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THE IMPACT OF POVERTY ON HUMAN HEALTH: A PANEL DATA ANALYSIS

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ABSTRACT

The experience of living in poverty affects social life in different ways. Poverty upsets the health status of individuals. Health is a major cornerstone of economic development on a macro level, while health is essential to ensure an economically productive life at the micro-level. This study aims to analyze the impacts of poverty, income, and education on human health for South Asia over 1980-2017 by using pooled OLS and fixed effects approach. To measure the status of health, life expectancy and infant mortality are taken as proxy indicators. Poverty is measured by headcount ratio and health facilities are measured by the role of physicians and immunization. The results concluded that poverty adversely affects the status of human health while health facilities play a vital role in the provision of better health. It is recommended that the government of these countries formulate such policies to reduce poverty and improve health status.

Keywords: Headcount Ratio, Life Expectancy, Infant Mortality, Fixed Effects (FE) Model
Jel Codes: I32, J17

I. INTRODUCTION

Poverty is one of the greatest threats to the world. It is causing several impacts on the individual's life and has wider societal implications. Poverty affects the health status of the people. Health issues not only bring a reduction in income but also increase its daily expenditure due to the need for medicine etc. In poor countries, the status of health is usually alarming as compared to rich countries (World Bank, 1999). The causality between poverty and health run in both directions. The association between poverty and health is not a simple one, it is complicated and bidirectional. Illness adversely affects the income of the individual, and this bad health status keeps people poor (Wagstaff, 2002). Low-income people within these countries suffer from poverty and bad health, therefore, they are caught in a vicious circle of poverty. Prosperity may become the source of enjoyment of happy life or depravedness may create disturbance in health status (Harpham and Grant, 2002). National income level is linked with desirable health status as GDP of the country go high, government increase the spending on health facilities which ultimately improves the status of health. With a rise in national income, a higher rate of life expectancies is anticipated. In the case of Pakistan, the government increased its per capita spending on health which is still not equal to the required level, prescribed by WHO. Health facilities also contributed a lot in determining health as several programs are directly funded by the government (Economic Survey of Pakistan, 2016). The significance of education cannot be ignored in fighting diseases. Economic growth and health have a positive association, as proved by a seminal piece by Pritchett and Summers (1993). The health care system cannot be ignored in the provision of better health facilities for good health.

Education also plays an important role in health and understanding the health mechanism. The role of education cannot be ignored at all. Education can also be seen as a productive asset for the people. Moreover, reduction in mortality rates is also attributed to education. However, it depends on the timespan of getting an education, if it is more, it will lessen infant mortality. To prove this argument, the evidence from developed countries where there is a high rate of educated people is linked with a higher rate of life expectancies and a lower rate of infant mortality (Zajacova and Lawrence, 2018). It is well known that education and health both are indispensable to make individuals more productive. Educational attainments are directly contributed to attaining the wealth of the nations. This fact is also prescribed in a report by Abayawardana and Hussain (2003). The difference in income of the countries proved that

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health and wealth positively associated, those countries who possess low income have less to spend on publically financed education as well health care, and in return the individuals of that country also have fewer amount to spend on health and educational attainments. To increase the standard of living and to eliminate poverty both education and health play a pivotal role. It is proved by many studies that illness, unemployment criminal attitudes mostly occurred because of lack of education. The people who have a low level of education, face many health problems while education contributes its positive consequences on the life of the individuals. Education is considered as the basic determinant of economic growth by new growth theories (Bloom et al., 2004). The causal linkage between income and health is also very strong among countries. Life expectancies are high among those who possess a handsome quantity of wealth, and both income and average life expectancy seems to go together. It enables a person to purchase more health care facilities which are argued by (Preston, 1975); and World Bank, 1993).

