Healthcare expenditure, good governance and human development

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Abstract

Purpose – This study aims to investigate the consequence of the quality of governance (QoG) in moderating the effect of healthcare spending on human development.

Design/methodology/approach – The authors employ a two-step Windmeijer finite sample-corrected system-generalized method of moments (sys-GMM) estimation technique on a panel dataset of 161 countries from 2005 to 2019. The authors use healthcare expenditure as the main explanatory variable and the Human Development Index (HDI) as the dependent variable and also consider voice and accountability (VnA), political stability and absence of terrorism (PSnAT), governance effectiveness (GoE), regulatory quality (ReQ), rules of law (RLaw) and control of corruption (CoC) dimensions of governance indicators as proxies of good governance. The authors develop a new measure of good governance from these six dimensions of governance using principal component analysis (PCA).

Findings – The authors empirically revealed that allocating more healthcare support alone is insufficient to improve human development. Individually, PSnAT has the highest net positive effect on health expenditure that helps to increase human welfare. Further, the corresponding interaction effect between expenditure and the Good Governance Index (GGI) is negative but insignificant for low-income countries (LICs); negative and statistically significant for sub-Saharan African (SSA) economies and positive but insignificant for South Asian nations.

Originality/value – This study is an in-depth analysis of how governance impacts the effectiveness of healthcare expenditure to ensure higher human development, particularly in a large panel of 161 countries. The authors have developed a new index of good governance and later extended the analysis by separating countries based on the income level and geographical location, which are utterly absent in existing literature.

Keywords Healthcare expenditure, Good governance, Human development, Principal component analysis, System generalized method of moments

Paper type Research paper

1. Introduction

Despite the fact that global government healthcare expenditure is increasing at a faster rate, with an average of 6% in low and middle-income countries (LICs and MICs) and 4% in high-income countries (HICs), it still pushes around 100 million people into extreme poverty each year as they have to spend more than 35% of their income to obtain healthcare services (WHO, 2019). Moreover, the devastating effect of the COVID-19 pandemic pointed out the lack of quality and sufficient infrastructure in the healthcare systems of each country in the world. These findings repeatedly create policy tension among the policymakers, particularly regarding the effectiveness of the healthcare budget and expenditure towards human capital development and economic welfare because long, healthy and innovative lives are the

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fundamental principle of each development. It is often acknowledged as a simple but powerful fact that "healthy people are the actual wealth of a nation, which is frequently mistreated in the pursuit of material and financial wealth" (UNDP, 1999).

The traditional and new growth theories also substantially acknowledge that sustainable economic development is hard to achieve without developing quality human capital (Romer, 1990; Barro & Sala-i-Martin, 1997; Krueger & Lindahl, 2001). If policymakers reduce their fiscal deficit by cutting back vital infrastructure investments such as human capital, sustained growth may suffer (Stiglitz, 1997). Thus, human development goes beyond economic growth and development, and it is a crucial concern for every nation. Along with higher skills and knowledge such as education, the formation of human capabilities, such as health, is the critical dimension of human development. As quality healthcare is a human right, the government should increase spending on the health sector so that citizens are less presumably to fall into poverty while striving for healthcare services. Policymakers urge to ensure an efficient and cost-effective way of utilizing healthcare expenditure to guarantee health coverage for all and to accomplish the health-related Sustainable Development Goals (SDG 3).

Studies found that increasing healthcare expenditure cannot alone ensure universal healthcare (UHC) facilities and thus human development (Farag *et al.*, 2013; Onofrei, Vatamanu, Vintilă, & Cigu, 2021; Ibukun, 2021). Several socioeconomic factors, such as quality healthcare infrastructure and a sound governance system, are required to consider. Nevertheless, a debate for several years between Keynesian and Neo-Classical economists exists on the consequence of government involvement in the economy. Buchanan and Musgrave (1999) argued that government intervention might make problems even worse as government decisions could become ineffective in an undeveloped private sector. Afonso, Schuknecht and Tanzi (2005) also claimed that government intervention frequently resulted in public monopolies, which pushed out private sector contributions. He claims that the government's role is to correct industry errors or adjust for industry deficiencies rather than replace the sector. However, several studies have shown that public expenditure, particularly healthcare, contributes positively to policy objectives. Gupta *et al.* (1998) suggest that public spending on the health sector positively contributes to human capital and boosts economic growth by reducing inequality and poverty. Benefits sourced from healthcare finance and economic growth could confirm double benefits for the poor as they will be healthier and face low trouble doing physical and brain work efficiently (Doryan, 2001). Consequently, these benefits improve labor productivity and sustained growth (Razmi, Abbasian, & Mohammadi, 2012).

The mixed consensus on the direct effect of health expenditure on various outcomes of human development and limited empirical studies on the impact of governance to enhance the effectiveness of health spending to attain sustainable human development primarily motivate us to carry out this study. Moreover, to achieve sustainable UHC for all, the World Health Organization (WHO) has declared good governance as a critical element. The absence of good governance reduces the effectiveness of healthcare spending in achieving human development. It is found that the cost of corruption in the health sector is much higher than that of what we require to accomplish UHC. Every year, almost US$ 500bn of the public health expenditure is lost to corruption. A higher absenteeism rate of qualified doctors and medical staff demands informal payments or bribes in exchange for free hospital care, beds and medicines. These are the prime causes of the decline in the effectiveness of health spending at an alarming level (Friedman, 2018; Hussmann, 2020).

Based on the above background, this study argues that the governance quality of an economy directly or indirectly controls the effectiveness of government health expenditure. Thus, the study's main objective is to validate the impact of a different dimension of good governance on health spending to achieve human development goals. Remarkably, the study investigates the following objectives: first, it verifies whether public health spending directly enhances human development; second, whether the different components of good

governance, such as voice and accountability (VnA), political stability, and absence of terrorism (PSnAT), governance effectiveness (GoE), regulatory quality (ReQ), rules of law (RLaw) and control of corruption (CoC) assist in increasing the effectiveness of health spending which were missed in existing studies. Third, which component of governance contributes more to facilitating healthcare spending efficiency? Finally, we investigate whether good governance's effectiveness in facilitating government health spending to ensure human development varies across different country groups based on income level and geographical location. The findings of the investigations mentioned above are based on the latest available panel data of 161 countries from 2005 to 2019.

We structured this study as follows: Section 2 contains brief existing literature addressing the link between health spending, governance factors and human development. Section 3 describes empirical specification and methodology and several determinants of human development, their definition and sources. The study's empirical results, discussion and extension are described in Section 4; lastly, Section 6 concludes with research limitations and some policy suggestions.

2. Literature review

Literally, human development is a multidimensional process that represents several aspects of human life, such as an improved healthy and long life, a quality standard of living, education, knowledge and skills, social, cultural and political freedom, civil rights and self-esteem (Ranis, 2004). Health expenditure can improve human development through several channels such as economic growth, improved labor productivity, reduced mortality and encouraging people to engage more in the learning and education process. Thus, a country must enhance its health and education sector investments to achieve its overall development. Investment in these two sectors is directly linked with the development of human capital, which is extensively used in social and economic research as an input to economic development. Smith (1776) has tried to elucidate the sources of an economy's welfare by providing two significant factors: economies of scale and quality human capital. The endogenous growth theory by Romer (1994) also emphasizes government expenditure or investment in human capital development. Quality human capital is a crucial source of economic growth. The theory holds that an economy's growth relies on domestic and foreign investment in innovation, human capital, technology and knowledge. Most of the studies also argue that economic theories rely on human capital. Human development is a source of development, which implies that investment in humans' intellectual and physical aspects leads to the most trustworthy conditions for heading toward optimal economic development. Therefore, we conclude that endogenous growth theory is the foundation of this empirical work.

