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State Capacity and Health Outcomes: An Empirical Analysis

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Abstract

The purpose of this study is to analytically explore and empirically test the relationship of state capacity with health outcomes using cross sectional and panel datasets of 156 countries from 1970 to 2015. This study uses three dimensions of state capacity namely amount, ability and position. The empirical analysis is conducted using OLS, 2SLS, Fixed Effects, Random Effects and System GMM. Overall results suggest that the role of state capacity is essential in boosting life expectancy and lowering infant mortality. Moreover, the results show that state capacity in terms of 'ability' has the largest impact on health outcomes while in terms of 'position' its effect is limited. Findings of the study are robust to different specifications, to alternative econometric techniques, and to regional controls. This research paper contributes the literature on health performance differences across countries by highlighting the heterogeneity of state capacity dimensions in shaping the links of state capacity with health outcomes. To the best of our knowledge, it is first study of its kind that provides an empirical analysis of life expectancy with state capacity. Moreover, this study uses Principal Components Analysis of different measures of state capacity and confirms the essential role of state capacity in improving health outcomes. The main implication of this research is that building state capacity is an essential prerequisite to achieve high health outcomes.

Keywords: state capacity, life expectancy, infant mortality, health performance, bureaucratic quality, health expenditure.

1. Introduction

Health is the main ingredient of human capital and well-being. Good health increases the efficiency both at individual and country level. According to the World Bank (1993), better-quality health contributes to economic growth by increasing worker's productivity, school enrolment of children, learning ability and substitute usage of resources. During last fifty years, the world has witnessed improved health outcomes in terms of high life expectancy and low infant mortality. Life expectancy has been improved from 54 years in 1960 to 71 years in 2015. Similarly, infant mortality rate was 102 per thousand live births in 1960, and now this figure has reduced to 24 in 2015. Nevertheless, many countries of

the world are still lagging behind in attaining better health outcomes. A simple descriptive analysis of the data reveals that health indicators vary substantially across countries. For instance, minimum average score of life expectancy is 39.54 and maximum is 81.49. Similarly, minimum average score of infant mortality is 3.89 and maximum is 147.86. These large variations across countries pose a serious challenge for the domestic governments because reducing health variations largely depends on the effective role of state.

The role of state largely depends on how the relationship between government and citizens is described in a society. Social contract theory believes that state is an implicit agreement between government and its members and the government has authority to describe and regulate the rights and duties. In contrast, the Marxist theory has viewed the origin of state from a materialistic viewpoint which highlights the influence of material conditions termed as economic conditions. As there was no state in old communist but the structure of private property operated as an imminent foundation of the rise of state. The owners of private property felt the need of a super power which may provide them well protection. In twentieth century, salient works of Skocpol (1979), Evans *et al*. (1985) and others highlight the importance of state in achieving different policy goals. Recently, the studies of Cingolani *et al*. (2015) and Hanson (2015) also highlight the importance of state capacity to accomplish certain economic and social goals.

The concept of state capacity is multidimensional, different scholars explain this concept according to their own research framework (Singer *et al*., 1972; Evans *et al*., 1985; Hanson & Sigman, 2013 and others). Many studies, in the disciplines of political and sociological sciences, measure the concept of state capacity in terms of bureaucratic quality (Huntington, 1968; Skocpol, 1979; Evans *et al*., 1985; Rauch & Evans, 2000; Soifer, 2008; Soifer & Vam hau, 2008), state's coercive capacity (Fearon & Laitin, 2003; DeRouen & Sobek, 2004; Sobek, 2010; Braithwaite, 2010), legal capacity (Lin & Nugent, 1995; Collier, 2009; Besley & Persson, 2009), fiscal capacity (Dincecco & Katz, 2012; Besley & Persson, 2011), infrastructure power (Mann, 1984; Besley & Persson, 2011; Hanson and Sigman, 2013) and good governance (World Bank, 1993; Hendrix, 2010).

