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Regional Comparative Analysis of Family Catastrophic Health Expenditure in Pakistan

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ABSTRACT

The amount of money Pakistani families spend on medical care is examined in this paper making use of PSLM data for 2018–19. It looks into the elements and factors that affect how much money families spend on various illnesses. Numerous factors, such as the type of disease, the number of people living in different provinces, the location (rural or urban) and age of the family heads affect the cost of a family's catastrophic expenditure. According to the estimation results, it can be concluded that in light of all factors have a positive influence on policy recommendations for health expenditure. Furthermore, any finding could have a broad impact on health expenditure of Pakistan. Each of these elements has a distinct impact on how the government determines what amount of funding to allocate to the health sector. The regression was conducted using regression analysis and the ordinary least squares (OLS) method. This method and technique are used in specific situations when the dependent variable in a model is quantitative. Estimates and results will be used to develop the policy and find solutions for every issue that can be attributed to the variables and household health spending.

Introduction

People start to value life more when a country gets richer, which leads to a demand for health services and an unavoidable rise in health care costs. The elderly population has grown significantly, necessitating intensive medical care, and wealthy people are generally more health-conscious. According to the Institute for Health Metrics and Evaluation (IHME), recent estimates

indicate that global health spending may increase from US Dollar 8 trillion in 2018 to Dollor18 trillion in 2040, with nearly 9 percent of the world's Gross Domestic Product expected to go toward health in that year.

National health systems where everybody has entrée to great quality medical care without fronting fiscal suffering on their own or their families are embodied by universal health coverage. In order to guarantee universal access, efforts should prioritize the proper use of resources, look into ways to expand revenue streams through industrialization and agriculture, and be financially sustainable enough to raise public health costs. The requirement for more funds to support the healthcare organization is one of the main issues during the coronavirus pandemic. Given that many people in the chosen emerging nations are infected, there is an vital necessity to comprehend the impact of commercial happenings like industrialization and agriculture on health care expenses. Poullier and Hernandez provided a classification of total health expenditure (THE), despite the fact that different countries may have different theories of health spending. The sum of the public and private costs of health care services is used to calculate total health expenditure. In adding to credits and endowments, public expenditure allocations are typically funded by social security assistance, various government taxes, and outside sources. Out-of-pocket (OOP) payments and other private health services are included in the private costs. The World Bank estimates that nearly 400 million people lack access to basic medical care. Evidence indicates that catastrophic health spending pushes nearly 100 million people into extreme poverty annually. Approximately semi of the world's populace lives in emerging nations. However, the total amount spent on health care is only USD 1.3 trillion, which is less than half of what is spent in the US. According to recent research, the significant disparity in Medical care expenditure per capita between these nations and the other nations examined in relation to the elements persuading health care expenditure can be characterized as scanty.