Several studies have investigated the link between public healthcare expenditure and economic growth. Nevertheless, the empirical analysis of the effect of health expenditure on human development is minimal. Moreover, the existing limited studies do not conclude that health expenditure improves human development. The studies on health spending and human development reflect two different views: positive, negative or no influences. Using a country-level dataset of 50 developing countries, Gupta *et al.* (1998) concluded that government healthcare spending helps to strengthen the health status of the country. They recommended that policymakers allocate more budgets to this sector abundantly and efficiently. A study by Rajkumar and Swaroop (2008) also found a strong positive effect of health expenditure on health and education outcomes of human development but with the presence of a higher quality of governance (QoG) and a low corruption rate factor at the cross-country level. Alin and Marieta (2011) theoretically analyzed the correlation between the healthcare system and human development. They have used the health dimension of the Human Development Index (HDI) as defined by life expectancy at birth and found that spending on health will increase human development and vice versa. Craigwell, Bynoe, & Lowe (2012) considered the panel data of 19

Caribbean countries and found that public spending has a positive effect on healthcare that increases the life expectancy of people but has no noticeable impact on the increasing level of education of people. Using the Granger causality test, Razmi *et al.* (2012) concluded that there is no two-way relationship between health spending and HDI in Iran; moreover, the ordinary least square (OLS) approach confirmed that public health expenditure assisted in increasing the HDI as the fund used to improve the healthcare system and awareness among the people. In order to evaluate the effect of government health, education and infrastructure expenditure on the HDI, Safitri (2016) employed panel data from 23 districts over the period 2008–2014 and found only the spending on health has a significant impact on the HDI improvement. Most recent studies have been conducted by Ibukun (2021) and Onofrei *et al.* (2021) on the role of governance in the effectiveness of health expenditure to achieve different health outcomes such as mortality rate (MR) or life expectancy at birth, respectively. Although their findings are not directly linked to human development, they found a positive relationship between health expenditure and life expectancy and a negative relationship with the MR. They also conclude that developing countries in the European Union and West Africa that have a higher level of good governance get more benefits from spending money on healthcare than countries with a lower level of good governance.

The second aspect of the existing literature is that there is a negative or no significant impact of government health spending on the HDI. Using time-series data, Asghar Scholar and Awan Scholar (2012) established that the impact of health expenditure is insignificant in Pakistan. Similar findings, such as government expenditure does not always competently increase human development, have been reported by Prasetyo and Zuhdi (2013). They investigated the impact of per capita government spending in the health and education sector on human development using 81 countries' datasets.

Thus, based on the review of existing literature, very few studies conducted an empirical analysis to establish the relationship between healthcare spending and governance settings that ultimately would facilitate sustainable human development. Healthcare is a basic need for people, and ensuring access to improved healthcare facilities is a political agenda; thus, we cannot overlook to include government factors while analyzing the effectiveness of health expenditure. Our paper is a significant diversion from the existing studies above because it investigates the impact of good governance on health expenditure in improving human development. Our extensive panel consists of 161 countries' data on health expenditure, good governance indicators and human development. Most previous studies cover single-country analyses focused on this issue (Youkta & Paramanik, 2020). This analysis forms the groups of countries based on their income classification and geographical location recommenced by the World Bank to address the issue of country heterogeneity that might affect the effectiveness of healthcare spending. We argue that this analysis is a novel investigation that considers different angles using a unique empirical model and an endogeneity consistent estimation strategy to justify our empirical findings, which are almost missing in the existing studies.

3. Data, methodology and empirical specification

3.1 Empirical model specifications

We specifically aggregate production function framework to examine the potential human development effects of government health expenditure in which human development (HD) of a country depends on healthcare spending (HEx), level of income (Y), QoG and the vector of other control variables.

$$HD = f(HEx,\ Y, QoG, Controls) \tag{1}$$

For the purpose of estimation, we derived following dynamic and multivariate regression of the determinants of human development from Equation (1) for panel data.

$$HD_{st} = \varphi HD_{s,t-1} + \varphi_1 HEx_{st} + \varphi_2 QoG_{st} + \varphi_3 (HEx_{st} \times QoG_{st}) + \varphi_4 Y_{st} + \varphi_5 ICT_{st} + \varphi_6 AtE_{st} + \varphi_7 EMI_{st} + \varphi_8 MR_{st} + n_s + u_{it} \quad (2)$$

where, HD_{st} is the human development in country s at year t and φ_1 is the elasticity of human development. HEx_{st} is the healthcare expenditure (percentage of gross domestic product [GDP]); QoG_{st} is the quality of governance; $Y_{st}, ICT_{st}, AtE_{st}$, EMI_{st} and MR_{st} represent the level of income, information and communication technology (ICT), access to energy, rate of emission and MR for country s at year t. n_s *and* u_{it} is the country-specific unobserved effects and error term, respectively. Human development is a persistent process; thus, past levels of development $(HD_{s,t-1})$ could explain the present and future levels of human development.

One of the prime objectives of this analysis is to examine whether *HEx* can enhance *HD* in the presence of *QoG* structure. We therefore incorporate the interaction of *HEx* and *QoG* indicators in the equation. Differentiating the equation with respect to expenditure yields the following where φ_1 and φ_3 capture the degree to which *QoG* of the country s improves the effectiveness of health spending on growth of human welfare.

$$\frac{\partial HD_{st}}{\partial HEx_{st}} = \varphi_1 + \varphi_3 QoG_{st} \quad (3)$$

We are expecting the sign of φ_4, φ_5 and φ_6 would be positive as both theoretical and empirical literature advocate the increase of level of income *(Y)*, and use of information technology *(ICT)* and access to energy *(AtE)* lead to improve human welfare. The coefficient of emission *(EMI)* and *MR* is expected to be negative. Remaining coefficients of health expenditure, governance and interaction terms are expected to be positive depending on their effectiveness of enhancing human development. To avoid omitted variable bias, the analysis considers control variables such as *Y, ICT, AtE, EMI* and *MR* based on existing literature. As poor institutional quality, government policies, democracy and transparency could affect budget and expenditure on health sector, we incorporate *QoG* indicators in the analysis.

3.2 Estimation strategy and handling endogeneity issue

The existing health spending effectiveness literature addresses several criticisms regarding the endogeneity issue, mainly due to models and methodologies used in empirical analysis. Endogeneity of healthcare expenditure results from different sources, such as reverse causality between expenditure and human development, omitted variable bias or unestimated heterogeneity (Baltagi, 2013). For a dynamic model, fixed effects (FE), FE with instrumental variables (IVs), least squares dummy variables corrected (LSDVC), difference GMM and system GMM (sys-GMM) estimation approaches can be applied. Nevertheless, FE estimators can be biased because of causality and omitted variables. FE-IVs and difference GMM suffer from small-sample bias (Nickell, 1981; Blundell & Bond, 1998) due to weak instruments; LSDVC is for "strictly exogenous independent variables" (Bruno, 2005), but we consider endogenous regressors in the model. Thus, we apply the sys-GMM estimation technique of Blundell and Bond (1998). This approach surmounts the problems of serial autocorrelation, reverse causality, endogeneity and heterogeneity (Roodman, 2009). We employ two-step robust sys-GMM as the estimators are more efficient than those obtained from one-step sys-GMM. Instead of differences, we also applied forward orthogonal deviations to reduce the loss of data (Roodman, 2009). All statistical and econometric analysis is performed using STATA (version 15.1).

3.3 Data sources and justification for the variables selection and expected results

This study focuses on the effect of health expenditure and governance on the human development of 161 countries from 2005 to available most recent updated data of 2019. Based on data availability, a sample of 161 countries is selected (Table 1).

According to the income level of each country, we divide the country into four groups: high-income country (HIC), low-income country (LIC), lower-middle-income country (LMIC) and upper-middle-income country (UMIC) groups (based on World Bank Country Classification for the 2022 fiscal year). Based on the location of countries, we grouped countries into regions like East Asia and Pacific, Europe and Central Asia, America and Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa. The variables selected for this study and the source of the data are given below:

Measurement of human development: Human development is the main dependent variable for this analysis. Development is a multidimensional process encompassing positive transformation in humans, social systems, public awareness, attitudes and institutional setup. The development process integrates the economy with the political and social structure of the country. Human development refers to the long-term multidimensional process of improving human beings, including long and healthy life, quality education, decent standard of living, guaranteed fundamental human rights, freedom for political participation and self-esteem. According to Ranis (2004), human development has two aspects: the first aspect includes human capabilities, such as better healthcare, knowledge and expertise. The second aspect consists of the human right to enjoy social, cultural, political and economic opportunities and benefits. We use the HDI as a proxy of human development for our analysis. Several prominent studies have considered the HDI as an indicator of human development. The HDI ranges from 0 to 1, a composite index measuring average achievement in three essential human development dimensions: a long and healthy lifestyle, knowledge and high quality of life. Data on the HDI are available in the United Nations Development Programme (UNDP) Human Development Data Center.