South Asian region is the most populous region and there are multiple groups of people varying by different norms. It is anticipated that poor people have worse health than rich ones. Poverty and health are interlinked as it might be considered as people who have good health are prosperous and prosperity cause good health (Zaidi et al., 2017). South Asia is the home of the largest portion of the world's poor and about 5 percent of the world's population lives here. This region is attributed to a variety of cultures, ethnicities, norms, and attitudes. It is also far behind in terms of purchasing power parity (PPP) per capita as it is compared with other regions in the world except for Sub-Saharan Africa. The decline in poverty is relatively low if it is equated with East Asians and pacific regions since 1981 (Unnisa et al., 2016). The study is designed to investigate the impacts of poverty on health status in South Asia. Human competencies and behaviors are directly affected by diseases and bad health, so, health is considered a significant part of welfare and it is also responsible for a better standard of living. Health is also directly urged its impacts on prosperity and wellbeing. The involvement of the government cannot be neglected in the provision of health care facilities. The study is designed to analyze the impacts of various social factors on life expectancy and infant mortality (health) for the region of South Asia. The study is designed as, in Section 2 covers an overview of the literature, a theoretical framework is provided to support the analysis in Section 3, while the used variables in the study are briefly explained and details are provided about data in Section 4. Section 5 contains a discussion on results, and a conclusion with suitable policy recommendations is given in Section 6.

II. LITERATURE REVIEW

This section carries the review of previous studies on the relationship between poverty, life expectancy, and infant mortality in two subsections, health & poverty, and health & education.

II.I. HEALTH AND POVERTY

Health is an invaluable asset that increases the productivity and prerequisites of being competent. To measure the low-income impacts on health for Kenya a study was conducted by Musyoka et al. (2018). A large sample was collected of about 33,665 households by keeping different indicators in observation and the data was collected from Kenya household expenditure and utilization survey. It is concluded that the chances of enjoying good health are increased if poverty reduces. It is observed that urban people are poorer in health than rural people. Adena and Myck (2014), investigated poor material conditions as the determinant of healthy life for 12 European countries. Health survey was collected from 50+ age men and women. It is concluded that relative income has no impact on changes in health, while subjective poverty has a significant impact on mortality. So, it is inspected that material conditions affect health among older ages. According to Bloom et al. (2010), health is a significant phenomenon for productivity as it is the form of human capital which ultimately increases productivity. Furthermore, it is examined that health greatly affects household income, economic growth, and development at a national level.

Numerous studies are conducted to study the relationship between the national income level and health which is an important factor to enhance the human capital resource. Biggs et al. (2010) investigated the relationship between income inequality, poverty, and GDP per capita. It is concluded that national income level and health are independently and substantially affected by poverty and income inequalities. For low-income countries, a cross-country analysis of 60 countries is presented by Wang (2003), and the data is obtained from 1990 to 1999. The results indicated an interesting fact that there exists a significant gap between rural child mortality and urban child mortality. The impacts of poverty and health on the women of developing countries are investigated by Dollar and Gatti (1999). It is concluded that gender inequalities are greater in developing countries. It is also found that religious preferences are greatly influenced women's education and status in society which plays a significant role in gender inequalities.

Malnutrition in South Asia is a major issue, no doubt, the growth is rapidly increasing in figures the developmental projects represents a sort of strengthening of that countries but the problems are still need to be addressed (Hatlebakk, 2012). To find out the answer to the question that whether malnutrition affects poverty, a large sample survey is

conducted of different regions of Nepal. Results concluded that malnutrition among boys is high as compared to girls because boys are early withdrawn from breastfeeding and they come to pulses and maize in diet which is one of the reasons for malnutrition.

According to millennium development goals, the topmost goal was a reduction of poverty and hunger. Attainment of early education was also the major goal. In moderated effect of poverty, it involves the family's decision-making power and its effects on their children. Ngoma and Mayimbo (2017) provided a descriptive analysis about the negative impacts of poverty on children and women. Healthier people enjoy good health while the poorest are those who are adversely affected by chronic poverty in the form of losing health. In 2000, United Nations set some targets to eradicate poverty, malnutrition, providing primary education, about 80% population of developing countries live below the poverty line. The researchers provide a detailed description of Zambia where 60% population is classified as poor, and the situation becomes more alarming after the mid-70s. Moreover, it is concluded that the solution to poverty is serious considerations of political and social policies which need to implement.