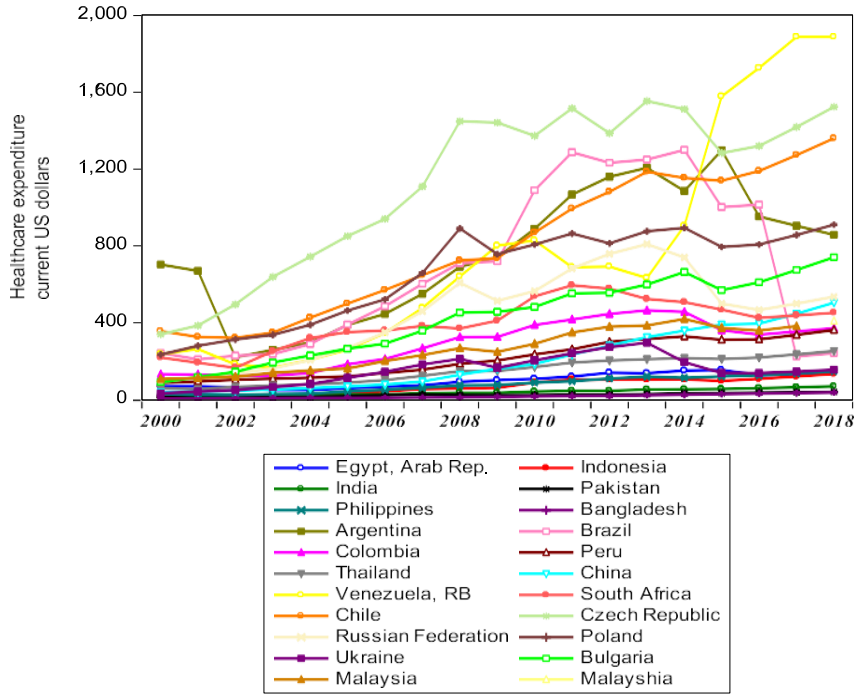

Fig. 1 Public healthcare expenditure among Emerging economies from 2000 to 2018

The tendency of public health care spending in the twenty-two (22) countries under study from 2000 to 2018 is depicted in Figure 1. It can be concluded that since 2000, public health expenses in emerging countries has been on the rise. When comparing the 22 nations, Venezuela had the highest public healthcare spending starting in 2015. This could be due to a variety of reasons, such as improving the effectiveness of healthcare or containing certain diseases like diphtheria. Therefore, higher health spending may not always translate into better health outcomes, as evidenced by parallel conclusions from Brazil, which saw a decrease in public health expenditure in 2018, while Bangladesh continued to be the worst-performing of the twenty (22) emerging nations in terms of the amount of public resources allocated to healthcare.

These countries continuously face a double burden of disease as they work to develop more sophisticated healthcare systems: on the one hand, while emerging nations struggle to meet the demand for primary healthcare and reduce the occurrence of transmittable diseases, they also face a growing number of non-communicable diseases, which are caused by unhealthy lives and an aging populace (Nazir et al., 2022; Sibt-e-Ali et al., 2018; Taqi et al., 2021; Ahmad et al., 2022). Many governments are being forced by the health cost effect to prioritize the providing of specific health services and more effectively use the financial resources that are available. The reviewed multicity literature over the past few decades has focused on determining the factors driving the rise in health spending. The Autoregressive Distributed Lag Model (ARDL) and ordinary least square (OLS) were used to analyze annual data from 1981 to 2014 in order to examine the elements impacting health care expenditure and the grounds of amplified health care spending in Malaysia. It was found that technological advancements are a contributing factor to the country's rising health care expenditures. Using annual time-series data from 1960 to 2012, Murthy and Okunade used the autoregressive distributed lag (ARDL) approach to examine the backing dynamics of health expenditures. They discovered that medical technology was a significant factor in the increasing expenses of health care in the US. Han and Cho's study of the factors influencing health spending in sixteen (16) Korean provinces between 2003 and 2010 revealed no discernible relationship between income and health spending. According to the empirical results of a 2017 study by Kraipornsak, income increases health expenditures in Asia and OECD nations. Ke, Saksena, and Holly looked at how government revenues, demographics, and income affected overall health spending. Di evaluated the impact of healthcare spending, age distribution, and income. Thompson, Wells, and Coasts attended to the vulnerable group’s health needs. Although the results of these studies offer a helpful framework for comprehending notable differences in health care spending between nations, the majority of them relied on time series data and ordinary least square; nevertheless, the findings and conclusions were contradictory. The use of quantile regression is appropriate and applied to produce a more robust and accurate finding with such limitations in the presence of outliers and heavy-tailed distributions.

Theoretically, the study offers a novel perspective on how economic activity and health spending are related. It is important to note that the majority of the literature on the impact of economic activity on health concentrated on developed countries, ignoring emerging ones. Understanding how industrialization and agricultural activities affect public health spending in developing countries is becoming more and more important as concerns and questions regarding the impact of economic activity on health spending become more prevalent. The study focused on the relationships between industrialization and agricultural activities on overall health spending in emerging nations, which the researchers believe receives little attention in the literature, in order to counter this and introduce innovation. In order to support how health management and policymakers can incorporate new insights on the allocation of resources for health, new variables

are introduced and recent data is used in the estimation process, creating a new image of traditional studies.