Measurement of healthcare expenditure: Our primary explanatory variable is health expenditure. Health expenditure refers to the final consumption of goods and services related to health, including spending on medical services, health and medical products, administering public health and training, capacity building and presentation programs by public or private sources or public–private partnerships. The total amount and growth of a country's health expenditure can be the outcome of various social and economic forces, the healthcare system and the country's government fiscal policy. We use current health expenditure as a percentage of the GDP to proxy healthcare expenditure. Data on current health expenditure are available in World Development Indicators (WDI), World Bank database.

Income level (Y): The level of income proxied by the annual growth of GDP has been considered a vital factor for explaining variation across different economies in the growth and level of expenditure on healthcare spending. An increased level of income would lead to an increase in the wide variety of opportunities and capabilities for individual households and governments, which in return will enhance human development (Ranis, 2004). Data on level of income are obtained from the WDI database.

Technology (ICT): ICT is a solid economic and human development enabler. It helps people solve their daily life problems, contributes to the increase of knowledge and productivity, and fulfills the gap of communication between people, relatives and businesses, which ultimately assists in ensuring human welfare and affects the level of living standards (Chhabra, 2013). ICT offers new opportunities for people's empowerment through quality healthcare, education and social and political system (Shade *et al.*, 2012). In order to measure ICT, we use the natural logarithm of mobile cellular subscriptions (per 100 people) as a proxy variable and obtain the data from the WDI database.

HI countries	Region	LMI countries	Region	UMI countries	Region	LI countries	Region
Australia	EAP	Algeria	MENA	Albania	ECA	Afghanistan	SA
Austria	ECA	Angola	SSA	Argentina	LAC	Burkina Faso	SSA
Bahamas, The	LAC	Bangladesh	SA	Armenia	ECA	Burundi	SSA
Bahrain	MENA	Belize	LAC	Azerbaijan	ECA	Central African Rep	SSA
Barbados	LAC	Benin	SSA	Belarus	ECA	Chad	SSA
Belgium	ECA	Bhutan	SA	Bosnia and Herzegovina	ECA	Congo, Dem. Rep	SSA
Brunei Darussalam	EAP	Bolivia	LAC	Botswana	SSA	Ethiopia	SSA
Canada	LAC	Cabo Verde	SSA	Brazil	LAC	Gambia, The	SSA
Chile	LAC	Cambodia	EAP	Bulgaria	ECA	Guinea	SSA
Croatia	ECA	Cameroon	SSA	China, PRC	EAP	Guinea-Bissau	SSA
Cyprus	ECA	Comoros	SSA	Colombia	LAC	Madagascar	SSA
Czech Republic	ECA	Congo, Rep	SSA	Costa Rica	LAC	Malawi	SSA
Denmark	ECA	Cote d'Ivoire	SSA	Dominican Rep	LAC	Mali	SSA
Estonia	ECA	Egypt	MENA	Ecuador	LAC	Mozambique	SSA
Finland	ECA	El Salvador	LAC	Fiji	EAP	Niger	SSA
France	ECA	Eswatini	SSA	Gabon	SSA	Rwanda	SSA
Germany	ECA	Ghana	SSA	Georgia	ECA	Sierra Leone	SSA
Greece	ECA	Guatemala	LAC	Guyana	LAC	Sudan	SSA
Hungary	ECA	India	SA	Haiti	LAC	Togo	SSA
Iceland	ECA	Indonesia	EAP	Honduras	LAC	Uganda	SSA
Ireland	ECA	Iran	MENA	Iraq	MENA	Yemen, Rep	MENA
Israel	MENA	Kenya	SSA	Jamaica	LAC		
Italy	ECA	Kyrgyz Rep	ECA	Jordan	MENA		
Japan	EAP	Lao PDR	EAP	Kazakhstan	ECA		
Korea, Rep	EAP	Lesotho	SSA	Lebanon	MENA		
Kuwait	MENA	Mauritania	SSA	Malaysia	EAP		
Latvia	ECA	Mongolia	EAP	Maldives	SA		
Lithuania	ECA	Morocco	MENA	Mauritius	SSA		
Luxembourg	ECA	Myanmar	EAP	Mexico	LAC		
Malta	MENA	Nepal	SA	Moldova	ECA		
Netherlands	ECA	Nicaragua	LAC	Namibia	SSA		
New Zealand	EAP	Nigeria	SSA	North Macedonia	ECA		
Norway	ECA	Pakistan	SA	Panama	LAC		
Oman	MENA	Papua New Guinea	EAP	Paraguay	LAC		
Poland	ECA	Philippines	EAP	Peru	LAC		
Portugal	ECA	Samoa	EAP	Romania	ECA		
Qatar	MENA	Senegal	SSA	Russia	ECA		
Saudi Arabia	MENA	Solomon Islands	EAP	Serbia	ECA		
Singapore	EAP	Sri Lanka	SA	Suriname	LAC		
Slovak Republic	ECA	Tajikistan	ECA	Thailand	EAP		
Slovenia	ECA	Tanzania	SSA	Tonga	EAP		
Spain	ECA	Timor-Leste	EAP	Turkey	ECA		
Sweden	ECA	Tunisia	MENA				
Switzerland	ECA	Ukraine	ECA				
Trinidad and Tobago	LAC	Uzbekistan	ECA				

(*continued*)

Table 1.
List of sample countries: by income group and by region

HI countries	Region	LMI countries	Region	UMI countries	Region	LI countries	Region
United Arab Emirates	MENA	Vanuatu	EAP				
United Kingdom	ECA	Vietnam	EAP				
USA	LAC	Zambia	SSA				
Uruguay	LAC	Zimbabwe	SSA				

Note(s): EAC = East Asia and Pacific, LAC = Latin America and Caribbean, ECA = Europe and Central Asia, MENA = Middle East and North Africa, SSA = Sub-Saharan Africa, SA = South Asia. High Income = HI, LMI = Lower-middle income, Upper-middle income = UMI and LI = Low income

Source(s): World Bank Classification of member countries

Table 1.

Access to energy: Access to energy is fundamental to satisfying the social needs that drive and fuel economic growth and human development (Gaye, 2007). More access to energy substantially impacts health, industrial and agricultural productivity, education and communication, and better access to information services. We use access to electricity (% of the population) to proxy access to energy. The data on this variable are obtainable from WDI.

Emission: Environmental pollution through greenhouse gases and climate change is the most critical environmental concern as they bring constant threats to humanity and well-being (Bedir and Yilmax, 2016). As carbon dioxide (CO_2) plays an influential role in environmental pollution, we use CO_2 emissions (kg per 2015 US$ of GDP) as a proxy variable of emission that might have an adverse impact on nature and human existence (Dimitriou & Kassomenos, 2017; Ballantyne, Wibeck, & Neset, 2016). CO_2 emission (kg per 2015 US$ of GDP) data are available in the WDI database.

Mortality rate (MR): We consider the infant MR (per 1,000 live births) to proxy the MR. Several studies argue that MR is connected with socioeconomic factors, and the promotion of these factors is very effective for the improvement of health status, welfare of society and overall human development. The infant MR is one of the critical parameters used to evaluate the prevalence of health conditions and assess socioeconomic welfare. Data on the infant MR (per 1,000 live births) are collected from the WDI database.

