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HEALTH OUTCOMES OF POVERTY: EVIDENCE FROM AROUND THE GLOBE

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ABSTRACT

This study is an attempt to examine the health-poverty nexus using panel data of 126 countries for 1990-2014. Poverty headcount ratio and poverty gap are used to measure poverty, and health is measured by life expectancy and infant mortality. The results confirm that poverty has an adverse effect on health. The findings discovered that the coefficients obtained using the poverty gap are bigger in magnitude as compared to the coefficients obtained using the headcount ratio. The system GMM confirms the robustness of the findings. This study suggests that programs to improve public health should not focus only on policies which foster economic growth but also on policies which help to decrease poverty.

Keywords: Poverty Gap, Headcount Ratio, Life expectancy, Infant Mortality
JEL Codes: I0, I15, I32, C33, D63

I. INTRODUCTION

Poor health is a primary obstacle to human capital and economic development. It not only affects the quality of life and life expectancy but also weakens the economic prospects. Thus, it is important from the policy perspective to understand the factors that determine health outcomes, e.g. income, education, healthcare facilities and environmental factors (Siddique and Kiani, 2020). Beside these determinants, poverty is an important determinant of health. According to the World Health Organization (WHO), around 1.2 billion of the world population lives in extreme poverty. Poverty is a state where one lacks access to the necessities of life. Poverty creates ill-health because it forces people to live in the environment (without decent shelter, clean water or adequate sanitation) which makes them sick. It is widely believed that poverty leads to poor health, decreased life expectancy, increased health inequalities and mortality (Payne, 2000; Swinnerton, 2006; Adena & Myck, 2014; Rambotti, 2015). According to Swinnerton (2006), poverty causes ill health through low income and health-damaging behaviors. "Low income" contributes to ill-health directly through insufficient diet and poor housing quality and indirectly by reducing social and community participation of people. The second factor is "health-damaging behavior" which states that poor economic and social condition, fewer prospects and feeling of being less empowered lead people to make unhealthy decisions such as drugs, smoking, alcohol and diet.

To date, most of the studies which have found a relationship between poverty and health are qualitative (see, for example, Wagstaff, 2002; Grant, 2005; Swinnerton, 2006; Gupta *et al.*, 2007 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., 2015; Audi et al., 2021a, 2021b, 2021c, Ali et al., 2021a, 2021b). Although few studies have provided empirical evidence, these are limited in their scope because of the issues of limited data coverage, estimation techniques and endogeneity problem. Anand & Ravallion (1993), Carrin & Politi (1995) Bidani & Ravallion (1997) and Rambotti (2015) conducted a cross-sectional analysis to analyze the relationship between health and poverty. The cross-sectional analysis ignores the dynamic nature of the relationship between poverty and health. Wen *et al.* (2003), Rajan *et al.* (2013), Senturk and Ali (2021), Roussel et al., (2021) and Audi et al., (2021) used logistic regression models which are not suitable in the case

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of the continuous dependent variable. Biggs *et al.* (2010) and Keita (2013) used panel data for Latin American countries and Sub Saharan Africa, respectively however, they don't address the problem of endogeneity. Moreover, regional analysis cannot be generalized at a global level. The study aims to find the relationship between poverty and health of a rich dataset covering 126 countries spanning over 1980-2014. We have used various proxies of health and poverty. The study performed a sensitivity analysis to check the robustness of results.

II. LITERATURE REVIEW

The literature provides various mechanisms through which poverty impacts health status. Poverty leads to poor health through insufficient food, clothing, housing; health detrimental decisions; inability to access education, basic health needs; stress and depression due to financial burden and unemployment. Besides, the quality of the residential area/environment also tends to determine health. Poverty leads to distress and disturbance, which result in ill health and mortality. Payne (2000) illustrates that poor people lacking necessities, have to reside in poor neighbourhoods with area problems and are more likely to experience crime and fear of crime, which lead to mental stress and depression. Mental stress and depression exert a negative influence on the health outcomes of a society. Swinnerton (2006) hold the view that poverty leads to poor health through material deprivation (by the effect of insufficient diet, poor housing quality and reduced participation in community) and health-damaging behaviors (by inducing unhealthy decisions such as drugs, exercise, smoking, alcohol and diet). Similarly, Adarkwa (2010) illustrates that inadequate housing accompanied by insufficient services, like energy, water supply and sanitation, is associated with decreased life expectancy and increased health risks. In contrast, better quality housing leads to improved hygiene, livelihoods, interaction with other members of the house and psychosocial wellbeing.