Furthermore, disregarding the unique effect of these elements on private and public health expenses in analysis may result in a nonexistence of chance to suggest precise strategies. This is because some findings have applied other factors, such as technical development, age, and literacy rate, to determine the aggregate form of whole health spending in emergent and advanced nations. Consequently, this study separated overall health expenditure into public and private categories. This study's practical implications include assisting in estimating the impact of the explanatory variables on the two components of overall health spending. The global interest in reducing the increase in health spending and improving financial risk protection for all demographic groups makes this study significant. In order to accomplish the justifiable advance aim of aggregate health financing, particularly in emerging nations, the study will offer suitable policy recommendations.

Additionally, the first-generation econometric technique was used in a survey of current research using panel data analysis on the variables affecting health care costs. The first-generation econometric method is predicated on the notion that panel data sets are homogeneous and cross-sectional independent. However, in situations where the results are more cross-sectional dependent and heterogeneous, depending on such an assumption of cross-sectional independence and homogeneity could produce erroneous estimation results. In order to select suitable estimation procedures, the study used the second-generation technique, which takes into account the problem of cross-sectional independence and homogeneity. Quantile regression, a novel method for panel data, seems more likely to produce reliable findings to close the breach in the empirical literature.

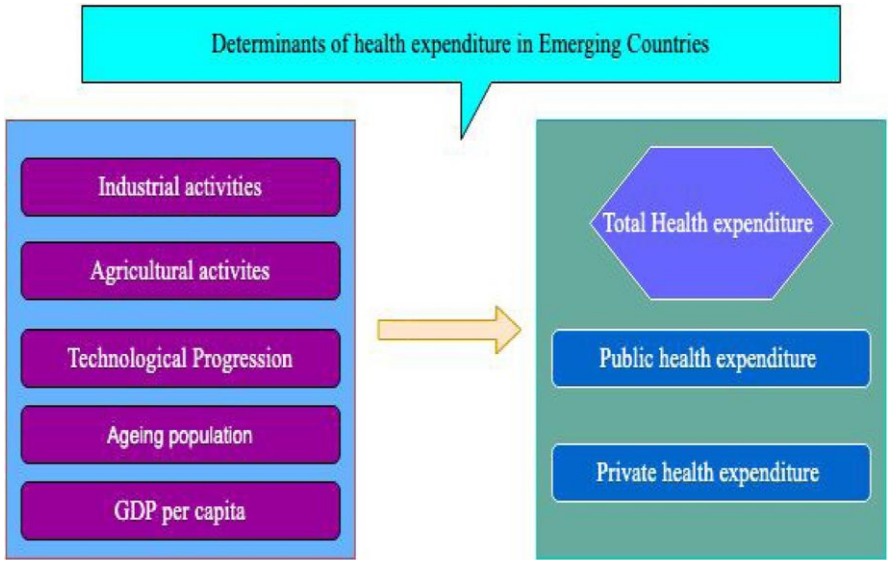

Fig. 2 Factors influencing health expenditure in emerging

An overview of the various factors influencing health spending in developing countries is given in Figure 2. The impact of industrial and agricultural activities on health outcomes and health expenditures was examined by Bergstra, Brunekreef Mudu, Terracini, Hawkesworth, Dan-gour Ejigu, and Mekonennem. It has been established that rising aging populations have an impact on health care costs. Bedir found that income levels influence healthcare spending. Technological advancement is the primary driver of health expenditures, according to research on the convergence and influencing factors of healthcare costs among OECD nations. The study's

conceptualization, informed by the literature mentioned above, is that GDP per capita, industrialization, agricultural practices, technological development, and populations 65 and older all have an impact on the costs of both public and private healthcare. The study's conceptual framework is shown in Fig. 2 below.