Raphael (2002) exposed that income inequality generates poverty which ultimately affects the health of the Canadian people. The level of economic development is related to the level of achievement of health. The link between health and poverty by keeping water as pivotal important, the link is established by Abayawardana and Hussain (2003). Authentic and most reasonable data sources are used to understand the link between these three indicators i.e. poverty health and water. Many diseases are spread through poor sanitation systems and it became the cause of some causalities. This study highlighted the importance of covering the groundwater to save lives.

The situation of poverty and improvement throughout the decade is determined by Irfan (2000). The major contribution of this study is to analyze the progress of economic development in the region of South Asia during the 1990s. In South Asia, the poverty level is also very alarming but with different initiatives, an effort is made to tackle the problem. The multidimensional poverty and its consequences on health are determined by Mohanty et al. (2017), for three countries Nepal, Myanmar, and India. Results suggested that refugees of Myanmar who have resided in Nepal and India face a severe problem about health because of multidimensional poverty.

II.II. HEALTH AND EDUCATION

By making Grossman (1972) work as a base, Fayissa and Gutema (2008), estimated a production function for sub-Saharan Africa. It is concluded that an increase in income per capita decreased the illiteracy rate and if there is an increase in food availability the life expectancy is increased.

Zimmerman and Woolf (2014) investigated a positive linkage between education and health status for the U.S people. Zajacova and Lawrence (2018) find this fact that adults with higher education enjoy more prosperity in their life in form of good health as compared to less educated persons. It is suggested that for the people of America it is necessary to eradicate the health disparities among white and black.

The nexus between education, health, and economic growth is investigated by Siddique et al. (2018) for 76 middle-income countries (MIC) for 1991-2016, using a fixed effects approach. It is empirically investigated that secondary and tertiary levels of education play a significant role in economic growth, which is relatively strong in upper MIC than lower MIC.

III. THEORETICAL FRAMEWORK AND METHODOLOGY

Theoretical support is attained from prevailing studies to elaborate the nexus between health and poverty. Pritchett and summers (1993) found a positive impact of an increase in per capita GDP on health as if the GDP of a country increased by 5% annually, there is a 1% decline in infant mortality. At the national level, if the country has more resources to spend on healthcare, the health status will be positively affected.

$$health = f(income) \dots\dots\dots (i)$$

Deaton (2003) found the impact of the increase in per capita income on health both in developed and developing countries and it is viewed that each additional unit of dollar spurs more on the lives of the developing countries than developed. It is proven by previous literature that health facilities are the most influential factor which determines the status of health (Peters et al., 2008; Mohan and Mirmirani, 2007).

$$health = f(economic\ growth, health\ facilities) \dots\dots (ii)$$

Poverty is a global issue that adversely affects the life of people. It is also viewed that poor countries have worse health outcomes than high per capita income countries. So, it is anticipated that the association between health and poverty reflects casualties running in both directions (Wagstaff, 2002). The relation which is shown in Eq. (ii) can be extended by adding poverty.

$$health = f(income, health\ facilities, poverty) \dots\dots\dots\dots\dots\dots\dots (iii)$$

By reviewing the literature and analyzing data of various health indicators and education it is statistically concluded that there exists a strong association between education and health (Cutler and Muney, 2006). It is well known that healthcare is not only the determinant of health but many other social factors also. Capital influences health, people who owned more capital can spend more on health which improves their status of health (Siddique et al, 2018).

$$health = f(income, health\ facilities, poverty, education, capital) \dots\dots (iv)$$

$$H = f(Y, HF, P, E, K) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (v)$$

Eq. (*v*) is converted into Cobb Douglas form,

$$H = Y^{\alpha_1}, HF^{\alpha_2}, P^{\alpha_3}, E^{\alpha_4}, K^{\alpha_5} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (vi)$$