Poverty induces poor individuals to opt choices which have a detrimental influence on their health status. For example, low-income forces poor to lowest "energy ladder" where instead of petrol and gas, dung wood and biomass are used which may lead to heart failure and respiratory illness (Smith, 1987)**.** Similarly, Bloom *et al.* (2001) point out that, the use of traditional fuel (in an inadequately ventilated area) as a mean of energy is injurious to health. Also, dependence on children for collecting dung and wood encourages a high level of fertility. This increased level of fertility rate harms mothers and children health. Moreover, poverty leads to poor health also through the lack of access to basic services. Poor people have a lack of access to quality food, health services, housing and employment which lead to poor health. Lack of access to quality food increases the likelihood of poor nutrition, suppressed immune system and decreased ability to cope with the disease, which in turn reduces productivity and income. In addition, they lack quality health services and related information. Lack of access to quality accommodation, clean water and improved sanitation leads to diarrheal diseases, respiratory diseases and morbidity. Poor also lack access to adequate employment, they have to work in stifling factories, next to roadsides, with unsafe chemicals or machinery and without safety and health protection. This increases the probabilities of morbidity and mortality (Lawson, 2004).

Poor children experience increased incidences of adverse developmental, health and other outcomes, compared to rich children. According to Brooks-Gunn and Duncan (1997)**,** poverty affects children health through poor birth outcomes, low growth, and poisoning. Low birth weight is linked with an increased probability of physical health and emotional problems which can be endured through childhood and adulthood. Low birth weight may lead to infant mortality (death in the 28 days of birth). Moreover, Gupta *et al.* (2007) describe that poverty leads to poor health in childhood through birth outcomes, condition of houses & roads, maternal health, parental mental health and overall family functioning. Poverty affects children's health not only when they are young, but also later in their lives e.g. low birth weight in childhood leads to high cholesterol, blood pressure, diabetes, lungs and cardiovascular diseases.

Some studies ascertain the bidirectional association between health and poverty. For instance, Wagstaff (2002) and Grant (2005) point out that poor people and countries suffer from several deprivations which could lead to a high level of malnutrition, ill-health and high fertility. In turn, illness or high fertility has a considerable effect on household income and consequently on being below/above the poverty line (due to significant health care cost). Moreover, Kuruvilla and Jacob (2007) assert that working poverty (working people with income lower than a specified poverty line), unemployment, low education, and lack of access to resources &affordable accommodations, leading to distress, hopelessness and anxiety, resulting in ill mental health. Mental illness in turn leads to economic hardship and poverty because mentally ill people become unemployed loss productivity

and require expenditure for treatment. Qualitative literature on health and poverty reveals that poverty is linked with poor health, decreased life expectancy and increased mortality. Also, literature uncovers that the association between health and poverty is bidirectional that is poverty leads to poor health and ill- health, in turn, leads to further poverty. However, the extant empirical literature has ignored the endogenous nature of the relationship between poverty and health. Place of residence plays an important role in determining health. There exists a strong relationship between poor health and socioeconomic position. In this respect, Haan *et al.* (1987) examine the mortality experience of people aged 35+ over 1965-1994 in Oakland, California. They perform logistic regression on data taken from the Alameda County Study. Authors find that mortality rate is higher for people living in poverty areas compared to those in non-poverty area. Similarly, by employing multiple logistic regression analyses on a sample of 1737 residents of Oakland, California Yen and Kaplan (1999) examine the effect of residence in poverty area on depressive symptoms and perceived health. They find that risk of depression is higher for people living in a poverty area. The health of individuals living in a non-poverty area changes from excellent to fair or poor if they have to reside in a poverty area.

Moreover, Wen *et al.* (2003) conduct a study to investigate the effect of neighbourhood structure on individual health in the US. Results obtained from hierarchical Ordinal Logit models reveal that an individual's health is positively and significantly influenced by neighbourhood affluence. Using correlation analysis for 22 countries Anand and Ravallion (1993), Ali and Naeem (2017), Ali (2011) find that life expectancy decreases by 0.21% due to a 1% increase in poverty. Carrin and Politi (1996)use the same model as of Anand and Ravallion (1993) but a rich data set involving 84 developing countries suggested that lower level of rural or total poverty is linked with improved health. Similarly, Bidani and Ravallion (1997) find that poor are expected to have 9 years shorter life than non-poor using a sample of 35 developing countries. Besides, they explore that public health has a more favorable effect on the health status of poor's as compared to rich.