Researchers face challenge in defining this concept (Soifer, 2008) as it varies across different policy sectors (Krasner *et al*., 1978). This paper designs the concept of state capacity in three terms. (1) Amount: How much a state produces/collects something for its survival that is extracting government revenue for economic performance (Evans & Rauch, 1999; Dincecco & Katz, 2012; Hamm *et al*., 2012). (2) Ability: It refers to the ability of a state to do something particular for its survival that is maintenance of law & order, control of corruption and protection of property rights (Lin & Nugent, 1995). (3) Position: It refers to a particular position that is bureaucratic quality which indicates implementation power (Geddes, 1996; Dahlstrom *et al*.,

2010).

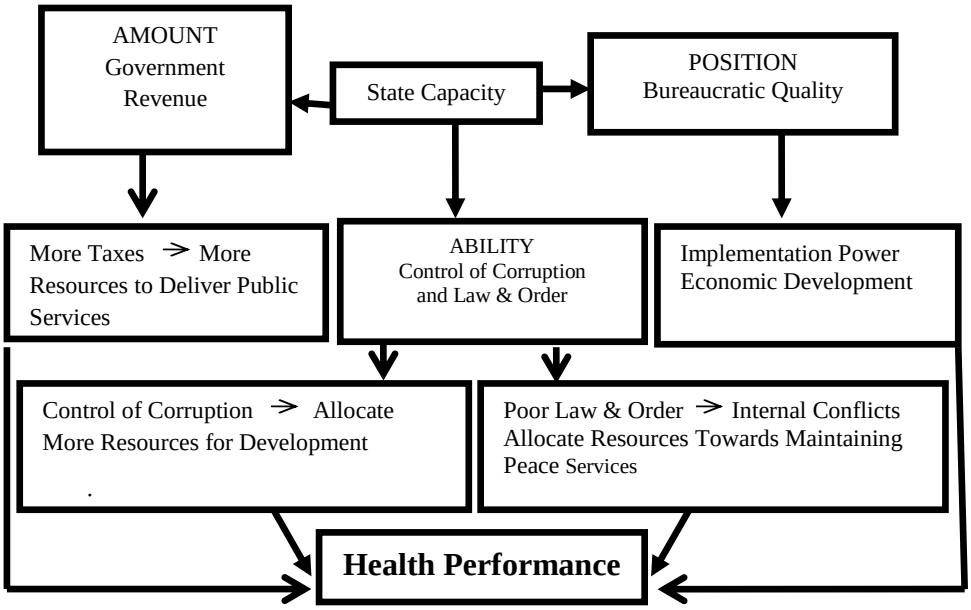

Figure 1: Linkages of State Capacity with Health Performance

A huge strand of the literature links health with income (Filmer & Pritchett, 1999; Wang, 2003; Shaw *et al*., 2005; Kabir, 2008; Rajkumar & Swaroop, 2008), health expenditures (Collins & Klein, 1980; Wang, 2003; Dehn *et al*., 2003; Bokhari *et al*., 2007; Novignon *et al*., 2012), inequality (Asafu-Adjaye, 2004; Babones, 2008) and military expenditures (Mintz, 1989; Yildirim & Sezgin, 2002). Similarly, voluminous political research has linked state capacity with civil war (Braithwaite, 2010; Thies, 2010; Gleditsch and Ruggeri, 2010; De Soysa and Fjelde, 2010) and regime type (Nelson, 2007; Knutsen, 2013; Hanson, 2015). However, a few studies have given importance to development related issues (Rajkumar & Swaroop, 2008; Englehart, 2009; Cingolani *et al*., 2015). In particular, the role and importance of state capacity in explaining cross county variations of health outcomes is limited.

The present study attempts to explain the concept of state capacity and analyzes its impact on health performance in terms of life expectancy and infant mortality. We believe that this is the first work of its kind that encompasses the impact of state capacity on life expectancy and infant mortality. This study addresses the following questions: Does state capacity improve health outcomes? Does the impact of state capacity on health outcomes vary depending upon the different measures of state capacity?

