7
2016-17	190	102	292	0.7

Source: Economic Survey of Pakistan, various additions.

Appendix Table 2

*Health Expenditure in Selected Countries 2014*

Countries	% of all Govt. Resources going to Health	Govt. Expenditures on Health (% of GDP)	Health Expenditures (in US \$)	Per Capita Total Share Allocated by Households on Health Exp. (%)
	Health	GDP)	\$)	
Bangladesh	6	1	31	67
India	5	1	62	62
Malaysia	6	4	210	35
Nepal	11	2	40	48
Pakistan	5	1	36	56
Sri Lanka	11	2	127	42
Thailand	14	3	216	12

Source: World Health Statistics (WHO) 2014.

Appendix Table 3

*Health Facilities over Time in Pakistan*

Year	Population per Hospital (000)	Population per BHUs (000)	Population Per Maternity and Child Health Centers (000)	Population per Rural Health Centers (000)	Population per Bed
2001	157	27	162	264	1458
2003	165	28	165	271	1513
2005	170	29	172	281	1537
2007	172	30	180	290	1577
2009	176	32	188	297	1639
2011	181	33	208	306	1647
2013	166	33	268	276	1557
2015	164	35	262	280	1604
2016	183	37	265	284	1592
2017	184	38	267	283	1580

Source: Pakistan Economic Survey, various rounds.

Appendix Table 4

*Incidences and Intensity of Catastrophic Health Expenditures (%)*

Thresholds	OOP Health Expenses as Share of Total Expenditure (in %)			OOP Health Expenses as Share of Non-food Expenditure (in %)		
	Headcount (H)	Mean Gap	Mean Positive Gap	Headcount (H)	Mean Gap	Mean Positive Gap
5%	39.3	4.8	12.4	—	—	—
10%	22.4	3.4	16.5	—	—	—
15%	14.8	2.6	20.8	—	—	—
20%	10.6	2.2	26.2	30.4	13.0	43.5
25%	8.9	1.8	29.2	25.2	11.7	48.2
30%	—	—	—	21.6	10.6	52.2
35%	—	—	—	18.5	9.8	57.2
40%	—	—	—	15.9	9.1	63.8

Source: Estimated from PPHS 2010 micro dataset.

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