Employing OLS on a sample of 207 thirteen years old children in rural New York, Evans and Kim (2007) investigate the relationship between childhood poverty duration, cumulative risk exposure and stress regulation. Their findings reveal that, among those who have spent a large time in poverty, systolic & diastolic blood pressure reactivity was low (i.e low cardiovascular reactivity) as high cumulative risk exposure in childhood reduces the capability to deal with environmental stress. It is also possible that poverty has no effect on health but it may influence the relationship between health and wealth. For example, using fixed effects technique on data for 22 Latin American countries during 1960-2007 Biggs *et al.* (2010) find that poverty does not affect health, while GDP has a significant effect. These results confirm the phrase that "wealthy is healthy". While the linkage between GDP and health depends upon the distribution of wealth and poverty. Keita (2013) conduct empirical analysis using data for 45 Sub Saharan African countries during 1960-2011. By using different estimation techniques (like pooling, fixed effects, system GMM and long difference) author find that extreme poverty has a strong negative and significant relationship with health irrespective of the technique used. Besides, many other socio-economic and health system factors (like GDP, education, physicians health expenditures, sanitation and water) has expected and significant correlation with life expectancy.[5] Similarly, Rajan *et al.* (2013) find that in India literacy has a strong and significant effect on health at state-level. At the district level, average income influences under-five mortality but through reducing poverty and increasing literacy. Awiti (2014) examined how poverty influences public health, including food insecurity, deprivation, housing, mental health issues, and fuel and transport poverty.

According to Braveman & Gottlieb (2014) Poverty works not only through the instant impacts of deprivation on families (lack of food, housing, transport, etc.) but also from the effects of chronic stress, causing patho-physiological change (called allostatic load) in people. The long-term consequences of allostatic load and unhealthy behaviors are a variety of diseases, which, if not treated properly, can lead to premature death. Rambotti (2015) analyze the impact of poverty on health and to investigate the interaction between poverty and inequality across countries and states in the US. Results revealed that in the case of cross country comparison the impact zof income inequality on health is higher in high poverty countries. And in case of states comparison poverty replace inequality. It is argued that the differential might be due to different measures of poverty at both state and country level. Aue et al. (2016) examined the association between income poverty and health behavior utilizing data from German Socio Economic Panel from time period 2000 to 2010. They made use of logistic

[55] Keita (2013) treated income (GDP per capita) as endogenous and poverty as exogenous that is system GMM is used to deal with endogenous nature of income.

regression for cross sectional data and estimated fixed effects models to investigate the influence of poverty on tobacco consumption of tobacco, nutritional behavior, and physical activity. Results proposed that poverty is associated to behaviors leading poor health, mainly concerning physical activity and tobacco utilization. Price et al. (2018) Stressed that environmental, cultural and socioeconomic conditions have adverse impacts on health of poor. People residing in poverty are expected to suffer from infectious diseases, various chronic diseases and premature mortality. They are deprived of political, psychosomatic and social power, worsening enduring deprivation and health over cohorts. Public health professionals research to become advocates for the underprivileged, executing programs for health promotion, and understanding the effects of poverty on health.

Chung et al (2020) find out the drivers and mechanisms of the malicious cycle of health and poverty amongst the chief participants in Hong Kong. Respondents in the study were recruited through relevant public health-care clinics and NGOs. Social and material barriers as a consequence of unequal prospects and power, seem to play an important role in producing unequal distribution of social health factors. In addition Access to healthcare varies in the social ladder under Hong Kong's dual track healthcare system. Tafran et al (2020) conducted a study using secondary data from 2002-2014 of 12 states in Malaysia to examine the determinants of life expectancy. They used fixed-effect regression analysis to investigate the impact of various socioeconomic variables like poverty, unemployment and income on life expectancy. They found that all three variables significantly determine life expectancies. The coefficients obtained from fixed effect regression propose that 1% decrease in poverty, $23.20 rise in monthly income and, 1% decline in unemployment increases life expectancy by 17.9, 16.3 and 72.0 respectively. The extents of the influence of the socioeconomic factors on health differ by gender.