By taking a natural log to linear Eq. (*vi*),

$$ln\, H = ln\, Y^{\alpha_1} + ln\, HF^{\alpha_2} + ln\, P^{\alpha_3} + ln\, E^{\alpha_4} + ln\, K^{\alpha_5} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (vii)$$

The derived Eq. (*vii*) is written as an empirical equation,

$$ln\, H_{it} = \alpha_1\, ln\, Y_{it} + \alpha_2\, ln\, HF_{it} + \alpha_3\, ln\, P_{it} + \alpha_4\, ln\, E_{it} + \alpha_5\, ln\, K_{it} \dots\dots\dots\dots\dots (viii)$$

The study uses life expectancy and infant mortality as proxy variables of health. Headcount ratio is used for poverty, immunization, and physicians are used as health facilities. Gross enrollment in primary education and gross fixed capital is used. By adding the mentioned variables into Eq. (viii), we get,

$$LE = \beta_1\, ln\, Y_{it} + \beta_2\, ln\, PHY_{it} + \beta_3\, ln\, HC_{it} + \beta_4\, ln\, SP_{it} + \beta_5\, ln\, K_{it} \dots\dots (1)$$

$$IM = \gamma_1\, ln\, Y_{it} + \gamma_2\, ln\, IMM_{it} + \gamma_3\, ln\, PHY_{it} + \gamma_4\, ln\, HC_{it} + \gamma_5\, ln\, SP_{it} + \gamma_6\, ln\, K_{it} \dots (2)$$

In these equations, LE is used for life expectancy, Y shows income, PHY shows physicians, and SP is used for gross enrollment in primary school. K is used for gross fixed capital. Infant mortality is shown by IM. HC is used for headcount ratio which is used as a proxy of poverty.

To find out the impact of health facilities, education, and income on health in South Asia, panel data analysis is used. Panel OLS, and based on Hausman test fixed effects model is used.

IV. DATA

This section contains the data and correlation between the variables for the period of 1980-2017 for selected South Asian countries. These countries are Pakistan, India Bangladesh, Sri Lanka, Nepal, and Bhutan. The variables are taken from World Development Indicators (WDI). Data on life expectancy, infant mortality, and some other causes of death, are considered as the most reliable indicators of health (Robine et al., 1999). Infant mortality and life expectancy are used as an indicator of health (Ali, 2015; Ali, 2018; Ali and Bibi, 2017; Ali and Ahmad, 2014; Ali and Audi, 2016; Ali and Audi, 2018; Ali and Rehman, 2015; Ali and Senturk, 2019; Ali and Zulfiqar, 2018; Ali et al., 2016; Ali et al., 2021; Ali et al., 2021; Siddique and Kiani, 2020; Siddique et al., 2020; Shahid et al., 2021) which showed the number of years an infant would live if the prevailing pattern of maternity at the time of its birth were to stay same throughout its life. Life expectancy at birth indicates the number of years a newborn infant would live. It is found that the literacy rate of the nation directly affects life expectancy, and the negative linkage between poverty and health is also found (Wen et al. 2003). The infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year. Poverty adversely affects the health of individuals (Santana, 2002). A decrease in poverty creates a strong and positive relationship with infant mortality (Biggs et al. 2010). Across the world, it is known that ill-health affects income, and poverty negatively affects health (Bloom et al., 2010). A majority of poor catastrophically suffered from bad health, they face more death shocks than rich people (Ali and Naeem, 2017; Ali, 2011; Mohanty et al., 2017). Headcount ratio is used as a proxy variable of poverty which is also used by Majeed et al., (2021). The poverty headcount ratio at $3.20 a day is the percentage of the population living on less than $3.20 a day at 2011 international prices.

Numerous studies showed the changing effect of income on various social factors along with changing in the pattern of technology, increasing ratio of educated persons, and physical capital accumulation (Pritchet and Summers; 1996). People from high-income countries enjoy better health than low-income countries. A relationship between health and economic growth is prescribed by Preston in 1975 which depicts that health and income positively correlated with each other. Two proxy variables are used as income i.e. GDP per capita at PPP (Y) and GDP per capita at constant 2010 in US$.