Since increasing disease burden across countries has become a global challenge, it is important to identify the ways to overcome it globally. The present study identifies improving state capacity as one of the major way forward to improve health outcomes and to alleviate global disease burden. Since state capacity has diverse dimensions, it is important to explore the relative importance of these dimensions to improve health indicators. The central implication of this study is that state capacity helps to improve

health outcomes. In particular state capacity in terms of 'ability' has the largest impact on health outcomes while in terms of 'position' its effect is limited.

This paper is organized as follows: Section 2 consists of literature review. Section 3 focuses on methodology. Section 4 explains data and variable description. Section 5 consists of empirical results and Section 6 presents conclusion.

2. Literature Review

State capacity has appeared as an advocated promoter for achieving desirable social and economic outcomes (Hanson, 2015, Cingolani et al., 2015). A vast strand of the political sociological literature stresses the position of bureaucracy for state capacity. Huntington (1968), Weber (1978) and Skocpol (1985) take state capacity as low corruption and high law & order situation, which have caught substantial importance in economic development literature. Corruption badly affects growth and development by worsening investment (Tanzi, 1998). Using cross-country data from 1982-1994, Li et al. (2000) conclude that corruption badly affects social spending such as spending on education and health.

Hanson and Sigman (2013) conduct research to measure state capacity for comparative political research by employing 24 different indicators linked to the three core dimensions (extractive capacity, coercive capacity and administrative capacity) of state capacity. They consider tax revenue, main element which describes state capacity. Similarly, Besley and Persson (2011) define state capacity in terms of extracting tax that assists the state to perform in a better way.

A huge chunk of state capacity literature has focused the impact on civil war. Ross (1973) and Arrow (1985) argue that asymmetric information and contradictory incentives cause agents not to follow government. Besley and Persson (2008) find that internal war creates conflicting interest among groups which cause smaller investment in fiscal capacity whereas external war creates mutual interest among groups in society which cause larger investment in fiscal capacity and lead to growth of state capacity. Thies (2010) conclude that civil war onset has negative impact on state capacity while state capacity has no impact on civil war onset by using Fearon & Laitin's data containing 157 countries for 1960-99. Primary commodities directly affect state capacity and indirectly affect civil war onset.

High participation of government in term of democracy leads to high accountability which boosts state capacity (Back & Hodenius, 2008; Taylor, 2011). Therefore, literature also focuses comparative analysis between state capacity and regime type. Resources allocation level, distributional manner and its effective use indicate the impact of public services on development outcomes, provided by rulers and state. For this, role of democracy (by increasing incentives to improve allocation level) and state capacity (improve distributional manners) can either be complement or substitute by working independently. For that reason, Hanson (2015) finds out which combination between democracy and state capacity is important for social development goals. Resources should be directed where public services improve human outcomes, although spending is greater on public services in democracies yet these spending on rent seeking rather than loyalty-building measures. Concluding remarks are that high sate capacity improves development indicators more than democracy.

A handful literature covers development side in prism of State Capacity. Englehart (2009) discusses role of state is twofold in light of Principal Agent Theory. Normatively, state should protect human rights but empirically, states not able to do it. Law & order, corruption and tax/GDP are used to measure state capacity by employing time-series cross-section analysis that covers 140 countries. Conclusion of study is that weak states indicators: corruption, low tax revenue and worse law and order conditions responsible for human rights abuses as compared to strong state capacity. State capacity is important for achieving social and economic goals. Cingolani *et al*. (2015) estimate the state capacity on two MDGs: child mortality and tuberculosis prevalence by using panel data from 1990-2010. Random and fixed effects indicate that high state capacity reduces child mortality and TB prevalence and can improve basic welfare level.

Although vast literature consists on state capacity and explore its impact with economic growth (Evans & Rauch, 1999; Dincecco & Katz, 2012), security (Sobek, 2010; Braithwaite, 2010; DeRouen *et al*. 2010) but a very few work is done on development (Cingolani et al., 2015). This study extends the existing literature in a number of ways: First, we categorize the concept of state capacity in term of amount: tax revenue, ability: control of corruption and law & order and position: bureaucratic quality. Mostly Previous studies take only one or two dimensions to measure state capacity. Second, this study used a large dataset covering 156 countries from 1970-2015. Third, instruments (internal and external) are used to deal with endogeneity. Finally, this study has extended investigation to check whether results are sensitive to other determinants of health.