III. THEORETICAL FRAMEWORK

Health Production Function of a nation which is produced upon the behavior, medical care and the limitations the people face (Grossman, 1972). The production function can be written as

$$H = f(X) \dots\dots (A)$$

where, H is individual health output and X is a vector of individual health inputs like income, health care facilities, education, employment, environment, life style. To convert this micro level model into macro level, individual health inputs are categorized into economic (Y), social (S) and environmental (V) factors following Fayissa and Gutema (2005)**.**

$$H = f(Y, S, V) \dots\dots (B)$$

Numerous variables are used in the literature, the variables in economic factors vector comprise economic growth and health, social factors vector include education and environmental factors vector contain carbon dioxide emissions.

$$H = f(EconomicGrowth, healthfacilities, Edu, CO2E) \dots\dots (i)$$

This study intends to discover other potential determinants of health by focusing on poverty. According to UN poverty is "a denial of choices and opportunities, a violation of human dignity". It is incapability to participate in society effectively. It means lack of access to adequate food, clean water, sanitation, clothing, education, health care facilities, land to grow food, job and credit. Poverty is powerlessness, insecurity and exclusion of individuals and societies[6]. To take into account the effect of poverty on health, equation (i) is extended to include poverty

$$H = f(Growth, healthfacilities, Edu, CO2E, Poverty) \dots\dots (ii)$$

In this analysis, life expectancy and infant mortality are used as a proxy of health. To measure poverty two proxies head count ratio and poverty gap are used. Eq (ii) can be written as follows for the panel data analysis,

$$H_{it} = \beta_{it} + \beta_2 lnY_{it} + \beta_3 HF_{it} + \beta_4 EDU_{it} + \beta_5 C02E_{it} + \beta_6 POV_{it} + \varepsilon_{it} \dots\dots (iii)$$

where, t = Time period (1980-1984, 1985-1989….2010-14), i= number of countries (126), *H* is health measured by infant mortality and life expectancy, *lnY, HF, EDU* and *CO2E* and *POV* are economic growth, health facilities, education, carbon dioxide emission and poverty, respectively.

IV. METHODOLOGY

In our model it is possible that problem of endogeneity may arise because of simultaneous relationship between health and poverty. Poverty may lead to poor health and in result ill health may lead to further poverty. If relationship between independent variable and residual (error term) is not zero than variable is said to be endogenous. In our case, poverty is endogenous if Cov (poverty, μ) ≠ 0. In this case we have to opt instrumental

[6]"Indicators of Poverty & Hunger" by United Nations.

variable technique. In panel data heteroscedasticity problem is expected to occur so in this case generalized method of moment (GMM) is more suitable.

To deal with issues of potential endogeneity, measurement error, omitted variables and heteroscedasticity we have used system GMM. In addition, system GMM instrument endogenous variables with their own lags (Hoeffler and Temple, 2001).

V. DATA

The data is taken (i) from 1980 because of data availability issue on poverty before 1980 (ii) at a five-year interval because changes in health outcome evolve (Owen & Wu, 2002). The summary of variables is given in this section. The data on all variables are taken from the World Development Indicators (WDI) except factor endowment and landlocked which is taken from Easterly (2007) and Wikipedia, respectively. Life expectancy at birth, total (years) and Mortality rate of infant (per 1000 live births) are used as dependent variables, also used by Siddique et al. (2018) & (2020). Our focused independent variable is poverty. To investigate the link between poverty and health outcomes, two measures of poverty are used: (i) poverty headcount ratio and (ii) poverty gap. World Bank defines poverty as a proportion of the population living below $1.90 per day. Variable used to measure poverty headcount ratio is poverty headcount ratio at $1.90 a day (PPP, % of population), which is also used by Biggs et al. (2010). Poverty Gap is defined as an average shortfall in consumption and income from the poverty line. It is measured as the poverty gap at $1.90 a day (PPP, % of population), which is used by Rajan et al. (2013). This study uses physicians (per 1,000 people) and immunization measured by measles (% of children ages 12-23 months), the log of GDP per capita (constant 2005 US$) as economic growth, which is also used by (Siddique and Majeed 2015; Siddique et al., 2018). We have used female education and total education which is measured by school enrollment, secondary (% gross), which is also used by Shahid et al. (2019). CO2 emissions (metric tons per capita) is used to capture the effect of environmental factors. Instruments used in the health-poverty model are factor endowment, landlocked and time dummies. In existing literature there exist no direct well-established instruments for poverty, but poverty and inequality are closely intertwined; countries/states/societies having large inequalities in income are expected to have a high level of poverty (Fiscella & Franks, 1997, Chani et al., 2011; Pervaiz et al., 2011). Existing literature on the inequality suggests that most of the variation in income inequality is explained by factor endowment (Easterly, 2007). Future research is required to search for better instruments of poverty. Dutt and Tsetlin (2015) investigated the importance of poverty relative to inequality for development outcomes. To make a possible comparison, they replicated Easterly (2007) and utilized poverty in conjunction with income inequality by employing the same instrument based on land-endowment as Easterly (2007) for both inequality and poverty. They found that this instrument strongly affects poverty.