Review Literature

According to (Kiross et al., 2020), there has been an increase in interest in examining the degree to which public health spending influences health outcomes in recent years. Numerous factors, including shifting demographics, increased healthcare costs, and a greater understanding of the value of public health, have contributed to this interest. Therefore, in order to ensure the effective and efficient allocation of public funds to promote better health outcomes, it is imperative to comprehend the relationship between public health expenditure and health outcomes.

Rana, Alam, and Gow (2018) found that there is a stronger correlation between health spending and health outcomes in low-income countries than in high-income ones. They also found a correlation between maternal and child mortality and health expenditure. The authors also discovered that declining maternal mortality can be better explained by rising health spending than declining child mortality. This suggests that compared to a decrease in maternal mortality, a higher reduction in infant mortality was the outcome of an increase in health spending.

In their study based on the 2010 Bangladesh household income and expenditure survey, Molla et al. (2017) demonstrated that factors like household income, the prevalence of male family members, the number of family members, the presence of chronic diseases, and health shocks were significant predictors of household expenditures in Bangladesh and had a positive sign, meaning that expenditures increased. The most valuable factors were found to be health shocks and chronic diseases. Their finding that rural households spend less on out-of-pocket medical expenses than urban respondents after adjusting for all of the previously mentioned factors is the most intriguing. The authors explain it by pointing out that most modern medical practitioners and costly services are found in urban areas.

As one of the main pillars in promoting the population's health and well-being, Karanikolos et al. (2013) found that allocating public funds for health expenditures is an essential part of any government's budget. Spending on public health can significantly affect a nation's citizens' health outcomes. However, research on the connections between public health spending and health outcomes is lacking, despite the significance of public health spending.

In order to improve health outcomes on the continent, Sambo and Kirigia (2011) talked about the significance of public health spending in Africa and the necessity of efficient health financing policies. The difficulties African nations face in attaining universal health coverage were emphasized in the article, along with the part public health policy plays in overcoming these difficulties. In order to guarantee that public funds are distributed effectively and efficiently in support of improved health outcomes, it also highlights the necessity of evidence-based policymaking.

Material and Methods

The foundation of research is data and technique. Without this idea, there can be no research objectives. Data provide the research project its direction, while methodology ensures the tools & procedures for model estimate.

Data Range and Data Source

To ascertain the household expenditure on catastrophic health expenditure in Pakistan, this investigation is founded on a household survey. The PSLM (Pakistan Social and Living Standard Measurement) Survey Round-VII 2018–2019 provided the statistics used to make this judgement. The data collection includes information about Pakistan's four provinces (KPK, Punjab, Sindh and Baluchistan). A cross-sectional survey with a sample size of 48968 people was conducted in Pakistan at random. Data from surveys is available at the household level and includes information on catastrophic medical costs as well as various socioeconomic factors, including income, region, income, family head age and employment status, province, household head education, number of children, and family head gender.

Research Design

The equation is estimated using the ordinary least square (OLS) approach and a linear regression methodology. The kind of dependent variables will determine the estimate strategy. We employ the OLS Method and regression analysis in this situation since the dependent variable is quantitative in character. The above-discussed Method and Technique can no longer be used since the dependent variable in this situation is qualitative-based in nature. The use of the regression analysis approach to estimate models is without dispute. All of the explanatory variables' measureable statistics and the reliability of those same variables will be provided by the estimated model. If the probability of the variable, or P value, is less than five percent (5%) or 0.05 or ten percent (10%) 0.10, the variable is statistically significant; otherwise, it is statistically insignificant.

We also employ the F statistic to assess the Model's overall performance. The power of the explanatory variable is sufficient to support the model if the probability value of the F test is less than 5%. In addition, the T Test is utilized to determine the importance of every variable. The P value is the same in terms of instance and circumstance as previously described. The contribution of the explanatory factors to the dependent variable's mean household expenditure on catastrophic health expenditure will be quantified by the estimated coefficients. The amount of the influence on the dependent variable will be explained by the model's coefficient.