The association between education and health is documented by many researchers and it is well admitted that educated people are well aware of the consequences of chronic disease, in most cases, they approached to health care unit at the right time. People who have better education face low illness rates (Cutler and Muney, 2006). It is anticipated that as long as the number of years of attending school increases it reduces the probability of having bad health. Gross enrollment at the primary level is taken as the proxy of education.

Health care expenditures, the number of physicians are used as a tool to measure the health outcome, improvement in health facilities is significantly associated with improvements in infant mortality and life expectancy (Liaqat et al., 2021). Physicians are used as an indicator of health facilities which includes those specialists of medical practitioners. The other proxy that is used for health facilities is immunization which is "child immunization, measles, measures the percentage of children ages 12-23 months who received the measles vaccination before 12 months or at any time before the survey. A child is considered adequately immunized against measles after receiving one dose of vaccine.

When income increases there is a general tendency that people now can spend on health to buy healthy food for themselves. The importance of money in the provision of health is undermined by many researchers, however, some argue that an increase in income or investment do not affect the health of people in the long term mean they do not buy for good health, but anyhow, the analysis is different across countries and regions. So it is very crucial to bring this into the discussion that to what extent money affects the health of the people. Gross fixed capital is used to measure its effect on health.

V. CORRELATION AMONG VARIABLES

Table 1 and Table 2 show the correlation among the variable for south Asian countries. Table 1 shows a positive correlation between life expectancy and economic growth. Health facilities (physicians) are positively correlated with the dependent variable. Life expectancy has a positive correlation with all variables except poverty in Eq. 1.

Table 1: Matrix of Correlation for Eq. 1

Var.	LE	Y	PHY	HC	SP	K
LE	1.0000					
Y	0.7389	1.0000				
PHY	0.5055	0.3828	1.0000			
HC	-0.4884	-0.7629	-0.2869	1.0000		
SP	0.6735	0.2544	0.2274	-0.4181	1.0000	
K	0.2482	0.5006	0.1438	-0.2167	0.2286	1.0000

Table 2: Correlation among Variables for Eq.2

Var.	IM	Y	IMM	PHY	HC	SP	K
IM	1.0000						
Y	-0.2638	1.0000					
IMM	-0.4393	-0.1355	1.0000				
PHY	-0.3116	-0.2359	0.3125	1.0000			
HC	0.7132	-0.4203	-0.3639	-0.2749	1.0000		
SP	-0.5800	-0.113	0.4221	0.2037	-0.2589	1.0000	
K	-0.4723	0.0669	0.3788	0.1782	-0.3742	0.3249	1.0000

Table 2 depicts that IM is positively associated with poverty while it is inversely correlated with all other variables of Eq. 1.

VI. RESULT AND DISCUSSION

Income and health have a positive association as proved by a seminal piece by Pritchett and summers (1993). The health care system cannot be ignored in the provision of better health facilities for the good health of the people. The results of panel OLS and fixed effects models are discussed in this section.

VI.I. RESULTS OF PANEL OLS

Table 3 represents the regression results of the panel OLS model for Eq. 1 & 2. Headcount ratio is taken as the proxy of poverty, and it brought a reduction in life expectancy (LE) and causes infant mortality. Results show that (Eq. 1) a 1% increase in income brought a positive impact on life expectancy by 0.27% which shows the existence of a direct and positive relationship between life expectancy and per capita income. The coefficient of PHY is negative but insignificant. The negative sign of HC indicates that there exists an inverse relationship between HC and LE. The results indicate that education plays a very important and positive role in the improvement of the life expectancy rate. The results are consistent with (Siddique et al, 2018 and Bloom et al. 2004; Nazir et al., 2021; Ali et al., 2022). In Eq. 2, infant mortality (IM) is taken as a dependent variable. The negative sign of YP indicates that there exists an inverse relationship between income and IM. Physicians are taken as the proxy of health facilities, the coefficient of physicians

is -0.0072 which revealed that the availability of the health care personnel is very important. The results show an inverse relationship between immunization and IM that is consistent with Mohan and Mirmirani (2007).