VI. EMPIRICAL RESULTS

The panel data model is estimated by allowing potential endogeneity problem. We have reported the estimated results from fixed/random effects, and system GMM model.

VI.I. PANEL REGRESSION ANALYSIS

We have analyzed the relationship between "health and poverty" using panel data for 129 countries over period 1980-2014. Table 1 shows the fixed effects and random effects results for variables specified by equation iii. We have used two different proxies to measure poverty (1) poverty head count ratio at $1.90 a day and (2) poverty gap at $1.90 a day. Similarly, we have used two measures of health (1) life expectancy at birth and (2) infant mortality. Columns 1-4 of Table 2 shows the results obtained from fixed effects regression, while columns 5-8 display the results of random effects regression. Fixed effects result show that life expectancy is adversely influenced by poverty headcount ratio while poverty gap coefficient has the opposite sign [HCR= -0.00932 and PG=0.0165] but this effect is not significant with either measure of poverty. Table's columns 3 and 4 show fixed effects regression results with infant mortality as a health measure. Here, with infant mortality coefficient of poverty has expected sign and is significant which was insignificant with life expectancy. In random effect, poverty has an adverse and significant impact on health (irrespective of poverty and health measure used). This association between poverty and life expectancy is in accordance with Rambotti (2015) and Adena & Myck (2014) who found that across states in U.S. poverty has adverse and statistically significant effect on life expectancy. Similarly, investigation done by Rajan *et al.* (2013) confirmed that reduced poverty instead of high wealth improve health. At both district and state level (in India), poverty is positively related with infant mortality.

Table 1: Fixed/Random Effects Results

Variables	Fixed Effects				Random Effects			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	LE		IM		LE		IM	
Economic Growth	6.29***	6.64***	-9.35***	-10.2***	4.36***	5.01***	-7.70***	-8.85***
	0.63	0.58	2.63	2.54	0.46	0.43	1.55	1.48
CO2 Emission	-0.11	-0.12	1.46*	1.41*	-0.27*	-0.28*	0.86**	0.83*
	0.20	0.20	0.74	0.74	0.15	0.15	0.43	0.43
Education	0.12***	0.12***	-0.25***	-0.26***	0.11***	0.11***	-0.32***	-0.32***
	0.01	0.01	0.06	0.06	0.01	0.01	0.05	0.04
Physicians/ Immunization	1.13**	1.07**	-0.56***	-0.56***	1.56***	1.60***	-0.52***	-0.53***
	0.52	0.52	0.05	0.04	0.34	0.34	0.04	0.04
Headcount Ratio	-0.01	-	0.26***	-	-0.05***	-	0.29***	-
	0.02		0.06		0.01		0.05	
Poverty Gap	-	0.02	-	0.44***	-	-0.048**	-	0.48***
		0.03		0.10		0.02		0.09
Constant	6.89	3.72	162.6***	171.4***	22.4***	16.6***	153.1***	164.9***
	-4.59	-4.08	-18.47	-17.13	-3.50	-3.13	-11.46	-10.20
Observations	436	436	410	410	436	436	410	410

*Note:*Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2: System GMM Results

Variables	(1)	(2)	(3)	(4)
	LE		IM	
Lag LE/ IM	0.707***	0.710***	0.638***	0.668***
	(0.0163)	(0.0165)	(0.0442)	(0.0358)
Economic Growth	1.251***	1.276***	-4.145***	-2.920**
	(0.232)	(0.223)	(1.482)	(1.429)
CO2 Emission	-0.770***	-0.749***	1.159***	0.803**
	(0.115)	(0.115)	(0.404)	(0.387)
Education/ Education (Fe)	0.121***	0.117***	-0.118***	-0.107***
	(0.0105)	(0.0103)	(0.0332)	(0.0303)
Physicians/ Immunization	0.676***	0.653***	-0.106**	-0.0760*
	(0.169)	(0.175)	(0.0453)	(0.0419)
Headcount Ratio	-0.0255***	-	0.0722*	-
	(0.00594)		(0.0423)	
Poverty Gap	-	-0.0579***	-	0.161**
		(0.00939)		(0.0722)
Constant	0.823	0.865	52.20***	39.78***
	(1.967)	(1.677)	(14.00)	(13.03)
Observations	337	337	328	328
Instruments	49	49	22	22
AR1 (Pr> z)	0.086	0.095	0.249	0.322
AR2 (Pr> z)	0.777	0.829	0.330	0.312
Hansen test Prob> chi2	0.266	0.242	0.053	0.052