Econometric Model

Forming the model's structure and defining its variables is crucial before beginning estimation and data analysis. The model demonstrates the nature and kind of variables while offering the framework and estimating methods. This model of multiple linear regressions will resemble the following.

Dependent variable = $C + B_1X_1 + B_2X_2 + B_3X_3 + e$

Dependent variable (Y) = Health Expenditure

Constant = C
X_1 = Age of the family head
X_2 = Number of Province
X_3 = Region (Urban or Rural)
e = Error term

These models also need to explain categorical variables that will appear when the regression is being done. As an illustration, the first variable in the above structure is age of the family head a

quantitative variable that stays the same, but all other variables will be further recoded into single variables that constitute one category variable. We line up the entire categorical variable into their new variables that will help a lot to understand the regression in model and the real shape of model by clearing the results of the model.

For instance, one variable is region, which is tested against household spending on catastrophic health expenses to determine what proportion of regions we regard to be urban and rural.. Province is the next variable since we want to test and examine household spending based on the patterns of people residing in Pakistan's four provinces. The provinces of Punjab, KPK, Sind, and Baluchistan are included in this categorical variable. Other factors will be taken into account using the same methodology.

Data Analysis

Table 1: (Researcher's own contribution, PSLM 2018-19)

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0.723	0.522	0.522	0.560

The values of R square and adjusted R square that explain how each explanatory variable explains the variation in the dependent variable are reflected in table 1. In the regression mode, it depicts the variation in health expenditure that takes into account all independent variables. The independent variables account for 52.2 percent of the variation in education costs, as evidenced by this.

Table 2: (Researcher's own contribution, PSLM 2018-19)

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16276.646	64	254.323	812.384	0.000
	Residual	14878.666	47527	0.313		
	Total	31155.312	47591			

The statistic of the F test, which includes the strength and power of all independent variables and their effects on the dependent variable, is depicted in this summary of table 2. The F statistic has a probability value of 0.000, which is statistically significant and suggests that the regression model as a whole is substantial. This F test demonstrates that the value of R square is statistically significant. The statistical significance of this relationship is determined by the overall F-test. We can conclude that the R-squared value is significantly different from zero if the overall F-test P value is less than the significance level. The Model Summary and ANOVA table, which exclusively addresses the model's performance and credibility, were discussed earlier. The focus of the research is now on discussing and interpreting the magnitude and impact of each variable on health expenditure. It will provide additional clarification regarding how each variable contributes to the total cost of heath. In order to comprehend the essence of this research paper, which was designed to comprehend the aspect of household health expenditure, we will plot the compare means and coefficients table.

Table 3: (Researcher's own contribution, PSLM 2018-19)

Mean Health Expenditure			
Illness	**Mean**	**N**	**Std. Deviation**
Liver Disease	4438.70	1486	9758.109
Road accident	9538.65	440	28937.912
Fractures	6065.82	386	13421.599
Diarrheal Disorder	1108.19	2175	2839.639
Pneumonia	3083.41	205	3558.030
Fever	555.42	20637	1210.279
Malaria	2592.38	1992	2828.314
Typhoid	3344.48	841	4602.456
Chest infection	2190.75	1020	6185.740
Asthma	2950.57	763	2887.986
Liver/Kidney diseases	6603.80	1271	15836.594
Measles, Polio	2292.97	238	5777.237
Stroke/paralyses	7762.93	274	12486.781
Muscular pain	2481.32	3401	6163.183
Depression	4917.18	388	5674.610
Eye infection/disorder	4258.92	559	8913.710
Ulcer disease	3215.33	790	5368.542
Hepatitis infection	6367.23	835	10636.218
Tuberculosis	4689.30	305	6930.515
Diabetes	2968.67	2644	4870.299
Heart disease	10884.47	1044	60215.636
High BP	2259.98	2007	3509.145
Guyenne issue	6698.61	850	11651.124
Dog bites/snake	5895.00	15	11173.589
Dental care	1992.47	232	4233.100
Burns	4652.79	24	5389.061
Brain hemorrhage	12863.29	63	14136.881
AIDS	6420.00	5	8425.188
Cancer	53695.33	99	136132.440
Don't Know	2482.96	104	3289.326
Others, Specify	4017.59	3875	13880.834