The measure of good governance: Government performs a vital role in providing a quality life for its people through a quality healthcare system. The system in each country comprises all institutions, government bodies and resources dedicated to producing healthcare. Thus, transparency in all steps of the system could promote the effectiveness of health spending to achieve better human welfare. The WGI project reports six dimensions of governance, such as VnA, PSnAT, GoE, ReQ, RLaw and CoC. We use each dimension in our study as a proxy for governance indicators. Moreover, by combining these six dimensions, we generate a single index, the Good Governance Index (GGI), that would be used as an indicator of good governance through principal component analysis (PCA). Under PCA, the GGI is defined as the linear combination of six estimates of the QoG. We can express the relationship as follows:

$$GGI_{st} = \beta_1 nVnA_{st} + \beta_2 nPSnAT_{st} + \beta_3 nGovE_{st} + \beta_4 nRegQ_{st} + \beta_5 nRLaw_{st} + \beta_6 nCoC_{st} + \varepsilon_{st} \quad (4)$$

Here, β_1 to β_6 is the weight against each indicator of QoG, which we will derive from PCA. Before applying PCA, each indicator is normalized (n) to ensure that all indicators contribute evenly to a scale (0 to 1) when they are added collectively. Table 2 represents the minimum

number of principal components that constitute most of the variation and their respective and highest eigenvalue (EV). Following Kaiser (1960), the component that contains an EV greater than one is considered for further analysis.

The analysis shows that the first principal component (Comp1) consists of the highest eigenvalue, and theoretically, Comp1 explains the maximum variation. The first principal component explains 85.1% of the total variations of the explanatory variables. Thus, we consider only Comp1 for analysis and estimate the GGI using the parameters allocated to Comp1. Later on, using orthogonal varimax rotation, we obtain weights against each Comp1 and the associated eigenvalues (Table 3). The table represents that all indicators of QoG are positively equated with the first principal component (Comp1). The highest weight corresponds to the RLaw followed by GoE, CoC, ReQ, VnA and PSnAT. We use the normalized value of the good governance index (nGGI) in order to analyze the impact of nGGI on the effectiveness of HEx in improving the HDI.

4. Empirical results and discussions

4.1 Summary statistics

Table 4 illustrates the summary statistics, including total observation average, standard deviation (SD), and minimum and maximum values of the selected normalized and logged variables. Except for Y, AtE and MR, the descriptive statistics represent minimum variation within data across the selected 161 countries. Except for very few control variables, all other variables contain complete data of 2415 observations from 2005 to 2019.

The Pearson's (1896) correlation coefficient matrix for all variables, excluding interaction terms, is shown in Table 5. Public healthcare expenditure and all proxies of QoG are positively and significantly correlated with the human development indicator. The correlation coefficient between the level of income and emissions is found to be opposite to our expectation, which may be due to the income disparities among the nations, and HICs produce more greenhouse gases than developing countries. Moreover, this relationship could vary with the presence of control variables and a group of countries. We justify these initial

Variables	Component	EV	Difference	Proportion	Cumulative
nVnA, nPSnAT, nGovE, nRegQ, nRLaw, nCoC	Comp1	5.105	4.725	0.851	0.851
	Comp2	0.380	0.060	0.063	0.914
	Comp3	0.320	0.206	0.053	0.967
	Comp4	0.114	0.069	0.019	0.986
	Comp5	0.045	0.008	0.008	0.994
	Comp6	0.037	–	0.006	1.000

Source(s): The author's calculation using STATA

Table 2. Principal components for different indicators of QoG

Variable	Comp1	Unexplained	kmo	Overall kmo
nVnA	0.378	0.270	0.944	
nPSnAT	0.365	0.320	0.964	
nGovE	0.425	0.077	0.880	0.904
nRegQ	0.418	0.106	0.890	
nRLaw	0.433	0.043	0.878	
nCoC	0.425	0.079	0.902	

Source(s): The author's calculation using STATA

Table 3. Scoring estimates for orthogonal varimax rotation (weights)

Variables	Variable definition at data source	Obs	Mean	SD	Min	Max
HDI	Human Development Index	2,415	0.696	0.160	0.294	0.957
HEx	Current healthcare expenditure (% of GDP)	2,415	6.165	2.527	1.600	20.413
Y	GDP growth rate (Annual %)	2,414	3.777	4.122	−36.392	34.500
ICT	Log of mobile cellular subscriptions, per 100 people	2,386	15.726	1.877	8.700	21.254
AtE	Access to electricity (% of population)	2,408	79.355	29.859	2.660	100.000
Emission	CO_2 emissions (kg per 2015 US$ of GDP)	2,308	0.472	0.383	0.050	3.027
MR	Mortality rate, infant (per 1,000 live births)	2,415	25.458	23.692	1.600	124.100
Quality of governance indicators						
VnA	Voice and accountability, estimate	2,415	−0.052	0.941	−2.230	1.740
PSnAT	Political stability and absence of violence/ terrorism, estimate	2,415	−0.133	0.951	−3.010	1.640
GoE	Government effectiveness, estimate	2,415	−0.003	0.967	−2.280	2.440
ReQ	Regulatory quality, estimate	2,415	0.023	0.928	−2.270	2.260
RLaw	Rule of law, estimate	2,415	−0.051	0.974	−1.900	2.130
CoC	Control of corruption, estimate	2,415	−0.053	1.001	−1.680	2.470
Governance index obtained using principal component analysis (PCA)						
GGI	Index of good governance (Normalized)	2,415	0.498	0.228	0	1

Note(s): We convert the HDI range to (0100) from (01)

Table 4. Summary statistics

findings in the empirical part. The matrix also indicates that, except for emission and ICT variables, all other variables are highly correlated with the HDI, signifying the possibility of multicollinearity. We used the variance inflation factor (VIF) test in the multiple regressions (using the governance indicator). We found that the mean VIF lies between 2.22 and 2.44, implying that multicollinearity is not a significant issue in this analysis.

5. Presentation and discussion of empirical results

5.1 Healthcare expenditure, quality of governance and human development nexus

Before discussing sys-GMM estimators, we applied FE estimation techniques in the dynamic panel data model. We found that (Table 6) the FE results align with economic theory and have expected signs. Nevertheless, all coefficients are insignificant except for the coefficients of income level and technology. Comprehensive income and up-to-date medical technologies will increase the sort of choices and capabilities of households and governments, which will ultimately improve human development. We initially find that healthcare expenditure is only significant when the country's government is highly effective and has high control over corruption. However, these FE estimators are considered biased and incompetent and have potential problems with causality and endogeneity.

Additionally, the inclusion of the lag of HDI as a regressor produces a problem of autocorrelation. The FE estimates of the lagged HDI are positive and enormously significant, confirming that development is persistent. Thus, the dynamic panel data model is the appropriate specification for our analysis. Besides, our large sample consisting of 161 countries (N) over 15 (T) years also validates the use of the system GMM as it is designed for "large N, small T" (Roodman, 2009). Thus, we will discuss the empirical results derived from the two-step system GMM method in the remaining part of the study.

Table 7 presents the main empirical findings of two-step sys-GMM estimators with Windmeijer's (2005) finite sample-corrected and heteroskedasticity consistent estimators.

Table 5. Pearson correlation matrix

	HDI	HDI ($t-1$)	HEx	Y	ICT	AtE	Emission	MR	VnA	PSnAT	GoE	ReQ	RLaw	CoC
HDI	1													
HDI ($t-1$)	0.99*	1												
HEx	0.39*	0.39*	1											
Y	−0.21*	−0.23*	−0.24*	1										
ICT	0.20*	0.16*	0.09*	−0.01	1									
AtE	0.86*	0.86*	0.20*	−0.16*	0.22*	1								
Emission	0.07*	0.07*	−0.15*	0.06*	0.16*	0.28*	1							
MR	−0.90*	−0.90*	−0.31*	0.19*	−0.16*	−0.86*	−0.16*	1						
VnA	0.62*	0.61*	0.51*	−0.21*	−0.04*	0.39*	−0.30*	−0.51*	1					
PSnAT	0.61*	0.61*	0.29*	−0.11*	−0.25*	0.40*	−0.14*	−0.55*	0.66*	1				
GoE	0.83*	0.83*	0.41*	−0.17*	0.12*	0.59*	−0.16*	−0.72*	0.74*	0.72*	1			
ReQ	0.80*	0.80*	0.43*	−0.17*	0.12*	0.55*	−0.20*	−0.68*	0.77*	0.68*	0.93*	1		
RLaw	0.77*	0.77*	0.43*	−0.18*	0.02	0.50*	−0.23*	−0.66*	0.79*	0.76*	0.95*	0.92*	1	
CoC	0.73*	0.73*	0.44*	−0.17*	−0.01	0.46*	−0.26*	−0.60*	0.76*	0.75*	0.93*	0.88*	0.95*	1