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

As far as effect of control variables is concerned regarding effect of other variables, we find that 1% increase in economic growth will increase life expectancy by 75 months (with a model using HCR) and 79 months (with a model using poverty gap) this is consistent with Bayati et al (2013) and Gilligan & Skrepnek (2014). If there is 1% increase in education than life expectancy will increase by 1.4 months (using HCR) and 1.42 months (using Poverty gap). Life expectancy is expected to increases by 13 months and 12.7 months as a result of 1 unit incline

in number of physicians as indicated in column 1 and 2 respectively. Table's columns 3 and 4 show fixed effect regression results when infant mortality is used as indicator of health. Here with infant mortality, coefficient of poverty has expected sign and is significant. This implies that infant mortality increase by 0.259 and 0.444 units due to 1% increase in poverty HCR and poverty gap respectively. This result is in accordance with arguments of Wagstaff (2002) & Grant (2005).

Table 3: Sensitivity Analysis Results of Life Expectancy and Poverty

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Life Expectancy						
Lag Life Expectancy	0.637***	0.678***	0.687***	0.633***	0.700***	0.727***	0.699***
	(0.0299)	(0.0436)	(0.0210)	(0.0236)	(0.0200)	(0.0200)	(0.0233)
Economic Growth	1.345***	0.268	1.301***	1.792***	0.135	0.591**	0.739**
	(0.439)	(0.358)	(0.275)	(0.344)	(0.191)	(0.250)	(0.305)
CO2 Emission	-0.82***	-0.362**	-0.793***	-0.846***	-0.425***	-0.513***	-0.239
	(0.153)	(0.183)	(0.127)	(0.163)	(0.121)	(0.128)	(0.172)
Education	0.106***	0.103***	0.120***	0.0788***	0.109***	0.112***	0.124***
	(0.0189)	(0.0177)	(0.0121)	(0.0117)	(0.0126)	(0.0122)	(0.0130)
Physicians	0.668***	0.0110	0.607***	0.788***	0.163	1.299***	0.0788
	(0.220)	(0.237)	(0.226)	(0.221)	(0.127)	(0.247)	(0.385)
Poverty Headcount	-0.029**	-0.048***	-0.024***	-0.059***	-0.054***	-0.047***	-0.0035
	(0.0132)	(0.0169)	(0.0067)	(0.0089)	(0.0129)	(0.0081)	(0.0088)
Water	0.0447						
	(0.0462)						
Health Expenditures		0.00255***					
		(0.0006)					
Dependency Ratio			-0.0167				
			(0.0139)				
Employment				0.0666**			
				(0.0286)			
Undernourished Ment					-0.0454**		
					(0.0191)		
Urbanization						0.802***	
						(0.0729)	
Regional Dum	NO	NO	NO	NO	NO	NO	YES
Constant	2.663	11.23***	3.192	2.609	11.63***	2.247	2.937
	(2.865)	(4.001)	(4.057)	(3.549)	(1.631)	(2.186)	(2.820)
Observations	308	254	337	308	246	337	337

Note: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

We have instrumented endogenous variable with a lag of endogenous variables and some external exogenous instruments like factor endowment, landlocked and time dummies. Hansen test confirms the validity of instruments used. It is clear from columns 1 and 2 of Table 2 that poverty irrespective of measure used is negatively and significantly linked with life expectancy. The coefficients of the poverty headcount ratio show that a one percent increase in poverty decreases life expectancy by 0.31 months or one percent increase in the poverty gap reduces life expectancy by 0.69 months. Similarly, columns 3 and 4 of table reveal that poverty is positively and significantly associated with infant mortality, implying that 1 percent increase in poverty headcount ratio and poverty gap increases infant deaths per 1,000 live births by 72 and 161numbers, respectively.

Thus, whether measured through poverty headcount or poverty gap; poverty is found to harm health. So, from the findings, it can be concluded that irrespective of poverty and health measure used, poverty has an adverse effect on health. Besides poverty, several other economic, social and environmental factors - like economic growth, physicians, education and CO2 emission - also play an important role in determining health status.