3. Methodology

Grossman (1972) explains Health Production Function of a country which specifies input output relation. Health is output which depends on many input variables.

$$Health = f(input\ variables) \ldots\ldots\ldots\ldots (i)$$

Here, output considers health indicators which are mostly measured through life expectancy and infant mortality (Li *et al*., 2017). Input variables consist of economic factors such as income and health expenditures and social factors such as improved water and immunization. Authenticity of providing all services to its citizens is core function of state, therefore strong state capacity specifies how health services can be delivered in an efficient way. Relationship between state capacity and health performance can be written in the form of panel as follows.

$$Health_{it} = \beta_{it} + \beta_1 State\ Capacity_{it} + \beta_2 X_{it} + u_{it} \ldots\ldots\ldots\ldots (ii)$$

Here,

X_{it}= vector of the determinants of life expectancy and infant mortality which includes improved water (iw), immunization (imm), health expenditures (hex), urbanization (upg), and economic growth (eg).

This paper considers life expectancy and infant mortality to gauge the perception of individual health. Principal Component Analysis (PCA) is used to measure overall state capacity (sc). Similarly, PCA of control of corruption and law and order is taken to measure the state capacity in terms of 'amount'. The dimensions of state capacity and control variables have been added into equation (ii) for life expectancy as follows:

$$le_{it} = \alpha_0 + \alpha_1 sc_{it} + \alpha_2 iw_{it} + \alpha_3 imm_{it} + \alpha_4 upg_{it} + \alpha_5 hex_{it} + \alpha_6 eg_{it} + u_{it} \ldots (1)$$

$$le_{it} = \alpha_0 + \alpha_1 amount_{it} + \alpha_2 iw_{it} + \alpha_3 imm_{it} + \alpha_4 upg_{it} + \alpha_5 hex_{it} + \alpha_6 eg_{it} + u_{it} \quad (1.1)$$

$$le_{it} = \alpha_0 + \alpha_1 ability_{it} + \alpha_2 iw_{it} + \alpha_3 imm_{it} + \alpha_4 upg_{it} + \alpha_5 hex_{it} + \alpha_6 eg_{it} + u_{it} \quad (1.2)$$

$$le_{it} = \alpha_0 + \alpha_1 position_{it} + \alpha_2 iw_{it} + \alpha_3 imm_{it} + \alpha_4 upg_{it} + \alpha_5 hex_{it} + \alpha_6 eg_{it} + u_{it} \quad (1.3)$$

Similarly, for infant mortality, equations used are:

$$lnIm_{it} = \beta_0 + \beta_1 sc_{it} + \beta_2 iw_{it} + \beta_3 imm_{it} + \beta_4 upg_{it} + \beta_5 hex_{it} + \beta_6 eg_{it} + u_{it} \quad (2)$$

$$lnIm_{it} = \beta_0 + \beta_1 amount_{it} + \beta_2 iw_{it} + \beta_3 imm_{it} + \beta_4 upg_{it} + \beta_5 hex_{it} + \beta_6 eg_{it} + u_{it} \quad (2.1)$$

$$lnIm_{it} = \beta_0 + \beta_1 ability_{it} + \beta_2 iw_{it} + \beta_3 imm_{it} + \beta_4 upg_{it} + \beta_5 hex_{it} + \beta_6 eg_{it} + u_{it} \quad (2.2)$$

$$lnIm_{it} = \beta_0 + \beta_1 position_{it} + \beta_2 iw_{it} + \beta_3 imm_{it} + \beta_4 upg_{it} + \beta_5 hex_{it} + \beta_6 eg_{it} + u_{it} \quad (2.3)$$

α_0 and β_0= intercepts, α_1 and β_1= change in life expectancy and infant mortality with respect to state capacity, α_2 and β_2, α_3 and β_3 , α_4 and β_4 and α_5 and β_5 = change in life expectancy and infant mortality with respect to improved water, immunization, urbanization and health expenditures, respectively. α_6 and β_6 = change in life expectancy and infant mortality with respect to economic growth, t= Time period 1970-1974… 2010-2014, i = Countries 1, 2……. 156 and ϵ_{it}= error terms with standard classical properties.