Note(s): (*) the significance at p-values of 0.05 or lower

Table 6.
Empirical results from FE estimation techniques

Dependent variable: Human Development Index (HDI)													
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Without	Quality of governance (QoG) indicator											
Variables	QoG	With VnA		With PSnAT		With GovE		With RegQ		With rlaw		With CoC	
HEx	0.0130	0.0119	0.0156	0.0126	0.0129	0.0141	0.0226	0.0176	0.0176	0.0141	0.0207	0.0132	0.0232
	(0.0169)	(0.0169)	(0.0175)	(0.0170)	(0.0183)	(0.0170)	(0.0156)	(0.0161)	(0.0161)	(0.0171)	(0.0161)	(0.0169)	(0.0164)
QoG		0.0579	−0.0272	−0.0403	−0.0442	0.193**	0.0961	0.0220	0.0220	0.144*	0.0475	0.0313	−0.101
		(0.0820)	(0.109)	(0.0528)	(0.0783)	(0.0751)	(0.0994)	(0.112)	(0.112)	(0.0828)	(0.103)	(0.0756)	(0.0942)
HEx × QoG			0.0168		0.000707		*0.0175**	0.0115	0.0115		0.0169		*0.0247***
			(0.0133)		(0.0113)		*(0.0101)*	(0.0118)	(0.0118)		(0.0113)		*(0.0102)*
Y	0.0452***	0.0450***	0.0453***	0.0455***	0.0456***	0.0450***	0.0453***	0.0453***	0.0453***	0.0451***	0.0454***	0.0451***	0.0456***
	(0.00360)	(0.00361)	(0.00372)	(0.00358)	(0.00362)	(0.00357)	(0.00365)	(0.00370)	(0.00370)	(0.00356)	(0.00365)	(0.00356)	(0.00361)
ICT	0.0826*	0.0799*	0.0847*	0.0812*	0.0810*	0.0859*	0.0853*	0.0782*	0.0782*	0.0860*	0.0858*	0.0818*	0.0822*
	(0.0452)	(0.0471)	(0.0487)	(0.0455)	(0.0444)	(0.0452)	(0.0451)	(0.0441)	(0.0441)	(0.0446)	(0.0445)	(0.0456)	(0.0458)
AtE	−0.00158	−0.00167	−0.00175	−0.00138	−0.00135	−0.00140	−0.00121	−0.00161	−0.00161	−0.00162	−0.00145	−0.00156	−0.00128
	(0.00369)	(0.00368)	(0.00366)	(0.00354)	(0.00373)	(0.00376)	(0.00376)	(0.00372)	(0.00372)	(0.00368)	(0.00367)	(0.00369)	(0.00374)
Emission	−0.103	−0.103	−0.101	−0.101	−0.102	−0.0822	−0.0807	−0.0976	−0.0976	−0.0981	−0.0999	−0.104	−0.109
	(0.0949)	(0.0938)	(0.0937)	(0.0987)	(0.0990)	(0.0918)	(0.0922)	(0.0945)	(0.0945)	(0.0918)	(0.0920)	(0.0945)	(0.0946)
MR	−0.00165	−0.00193	−0.00197	−0.00141	−0.00142	−0.00185	−0.00263	−0.00254	−0.00254	−0.00170	−0.00241	−0.00164	−0.00228
	(0.00418)	(0.00412)	(0.00415)	(0.00414)	(0.00415)	(0.00415)	(0.00433)	(0.00438)	(0.00438)	(0.00413)	(0.00428)	(0.00416)	(0.00425)
HDI ($t-1$)	0.925***	0.925***	0.924***	0.926***	0.926***	0.922***	0.921***	0.924***	0.924***	0.922***	0.921***	0.925***	0.924***
	(0.00937)	(0.00928)	(0.00945)	(0.00977)	(0.01000)	(0.00926)	(0.00938)	(0.00986)	(0.00986)	(0.00893)	(0.00906)	(0.00932)	(0.00963)
Constant	4.340***	4.431***	4.354***	4.271***	4.272***	4.479***	4.529***	4.507***	4.507***	4.492***	4.532***	4.361***	4.355***
	(0.790)	(0.826)	(0.848)	(0.770)	(0.766)	(0.790)	(0.805)	(0.764)	(0.764)	(0.793)	(0.802)	(0.789)	(0.795)
Observations	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127
R-squared	0.971	0.971	0.971	0.971	0.971	0.971	0.971	0.971	0.971	0.971	0.971	0.971	0.971
Country	161	161	161	161	161	161	161	161	161	161	161	161	161

Note(s): Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$ and *$p < 0.1$

Table 7. Empirical results from two-step system GMM estimation techniques

Dependent variable: Human Development Index (HDI)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Indicators of quality of governance (QoG)											
Variables	With VnA		With PsnAT		With GovE		With RegQ		With rlaw		With CoC	
HEx	0.0232	0.00881	0.233**	0.167**	0.0344	0.0200	0.0566	0.0179	0.0578	0.0342	0.0339	0.0299
	(0.0272)	(0.0348)	(0.0966)	(0.0780)	(0.0486)	(0.0236)	(0.0501)	(0.0299)	(0.0568)	(0.0275)	(0.0216)	(0.0253)
QoG	0.645***	−0.426*	1.273***	0.00996	0.967**	0.569***	1.044***	0.463**	0.777**	0.339*	0.673***	0.256*
	(0.123)	(0.216)	(0.482)	(0.314)	(0.480)	(0.166)	(0.288)	(0.185)	(0.375)	(0.192)	(0.124)	(0.150)
HEx × QoG		*0.160***		*0.163***		*0.0384**		*0.0600***		*0.0564***		*0.0549****
		(0.0391)		*(0.0646)*		*(0.0208)*		*(0.0254)*		*(0.0243)*		*(0.0206)*
Y	0.0388***	0.0416***	0.0170	0.0277***	0.0422***	0.0387***	0.0329***	0.0380***	0.0373***	0.0375***	0.0349***	0.0368***
	(0.00518)	(0.00549)	(0.0112)	(0.00992)	(0.00704)	(0.00461)	(0.00726)	(0.00492)	(0.00913)	(0.00538)	(0.00553)	(0.00543)
ICT	0.0510	0.0367	0.198	0.157	0.0538	0.0475	0.0561	0.0519	0.0377	0.0312	0.0562	0.0353
	(0.0413)	(0.0405)	(0.131)	(0.121)	(0.117)	(0.0341)	(0.0606)	(0.0412)	(0.0913)	(0.0392)	(0.0343)	(0.0368)
AtE	−0.0270**	−0.0325**	0.0842**	0.0602**	−0.0258	−0.0274***	−0.0209	−0.0350***	−0.0234	−0.0133	−0.00829	−0.0132
	(0.0125)	(0.0135)	(0.0331)	(0.0254)	(0.0310)	(0.00876)	(0.0239)	(0.0111)	(0.0343)	(0.0169)	(0.0161)	(0.0164)
Emission	2.053***	1.535***	−1.191**	−0.643	1.041	0.643***	1.079*	0.757***	1.847	1.210**	1.179**	1.195**
	(0.478)	(0.467)	(0.572)	(0.424)	(2.318)	(0.155)	(0.591)	(0.206)	(1.783)	(0.534)	(0.521)	(0.546)
MR	−0.0574**	−0.0767***	−0.121**	−0.0906**	−0.175*	−0.0733***	−0.198**	−0.0939***	−0.111	−0.0544**	−0.0430**	−0.0524**
	(0.0271)	(0.0279)	(0.0494)	(0.0393)	(0.101)	(0.0166)	(0.0979)	(0.0217)	(0.108)	(0.0223)	(0.0195)	(0.0219)
HDI ($t-1$)	0.915***	0.895***	0.594***	0.698***	0.742***	0.878***	0.698***	0.859***	0.831***	0.889***	0.902***	0.898***
	(0.0296)	(0.0332)	(0.153)	(0.120)	(0.191)	(0.0221)	(0.119)	(0.0285)	(0.157)	(0.0406)	(0.0371)	(0.0391)
Constant	7.923**	10.60***	21.11***	15.68**	23.09*	11.61***	26.17**	13.89***	14.95	9.167***	7.291***	8.467***
	(3.120)	(3.322)	(8.090)	(6.285)	(13.78)	(2.125)	(11.38)	(2.662)	(13.02)	(2.877)	(2.523)	(2.837)
Observations	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127
Groups/ Instruments	161/11	161/12	161/11	161/12	161/13	161/12	161/13	161/12	161/13	161/14	161/13	161/14
AB test for AR1	0.000	0.000	0.000	0.000	0.006	0.000	0.004	0.000	0.000	0.000	0.000	0.000
AB test for AR2	0.775	0.784	0.510	0.946	0.264	0.846	0.197	0.547	0.588	0.999	0.894	0.957
Sargan (Prob > χ^2)	0.332	0.385	0.320	0.522	0.284	0.117	0.002	0.139	0.311	0.134	0.122	0.151
Hansen (Prob > χ^2)	0.409	0.753	0.704	0.640	0.192	0.474	0.849	0.611	0.501	0.377	0.381	0.427