Table 4: Sensitivity Analysis Results of Infant Mortality and Poverty

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Infant Mortality						
Lag Infant Mortality	0.478***	0.482***	0.541***	0.582***	0.551***	0.522***	0.500***
	(0.0249)	(0.0321)	(0.0137)	(0.0246)	(0.0266)	(0.0188)	(0.0269)
Economic Growth	-1.508	-3.19***	-2.694***	-2.97***	-3.98***	-1.164	-4.61***
	(1.017)	(1.055)	(0.736)	(0.976)	(1.015)	(0.775)	(1.647)
CO2 Emission	0.747***	0.890**	0.352	-0.0690	1.702***	-0.210	0.196
	(0.288)	(0.403)	(0.226)	(0.339)	(0.582)	(0.281)	(0.847)
Education(Total)	0.0473	-0.0588	0.0863***	0.0188	0.0860**	-0.15***	-0.0487
	(0.0289)	(0.0514)	(0.0150)	(0.0268)	(0.0353)	(0.0287)	(0.0362)
Physician	-0.40***	-0.49***	-0.345***	-0.39***	-0.65***	-0.32***	-0.35***
	(0.0430)	(0.0599)	(0.0233)	(0.0404)	(0.0456)	(0.0230)	(0.0291)
Poverty Headcount	-0.0176	0.0266	0.182***	0.184***	0.147***	0.220***	0.131***
	(0.0387)	(0.0594)	(0.0276)	(0.0416)	(0.0440)	(0.0296)	(0.0343)
Water	-0.62***						
	(0.0746)						
Health Exp.		-0.0035*					
		(0.00181)					
Dependency Ratio			0.144***				
			(0.0245)				
Employment				-0.43***			
				(0.0673)			
Undernourish-Ment					-0.0298		
					(0.0918)		
Urbanization						-2.38***	
						(0.166)	
Regional Dummies	NO	NO	NO	NO	NO	NO	YES
	107.7***	82.83***	42.80***	87.18***	85.37***	61.72***	80.10***
Constant	(6.776)	(10.55)	(7.145)	(9.049)	(8.495)	(5.906)	(9.607)
Observations	290	244	318	290	231	318	318

*Note:*Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

VI.II. SENSITIVITY ANALYSIS

It is a way to check the robustness of results by examining the degree to which results obtained are influenced by altering models, assumptions, methods or values of unmeasured variables with the purpose of recognizing whether the results attained are dependent on other variables or techniques (Schneeweiss, S., 2006). It is also used to assess that whether changing any variable in the model results in different conclusions or interpretations (Viel et al., 1995). In this section, some additional determinants of health and regional dummies are introduced into a model to check the robustness. Table 3, 4, 5 and 6 present the results obtained (that is what happens to effect of poverty on health) using some additional determinants of health. From Tables, it is clear that poverty maintains its sign and significance that is the adverse impact of poverty on health is robust. This relationship between poverty and health hold even when regional dummies are added in regression. Regarding the effects of these additional variables on health, this study finds that access to clean water, health expenditures, employment

and urbanization have expected sign and are found to improve life expectancy, whereas age dependency ratio and prevalence of undernourishment has an adverse effect on life expectancy.

Table 5: Sensitivity Analysis Results of Life Expectancy and Poverty

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Life Expectancy						
Lag Life Expectancy	0.594***	0.741***	0.670***	0.603***	0.698***	0.712***	0.710***
	(0.0332)	(0.0378)	(0.0222)	(0.0269)	(0.0198)	(0.0191)	(0.0227)
Economic Growth	2.061***	0.739*	1.365***	2.545***	0.248	0.825***	1.159***
	(0.435)	(0.421)	(0.234)	(0.351)	(0.247)	(0.220)	(0.303)
CO2 Emission	-1.217***	-0.482**	-0.883***	-1.127***	-0.541***	-0.610***	-0.672***
	(0.168)	(0.196)	(0.122)	(0.165)	(0.146)	(0.133)	(0.145)
Education	0.110***	0.102***	0.101***	0.0731***	0.112***	0.0954***	0.115***
	(0.0146)	(0.0152)	(0.00889)	(0.00990)	(0.00792)	(0.00954)	(0.01000)
Physicians	1.173***	0.173	0.782***	1.177***	0.327*	1.406***	0.351
	(0.276)	(0.298)	(0.253)	(0.285)	(0.188)	(0.320)	(0.459)
Poverty Gap	-0.070***	-0.00430	-0.075***	-0.125***	-0.082***	-0.111***	-0.0324**
	(0.0165)	(0.0305)	(0.0109)	(0.0109)	(0.0163)	(0.0119)	(0.0126)
Water	0.0455						
	(0.0393)						
Health Expenditures		0.00231***					
		(0.000704)					
Dependency Ratio			-0.0159				
			(0.0134)				
Employment				0.0917***			
				(0.0248)			
Undernourish Ment					-0.069***		
					(0.0154)		
Urbanization						0.763***	
						(0.0799)	
Regional dummy	NO	NO	NO	NO	NO	NO	YES
Constant	0.129	2.959	5.826*	-1.946	10.78***	3.361*	1.505
	(2.528)	(4.026)	(3.501)	(2.978)	(2.056)	(1.742)	(2.734)
Observations	308	254	337	308	246	337	337
Instruments	42	33	49	42	42	49	49
AR1	0.029	0.297	0.085	0.133	0.097	0.830	0.075
AR2	0.886	0.419	0.973	0.308	0.662	0.978	0.848
Hansen test Prob> chi2	0.199	0.143	0.259	0.189	0.684	0.334	0.377