The exclusive table, Table 3, provides a clear representation of the mean amount each disease-bearing household spends on health, given the nature of the disease and the behavior of the family head or member, this spending seems very logical. This table indicates the names of disease and its expenditure respectively. There are total thirty-one diseases with respect to household expenses against each. We will consider all the diseases in the paper to access the pattern of household and their behavior for the determination of health expenditure. The above table clearly discloses the entire summary of each variable. It shows the name, mean expenditure, number of values taken or observation and standard deviation of each diseases. If we glance over the table above 4.3, we can see that it starts from liver and ends at other, specify disease. It highlights that each household or family head is willing to pay the specific amount of money on the health disease by them. We can observe that household is ready to spend on average 4439 Rs on liver disease per year.in the same

way we can clearly analyze the expense on each disease by the household or family head. If we read out the entire table 4.3, we can see the information and trends of family members that how they spend on their health issues.

Table 4: (Researcher's own contribution, PSLM 2018-19)

Model		Unstandardized Coefficients		Standardized Coefficients	T-Values	P-Values
		B	Std. Error	Beta		
1	(Constant)	2.942	0.060		48.658	.000
	KPK	0.262	0.007	0.127	36.346	.000
	Sindh	-0.096	0.002	-0.153	-42.927	.000
	Baluchistan	-0.103	0.002	-0.148	-42.918	.000
	Urban	.0038	0.003	0.046	14.206	.000
	Age of the family head	-0.031	0.009	-0.017	-3.488	.000

Because the models complete presentation and execution will be documented in this section. It will deduce the significance of each factor in relation to health spending. We will be able to comprehend each variable, its extent, and its effect on the dependent variable if we locate an overhead table 4.

Province is the first variable used in the discussion of household health expenditures, illustrating how different provinces differ from one another in terms of family health spending. We can determine that there is a difference in the spending levels of residents in Punjab and KPK by using Punjab province as a base. Comparatively speaking, Khyber Pakhtunkhwa residents spend 0.127 units more than they spend those in the Punjab province. However, when it comes to health care spending, Sindh and Baluchistan provinces exhibit distinct patterns. On average, Sindhi families spend 0.153 units less than Punjabi families. In a similar vein, people of Baluchistan spend, on average, 0.148 units less on medical conditions than those in Punjab Province.

The next category is the area or location whether it matters the costs of health or not? It goes without saying that the amount a household spends on health depends a lot on where they live, such as in the city or the village. Results clearly demonstrate that urban residents spend 0.046 units more on health than urban residents, as its probability value is less than five percent.

This examination has drawn comparative analysis of province and region (urban & rural) in term of spending on health expenditure. It can be concluded that it can help to formulate policy regarding the formation of health policy across the country.

Last factor of this examination is the age of the households whether it affects the health expense or not. The result in table 4.4 exposes that if one unit or one-year age of the family members goes up then expense on health diseases decrease on average 0.017 units. There may be much cause as income and resources of the household may increases with the passage of time.

Conclusion

In this paper, we looked at a variety of socioeconomic and demographic variables to see how much a family spends on heath related issues. If we look at the situation in the provinces, we can see that there is a big difference in spending between outlying areas and states should give more health facilities to fix these health problems. The disparity in spending between urban and rural areas is yet another crucial aspect in term of spending on health. When compared to households

who spend on health issues in urban areas, those who live in rural areas spend 4.6% less on health disease... In this paper, we looked at a variety of socioeconomic and demographic variables to see how much a family spends on medical diseases. It will also help to formulate the heath policy regarding increasing age of the household. This analysis finds out that one-year increase in the age causes to decrease on average health expenditure by 0.017 units. This conclusion may be supportive in many ways by the policy makers streamline the health policy in Pakistan.

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