Note(s): Windmeijer (2005) corrected standard errors in parentheses. GMM-type instruments for orthogonal deviations is L(2/3).L.HDI collapsed for all equations. ***$p < 0.01$, **$p < 0.05$ and *$p < 0.1$

We aim first to analyze the impact of health expenditure (HEx) on human development. In Table 7, the system GMM results show that the estimate for HEx is positive and significant at a 5% level when we consider PSnAT (Columns 3 and 4). In all other cases, the coefficients of HEx are insignificant but positive. It means that a 1% increase in healthcare expenditure in a stable political economy leads to an average 0.233 point increase in the HDI.

Our second objective is to examine the impact of QoG on the effectiveness of HEx in enhancing the HDI in all sample countries. As illustrated in Table 7, the sys-GMM estimates for indicators of QoG are generally positive and significant except for the estimate of VnA, which is negative and significant, and the estimates of political stability, which are positive but insignificant. These outcomes indicate a direct relationship between the governance factor and the level of human development. Table 7 also shows the findings of the estimation of whether healthcare spending can impact HDI improvement through good governance in the countries. We find that the coefficients of the interaction term between healthcare spending and each indicator of the QoG are positive and statistically significant. Healthcare spending is more effective in enhancing HDI if the countries can ensure a stable political environment (net effect is 0.145). These results are consistent with the findings of Kelsall, Khieng, Chantha, & Muy (2016) and Ranabhat, Kim, Park, & Jakovljevic (2019) that PSnAT help formulate healthy public policy, attract adequate domestic and foreign funding, improve the level of governance and assist in achieving universal and quality healthcare more quickly. The net positive and significant effect of HEx on the HDI is the second greatest (0.03132) when considering the rule of law in the regression. The effective rule of law provides opportunities for all citizens, communities and institutions to have comfortable access to justice and the legal system and ensures accountability for all stakeholders (medical suppliers, communities, governments and hospital authorities). It improves easier access to healthcare services for women, girls and poor and vulnerable groups of society. Another essential quality of a governance indicator is the control of corruption, which can directly promote human welfare. Though we found a positive but statistically insignificant impact of HEx on the HDI, the interaction of HEx with CoC is positive and highly significant, implying that control of corruption improves the efficiency of healthcare spending and treatment services, such as procurement of quality medical supplies and easier access to medical treatment.

Similarly, we find that governance quality, measured by CoC, GoE, ReQ and VnA, plays a crucial role in the efficacy of public healthcare spending in improving HDI. We find that the interaction of each governance indicator with HEx is positive and significant, and the net conditional effect of HEx on HDI is 0.027, 0.020, 0.019 and 0.0005, respectively (Table 8). The findings are acceptable and valid based on economic theory. Because a least corrupted government and the regulatory system allow people and relevant stakeholders right to voice over irregularities that contribute to bringing out the maximum and efficient use of resources in the health sector (Yaqub, Ojapinwa, & Yussuff, 2012; Tiongson, Davoodi, & Gupta, 2000)

Table 8. Conditional and net effect of HEx on HDI

Indicator of QoG	Unconditional effect of HEx (φ_1)	Mean of each indicator	Conditional effect of HEx (φ_3)	Net effect of HEx on HDI with respect to the indicator of QoG
VnA	0.00881	−0.052	0.1600	0.00049
PsnAT	0.167	−0.133	0.1630	0.14532
GoE	0.02	−0.003	0.0384	0.01988
ReQ	0.0179	0.023	0.0600	0.01928
Rlaw	0.0342	−0.051	0.0564	0.03132
CoC	0.0299	−0.053	0.0549	0.02699
$(\partial HD_{st})/(\partial HEx_{st}) = \varphi_1 + \varphi_3 QoG_{st}$				

and lead several social benefits such as reducing child and infant MRs thereby has a positive effect on human development. Datta, Yadav, Singh, Datta, & Bansal (2020) also argued that higher accountability at regular intervals to the citizens motivates political parties to allocate more budgets and public resources to healthcare. Failure to implement such actions and access to healthcare services and improve the health status of the people may result in the ruling party being taken out of parliament in the upcoming election (Dianda, 2020). This study, therefore, established that the QoG could enhance the effectiveness of healthcare expenditure in promoting human development.

Altogether, the coefficients of the income level have the expected sign with the required level of significance in most cases. The findings are in connection with the existing theory because growth in the income level of a country is the main contributor that directly improves the capabilities of people and, accordingly, human development since it puts, in a nutshell, the economy's control over wealth and resources (Sen, 2000). The negative and significant effect of the MR supports our existing studies that show a lower level of infant mortality indicates more remarkable human development. In all cases, the impact of ICT on human development is positive, which is an expected finding. However, the insignificant coefficient of ICT might result from the heterogeneous level of development of different countries. We find the expected sign for the coefficient of access to energy when we consider a stable political situation and a low level of terrorism or violence. The coefficient is negative, significant and sometimes insignificant in other cases. The negative result is also validated by the findings of Brahmachari (2018), who concluded that access to energy does not necessarily lead to a higher HDI score because access to electricity by households alone may not guarantee or contribute to human development. Acheampong, Dzator, & Shahbaz (2021) conclude that access to electricity in human development varies across the regions. It enhances human development in the Caribbean-Latin America and sub-Saharan Africa but worsens human development in South Asia. We find mixed effects of emission on human development. The findings are also acceptable because the effect might vary across the country's heterogeneity. For example, in countries such as Portugal, Ireland and the Netherlands, Pîrlogea (2012) found that emissions have relatively little impact on human development, whereas, for countries like Romania, Bulgaria and Poland, the reduction of CO_2 emissions has a robust positive effect on human development.

5.2 Further analysis: healthcare expenditure, GGI and human development nexus

In this part of the analysis, we first employ FE and sys-GMM estimation techniques to investigate the impact of GGI (developed through PCA) on the effectiveness of healthcare expenses in improving the human development of 161 countries. Second, we split 161 countries into four groups based on their income classification. Finally, we divided them into six groups based on their geographical location to analyze whether the conditional effect of health expenditure varies across income levels and geographical locations.

Table 9 shows the empirical findings of the conditional impact of HEx on the HDI considering all 161 countries. In the FE estimation, we do not find any significant impact of healthcare expenditure and GGI on human welfare. In Column 2, the sys-GMM estimator of GGI shows a direct positive and statistically significant impact on human development outcomes, implying that with a one-unit increase in the GGI, the HDI will improve by 4.13 points. However, the impact of HEx remains positive but insignificant. In the next step, we incorporate the interaction variable of HEx and GGI and find the interaction estimate is significant at a 5% level with a positive sign. This finding ensures that a quality governance setting is an integral tool for the effectiveness of healthcare spending to enhance human development. The net positive effect of healthcare spending on HDI under the presence of GGI is 0.0134 ($-0.0943 + 0.498 \times 0.216$), where 0.498 is the mean value of nGGI. The results imply