*Note:*Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

VII. CONCLUSION

In this study, we intend to extend the literature on health determinants by empirically investigating the relationship of poverty with health. To achieve this objective we have used panel data on 126 developing and developed countries for 1980-2014. Different estimation techniques like OLS, fixed & random effects and system GMM are used. Empirical results obtained confirmed that poverty has an adverse and statistically significant effect on health status irrespective of health and poverty measure used. For instance, in OLS life expectancy is expected to decline by 2 and 3.6 months due to 1% incline in HCR and PG, respectively. With infant mortality as a health measure, 1 per cent increase in HCR and PG is associated with the 350 and 650 number increase in infant deaths per 1000 live birth, respectively. This study finds that coefficients obtained with the poverty gap are bigger in magnitude as compared to coefficients obtained with headcount. We have checked sensitivity analysis on system GMM. It is observed that the adverse effect of poverty is insensitive to the inclusion of other determinants of health. Several policy implications can be drawn from this paper: (1) results

suggests that programs to improve health must not focus only on policies which promote economic growth but also on policies which reduce poverty, (2) considering non-income factors such as CO2 emissions and literacy may help in improving health outcomes, (3) strategies to increase timely and sufficient health services by increasing physicians supply for these groups should be taken into account (as poor has less access to health services).

Table 6: Sensitivity Analysis Results of Infant Mortality and Poverty

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	infant mortality						
Lag Infant Mortality	0.466***	0.451***	0.514***	0.557***	0.560***	0.523***	0.404***
	(0.0230)	(0.0484)	(0.0153)	(0.0260)	(0.0209)	(0.0189)	(0.0259)
Economic Growth	-1.534*	-3.344***	-2.781***	-3.572***	-1.847**	-1.669**	-1.775
	(0.909)	(0.893)	(0.474)	(0.788)	(0.835)	(0.652)	(1.776)
CO2Emission	0.540**	0.913**	0.255	-0.0378	0.659	-0.320	-1.588*
	(0.255)	(0.373)	(0.165)	(0.276)	(0.415)	(0.273)	(0.848)
Education Female	0.00636	-0.118*	0.00913	-0.0354	0.0607**	-0.170***	-0.224***
	(0.0367)	(0.0642)	(0.0204)	(0.0259)	(0.0239)	(0.0226)	(0.0377)
Physicians	-0.363***	-0.414***	-0.298***	-0.314***	-0.466***	-0.263***	-0.232***
	(0.0262)	(0.0352)	(0.0180)	(0.0274)	(0.0232)	(0.0173)	(0.0229)
Poverty Gap	0.274***	0.139	0.444***	0.366***	0.483***	0.465***	0.404***
	(0.0788)	(0.134)	(0.0458)	(0.0763)	(0.0832)	(0.0547)	(0.0681)
Water	-0.393***						
	(0.0562)						
Health Expenditures		-0.00182					
		(0.00180)					
Dependency Ratio			0.0904***				
			(0.0242)				
Employment				-0.370***			
				(0.0621)			
Undernourish-ment					0.0978		
					(0.0664)		
Urbanization						-2.188***	
						(0.214)	
Regional dummy	NO	NO	NO	NO	NO	NO	YES
Constant	86.63***	81.56***	49.73***	87.41***	54.93***	62.24***	68.06***
	(4.742)	(6.496)	(4.696)	(7.997)	(6.096)	(5.142)	(11.10)
Observations	290	244	318	290	231	318	318
Instruments	42	33	49	42	42	49	49
AR1 (Pr> z)	1.44	0.045	0.376	0.533	0.867	0.739	0.024
AR2 (Pr> z)	0.329	0.690	0.274	0.486	0.173	0.242	0.572
Hansen test Prob> chi2	0.628	0.439	0.272	0.479	0.430	0.567	0.689

Note: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

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