Table 3: Panel OLS Results

Variables	Dependent variable: LE		Dependent variable: IM	
	Coef.	Prob.	Coef.	Prob.
Y	0.2773	0.0000	0.2319	0.0000
IMM			0.0326	0.5308
PHY	-0.0015	0.6511	-0.00723	0.7064
HC	0.1490	0.0000	1.0643	0.0000
SP	0.45569	0.0000	-0.0470	0.0001
K	-0.1211	0.0000	-0.0899	0.3751
R^2	0.5688		0.5826	

VI.II. RESULT OF FIXED EFFECTS MODEL

The results of the FE model are shown in Table 4. In Eq. 1, a 1% increase in income brought a positive impact on life expectancy by 0.96%, which shows that there exists a positive relationship between life expectancy and per capita income, the result is consistent with (Bloom et al. 2004, Siddique et al, 2018). The coefficient of PHY is positive and significant, and these results are consistent with (Mohan and Mirmirani, 2007; Senturk and Ali, 2021). The negative sign of HC indicates that there exists an inverse relationship between HC and LE. The coefficient of SP is 0.19 expresses that a 1% increase in SP brought a 0.19%, increase in life expectancy. In Eq. 2, infant mortality (IM) is taken as a dependent variable. The negative sign of Y indicates that there exists an inverse relationship between income and IM, while probability showed that results are statistically insignificant. Physicians are taken as the proxy of health facilities, the coefficient of physicians is -0.0431 which revealed that the availability of the health care personnel is very important. The provision of physicians also indicates that there is better access to health care, so, it is observed that investment in health care services would reduce the rate of infant mortality. The results show an inverse relationship between Preventive immunization and IM that is consistent with Liaqat et al., (2021).

Table 4: Fixed Effects Model Results

Variables	Dependent variable: LE		Dependent variable: IM	
	Coeff.	Prob.	Coeff.	Prob.
Y	0.09657	0.0000	-0.0466	0.1432
IMM			-0.0426	0.0908
PHY	0.0066	0.5182	-0.04311	0.0001
HC	-0.0085	0.1010	0.2736	0.0000
SP	0.2018	0.0000	-0.6297	0.0000
K	0.0690	0.0000	-0.7074	0.0000
C	2.40078	0.0000	8.4766	0.0000
R-Square	0.7463		0.7147	

VII. CONCLUSION

Health is an important social capital and indispensable to participate in economic activities. The report of an association between life expectancy and poverty is caused considerable debate in the region of South Asia. Neighborhoods' economic structure and prevailing systems affect the other countries in the region. Understanding the pathways of health and poverty is brought into study for South Asia. In this study, an attempt is made to address the linkage between life expectancy, infant mortality, income, physicians, immunization, and headcount ratio. The concentration of the study is between 1980 and 2017 and for the panel of six countries, among them, Bangladesh, India, Pakistan, Sri-Lanka, Bhutan, and Nepal are nominated. Results indicate that for lowering the mortality, other measures are also very crucial, among which health facilities should be avail at right time. The estimated results showed that the most influential variable that determines infant mortality is the physicians monitored by the level of education and immunization. Physicians, education, and immunization led its significant results on the dependent variable. Headcount ratio is also showed their influential impact on infant mortality. In the life expectancy model again education level and physicians are highly significant. The expected signs with poverty headcount ratio showed that an increase in determining factors would reduce the life expectancy. The possible policy implication that might draw from this study is that education is the most important element to control infant mortality and it increases the chance of life expectancy. As it is seen that physicians led its influential impact on infant mortality and life expectancy, so, to spend on medical training and education must be prioritized. Effective immunization policy also had an important role. The results of the study suggest that to improve the health status among countries, the government

should advise a health policy that may focus on better health services, increase the number of physicians to improve adult literacy.

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