Dependent variable: Human Development Index (HDI)			
	(1)	(2)	(3)
Variables	FE	Sys-GMM	Sys-GMM
HEx	0.0133	0.0407	−0.0943
	(0.0170)	(0.0564)	(0.0613)
GGI	0.483	4.136***	1.596**
	(0.434)	(1.209)	(0.747)
HEx × GGI			0.216**
			(0.0955)
Y	0.0449***	0.0376***	0.0385***
	(0.00358)	(0.00809)	(0.0108)
ICT	0.0813*	0.0875	0.0423
	(0.0455)	(0.0730)	(0.0363)
AtE	−0.00170	−0.0406	−0.0191*
	(0.00370)	(0.0257)	(0.0107)
Emission	−0.101	2.219**	1.489***
	(0.0920)	(1.091)	(0.361)
MR	−0.00202	−0.207	−0.0421**
	(0.00413)	(0.160)	(0.0198)
HDI ($t-1$)	0.924***	0.724***	0.919***
	(0.00956)	(0.190)	(0.0232)
Constant	4.250***	23.19	6.231***
	(0.811)	(17.66)	(2.351)
Observations	2,127	2,124	2,124
R-squared	0.971		
Country/Instruments	161	161/11	161/12
AB test for AR1		0.004	0.000
AB test for AR2		0.218	0.948
Sargan (Prob > χ^2)		0.185	0.139
Hansen (Prob > χ^2)		0.925	0.316

Note(s): Robust standard errors in parentheses of FE. Windmeijer (2005) corrected standard errors in parentheses of sys-GMM results. GMM-type instruments for orthogonal deviations is L(2/3). L.HDI collapsed for all equations. ***$p < 0.01$, **$p < 0.05$ and *$p < 0.1$

Table 9.
Health spending, GGI and HDI: FE and two-step system GMM estimation

that more healthcare budget and expenditure channeled to countries with good QoG is most expected to lead to an enhanced impact on human development improvement. Apart from the government, multinational corporations and national and foreign donors should allocate healthcare support to countries with improved governance settings.

In the previous part, we have investigated the conditional effect of governance on healthcare spending in improving HDI considering all 161 countries. However, it is necessary for the researchers and policymakers to understand whether the effect varies if we group these countries according to their income level by referring to the World Bank's classification and geographical location to support homogeneity in each panel.

Thus, the next part of the study includes panels: HIC, LIC, LMIC and UMIC group. Table 10 represents the empirical findings from two-step sys-GMM estimation of the four country groups. In the four panels, we find expected results for our control variables as we have found and discussed against the results for Table 7.

We cannot identify any significant impact of HEx on the HDI but only for a panel of 42 UMI countries which is negative and statistically significant at 10% level without interaction term and 5% level with the presence of interaction term between HEx and GGI. One of the possible reasons for this negative and significant effect is the increase in the aging group (65 and above) and the declining fertility rate in the upper-middle-income group more

Table 10. Conditional effect of HEx on HDI on different income group of countries

Dependent variable: Human Development Index (HDI)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	High income		Low income		Lower middle income		Upper middle income	
HEx	0.00491	−0.160	0.0351	0.126	0.0659	−0.246	−0.0955*	−0.463**
	(0.0110)	(0.0990)	(0.0487)	(0.0986)	(0.0509)	(0.197)	(0.0532)	(0.210)
GGI	0.902***	−0.856	1.984***	5.544**	−1.257	−4.887*	1.747*	−3.077
	(0.254)	(0.960)	(0.691)	(2.514)	(1.050)	(2.650)	(0.905)	(2.287)
HEx × GGI		0.207*		−0.556		0.788*		0.858**
		(0.120)		(0.360)		(0.460)		(0.414)
Y	0.0410***	0.0387***	0.0465***	0.0490***	0.0815***	0.0738***	0.0469***	0.0433***
	(0.00544)	(0.00569)	(0.00623)	(0.00542)	(0.0216)	(0.0214)	(0.00681)	(0.00640)
ICT	0.0388**	0.0284*	0.257*	0.236*	0.140***	0.126**	0.0267	0.0219
	(0.0177)	(0.0144)	(0.143)	(0.127)	(0.0519)	(0.0533)	(0.0549)	(0.0487)
AtE	−0.00615	−0.126	0.00954*	0.00685	−0.0130*	−0.0128*	−0.0236	−0.0134
	(0.110)	(0.161)	(0.00496)	(0.00744)	(0.00670)	(0.00649)	(0.0161)	(0.0170)
Emission	0.122	0.00340	0.875	0.573*	0.00943	0.116	0.852*	0.613
	(0.0780)	(0.132)	(0.578)	(0.320)	(0.298)	(0.376)	(0.490)	(0.483)
MR	−0.0301***	−0.0403***	0.0168	0.0361	−0.0448***	−0.0448***	−0.0673***	−0.0580**
	(0.0104)	(0.0115)	(0.0134)	(0.0211)	(0.0130)	(0.0158)	(0.0220)	(0.0238)
HDI ($t-1$)	0.946***	0.950***	0.882***	0.963***	0.894***	0.897***	0.915***	0.916***
	(0.0146)	(0.0115)	(0.0795)	(0.0964)	(0.0361)	(0.0406)	(0.0306)	(0.0290)
Constant	4.349	17.57	−0.662	−5.545	6.977***	8.403***	8.658***	9.781***
	(10.51)	(16.12)	(2.591)	(4.572)	(2.423)	(3.107)	(2.395)	(3.039)
Observations	651	651	273	273	646	646	552	551
Country/Instruments	49/13	49/24	21/13	21/20	49/21	49/22	42/21	42/23
AB test for AR1	0.000	0.000	0.008	0.009	0.000	0.000	0.000	0.000
AB test for AR2	0.241	0.249	0.964	0.927	0.194	0.139	0.196	0.135
Sargan (Prob > χ^2)	0.382	0.612	0.465	0.740	0.117	0.148	0.015	0.010
Hansen (Prob > χ^2)	0.469	0.727	0.861	0.796	0.365	0.577	0.326	0.205

Note(s): Windmeijer (2005) corrected standard errors in parentheses of two-step sys-GMM results. GMM-type instruments for orthogonal deviations is L(2/5). L.HDI collapsed for all equations. ***$p < 0.01$, **$p < 0.05$ and *$p < 0.1$

than that of any other income group. As per WDI data, compared to 2000, the aging group of people increased to almost 83.58% in 2020 for UMI countries, which requires additional and effective use of the healthcare budget. Out-of-pocket transactions for securing health services and governance issues are also questionable in this region. Thus, this direct impact of HEx on the HDI is significantly reduced. The inclusion of interaction of HEx with GGI generates a positive and significant impact of HEx on improving human development. The findings demand policy implication that governments of these countries should appropriately address the problems such as bribery for obtaining health services, corruption, bureaucracy and inefficiency in healthcare budget and resource utilization. The above policy recommendation is highly required for all country groups considered for the analysis.

In the case of an LIC group, we find that quality governance significantly affects human development, but HEx does not. Evidence found that from 2000 to 2015, domestic government investment as a percentage of current health expenditure fell from 30 to 22%, and prioritization of the health sector in public spending declined from 7.7 to 5.95% in LICs (WHO, 2018).

From 2015 to 2019, current health expenditure (% of GDP) declined to 4.87 from 5.62% in the LICs, which is one of the possible leading causes of the insignificant impact of health expenditure as well as the impact of the interaction term on the HDI. In addition, inefficiency in utilizing health expenditure is another problem of the LIC group. For example, a large share of health expenditure involves the operational cost of hospitals, and the procurement of drugs, equipment and supplies is hospital-based. As much as 40–60% of hospital expenditure is used for the procurement of drugs in LICs, whereas in the HIC group, it accounts for only 5–10%. A wide range of scams and bribery in hospitals related to drug procurement and contractors often provide substandard or expired products. In the case of adaptation of new technology for medical services, there are high chances of corruption in procurement due to the asymmetry of information (Hussmann, 2020).

6. Conclusion and policy recommendation

The theoretical and empirical investigation on the issue of the effect of healthcare expenditure on human development has been analyzed broadly in prior studies. However, less concentration has been given to exploring the impact of QoG on the effectiveness of health expenditure in improving human development and particularly employing a large panel of 161 countries for the years from 2005 to 2019. This study uses a two-step system-GMM estimation technique, endogeneity, heterogeneity and autocorrelation consistent approach, under a dynamic panel data regression setting. First, this study uses all six dimensions of governance of the WGIs to compare the impact of each dimension on the effectiveness of healthcare expenditure. Next, following the PCA procedure, this study exploits all six indicators to develop a new comprehensive index, the GGI, to check the combined impact of good governance dimensions on the efficiency of health spending. Later on, this study grouped all 161 countries based on their income level and geographical location (Table 11) to examine whether the impact of GGI on the performance of health expenditure in promoting human development varies across different levels of income and different geographical groups of countries. All the contributions mentioned above are new contributions to the development economics literature.

The study has several significant findings that are reviewed as follows: first, while the current study suggests that higher healthcare spending could help directly in improving the human development and help in achieving SDG 3, from our empirical analysis, we found that healthcare spending has no direct effect in promoting human welfare but only with the presence of stable political situation. It has appeared that there could be other causal factors that help in promoting welfare. Thus, an extensive attempt has been carried out to realize

Table 11. Conditional effect of health expenditure on human development on different group of countries by region

Dependent variable: Human Development Index												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Variables\ region	East Asia and Pacific (EAP)		Europe and central Asia (ECA)		Latin America and Caribbean (LAC)		Middle East and North Africa (MENA)		South Asia (SA)		Sub-Saharan Africa (SSA)	
HEx	−0.163*	−0.468**	−0.0240*	−0.208***	0.00414	−0.134	0.0370	−0.279	−0.0296*	−0.0396*	0.0652	0.364
	(0.0823)	(0.217)	(0.0126)	(0.0448)	(0.0225)	(0.0826)	(0.0515)	(0.185)	(0.0146)	(0.0173)	(0.0667)	(0.256)
GGI	6.881	1.491	1.920***	−0.358	2.264***	0.668	2.152	−0.485	0.112	0.107	2.372**	8.297*
	(4.176)	(1.691)	(0.364)	(0.555)	(0.698)	(0.922)	(1.569)	(1.342)	(0.246)	(0.791)	(0.924)	(4.155)
HEx × GGI		0.592**		0.295***		0.208*		0.593*		0.0650		−1.358*
		(0.280)		(0.0721)		(0.108)		(0.322)		(0.0540)		(0.765)
Y	0.00635	0.0171	0.0454***	0.0461***	0.0498***	0.0460***	0.0235**	0.0360***	0.0416**	0.0427***	0.0322**	0.0528***
	(0.0246)	(0.0160)	(0.00328)	(0.00300)	(0.00718)	(0.00822)	(0.00985)	(0.0103)	(0.0123)	(0.00894)	(0.0134)	(0.0188)
ICT	0.270*	0.161*	0.0795***	0.0394*	0.0788**	0.0698**	0.109	0.187*	−0.0260	−0.0111	0.0495	−0.0637
	(0.140)	(0.0914)	(0.0263)	(0.0230)	(0.0305)	(0.0310)	(0.0961)	(0.105)	(0.0168)	(0.0465)	(0.0609)	(0.221)
AtE	−0.0464***	−0.0279***	0.0237	0.000550	0.0265**	0.0294**	0.00120	−0.0226	−0.00419	−0.00309	−0.0133	−0.0510
	(0.0130)	(0.00638)	(0.0463)	(0.0295)	(0.0106)	(0.0107)	(0.0107)	(0.0202)	(0.00753)	(0.00412)	(0.00955)	(0.0334)
Emission	0.527*	0.496	−0.0648	−0.100*	0.197	0.159	0.736***	1.016***	0.235	−0.00112	−0.208	−0.465
	(0.296)	(0.583)	(0.0549)	(0.0509)	(0.154)	(0.168)	(0.196)	(0.229)	(0.289)	(0.519)	(0.719)	(1.193)
MR	−0.0632	−0.0616	−0.0294***	−0.0474***	−2.85e-05	−0.00520	−0.0323	−0.108	−0.0182	−0.0132	0.0241	0.138**
	(0.0473)	(0.0381)	(0.0105)	(0.00993)	(0.00508)	(0.00672)	(0.0994)	(0.0959)	(0.0156)	(0.0117)	(0.0181)	(0.0559)
HDI ($t-1$)	0.859***	0.872***	0.914***	0.899***	0.918***	0.912***	0.934***	0.865***	0.956***	0.960***	1.016***	1.344***
	(0.0980)	(0.0490)	(0.0172)	(0.0181)	(0.0308)	(0.0308)	(0.129)	(0.103)	(0.0250)	(0.0238)	(0.0499)	(0.140)
Constant	8.254	10.10**	2.964	8.708**	1.306	2.699**	2.169	10.73	4.489*	3.781	−2.953	−23.50**
	(4.962)	(4.766)	(4.831)	(3.496)	(0.854)	(1.242)	(10.000)	(9.866)	(2.078)	(2.033)	(3.219)	(9.755)
Observations	297	295	608	608	359	359	225	225	111	111	526	524
Country/Instruments	23/11	23/18	46/12	46/13	27/12	27/13	17/12	17/13	8/12	8/12	40/15	40/12
AB test for AR1	0.005	0.006	0.000	0.000	0.001	0.001	0.007	0.006	0.008	0.011	0.000	0.005
AB test for AR2	0.191	0.106	0.217	0.178	0.737	0.642	0.472	0.544	0.412	0.308	0.879	0.461
Sargan (Prob > χ^2)	0.736	0.311	0.288	0.623	0.611	0.638	0.106	0.141	0.047	0.075	0.000	0.583
Hansen (Prob > χ^2)	0.848	0.539	0.340	0.656	0.440	0.464	0.224	0.416	1.000	1.000	0.145	0.382

Note(s): Windmeijer (2005) corrected standard errors in parentheses of two-step Sys-GMM results. GMM-type instruments for orthogonal deviations is L(2/4). L.HDI collapsed for all equations. ***$p < 0.01$, **$p < 0.05$ and *$p < 0.1$

whether other elements of good governance, such as VnA, GoE, ReQ, RoL and CoC, could influence such effectiveness in human welfare across the 161 countries. We found that the positive effect of healthcare expenditure is conditional to the QoG, where PSnAT ensure the highest positive and significant impact in determining the effect of HEx on the HDI.

We further extend our study by preparing a single index of good governance using all six governance components through PCA and found similar findings. However, it suggests that if we can ensure all six governance features in the country, the net positive and significant effect of good governance would increase radically. We later divided 161 countries into five groups according to income and six groups based on their geographical location. We do not find any significant, both direct and conditional, effects of health expenditure on human development in low-income group countries. The direct effect of health spending on countries in East Asia and Pacific, Europe and Central Asia, and South Asia is found to be negative and statistically significant. However, when we interact expenditure with the GGI, the effect becomes positive and significant (except for South Asia), which entails that good governance matters for the effectiveness of health expenditure. The negative and significant effects of expenditure and insignificant effects of the interaction with governance in South Asia is that most South Asian countries face challenges in controlling corruption and failing to ensure basic medical facilities for ordinary people and other human rights. For example, in the Corruption Perception Index (CPI), all Asian countries have scored below the global average of 43, except Bhutan. South Asian Association for Regional Cooperation (SAARC) countries like Bangladesh, India, Nepal, Pakistan and Sri Lanka have poor healthcare and governance structures. They mostly require bribes to get quality medical services, admission to the government hospitals, obtain a bed and get subsidized medicine and treatment (Thampi, 2002). Moreover, overpopulation, poor lifestyle and outdated equipment, and poorly maintained public hospitals would be the leading causes of the effectiveness of health expenditure to enhance HDI (Hassan, Zaman, Zaman, & Shabir, 2014). Proper government strategies, quality infrastructure, reform and quality governance are highly required to make health spending effective in the short and long run. The interaction effect of health expenditure and governance is also positive and significant for Latin America and Caribbean (LAC) and the Middle East and North Africa (MENA) region. We found a positive and insignificant effect on the HDI for the Sub-Saharan African (SSA) region. However, the interaction effect is negative and statistically significant mainly because, in this region, most of the countries lack the infrastructure to deliver quality healthcare and face a severe scarcity of medical facilities and trained medical personnel. Since the index of good governance is prepared using its six dimensions of governance, it is required to analyze which individual dimension of governance is most significant in improving human development. Such a study could assist policymakers in prioritizing and emphasizing the dimension, especially for country or regional or income group-level analysis, instead of the single index. We left this issue for future analysis.

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