In this study, Principal Component Analysis, a variable reduction technique, is used to reduce redundancy in variables (variables are correlated with one another) as they are gauging the identical construct. Cross sectional analysis is used to trace the behavior of economic variables at a given point in time. Whereas panel data provides both time and space dimensions. To deal with the potential problem of endogeneity, we have used Two Stage Least Squares in cross-sectional data and System GMM in panel data.

4. Data

Though many variables can be used to measure health performance yet the most appropriate variables are life expectancy and infant mortality especially for cross country analysis (Saunders, 1996; Babones, 2008). Life expectancy and infant mortality are used as dependent variables and state capacity is taken as independent variable. Four dimensions are used to measure state capacity. Tax revenue is the measure of amount, control of corruption and law & order are measures of ability while position is measured by bureaucratic quality. Table 1 presents data description of all variables.

Table 1: State Capacity and Health Outcomes: Data Description & Sources

Variable	Definition / Description	Source and Observation
Dependent Variables (Health Outcomes)		
Life Expectancy	Life expectancy at birth, total (years)	WDI, 207 (1970-2015)
Infant Mortality	Mortality rate, infant (per 1,000 live births)	WDI, 192 (1970-2015)
Independent Focused Variables (State Capacity)		
Tax revenue	Tax revenue (% of GDP)	WDI, 162 (1970-2015)
Control of corruption	The level of corruption within the political and legal system	ICRG, 139 (1984-2012)
Law and order	It is constructed using two measures - law and order. "Law" is defined as the strength of the legal system and "order" is the execution of the law.	ICRG, 139 (1984-2012)
Bureaucratic Quality	It is a measurement of the degree of autonomy and strength of the bureaucracy from the political pressure to "govern without drastic changes in policy or interruptions in government services".	ICRG, 139 (1984-2012)
Control Variables		
Safe water	Improved water source (% of population with access)	WDI, 201 (1970-2015)
Immunization	Immunization, DPT (% of children ages 12-23 months)	WDI, 191 (1970-2015)
Urbanization	Urban population growth (annual %)	WDI, 212 (1970-2015)
Health expenditure	Health expenditure, total (% of GDP)	WDI, 188 (1970-2015)
GDP per capita	GDP per capita (constant 2005 US$)	WDI, 199 (1970-2015)
GDP growth	Annual GDP growth in percentage	WDI, 205 (1970-2015)

This study takes the following control variables. Demographic and infrastructural determinants: urbanization (upg), improved water (iw) and immunization (imm). Urbanization has two fold phenomena where the first fold has positive impact by providing easy access to employment, health care and education (Gupta *et al*., 2002; Godfrey & Julien 2005) while the second fold has negative impact because of over crowdedness that causes social deprivation (Rogers & Wofford, 1989). Access to

improved and clean water has constructive impact on health (see, Cingolani *et al.*, 2015). Effective immunization programs can be cornerstone against reducing a cluster of diseases. High rate of immunization leads to lower infant mortality and higher life expectancy (Gupta *et al*., 2002; Cingolani *et al*., 2015). Policy determinant related government expenses: Public health expenditures ensure better facilities which have positive impact on health performance (Filmer & Pritchett, 1999; Gupta *et al*., 2002; Bokhari *et al*., 2007; Novignon *et al*., 2012). Economic and institutional determining factors: Economic growth measure through GDP per capita and GDP growth, as money has a psychosomatic impact on health (Wilkinson & Pickett, 2006). Income fulfills nutrition intakes and access towards basic health facilities (Filmer & Pritchett, 1999; Wang, 2003; Shaw *et al*., 2005; Kabir, 2008; Rajkumar & Swaroop, 2008; Hanson, 2015; Cingolani *et al*., 2015). Babones (2008) suggests ecological relationship between income and life expectancy: national income has comparatively more impact on life expectancy than individual income.

This study attempts to use instruments of all dimensions of state capacity. Religion history, ethno-linguistic fractionalization, legal origin and colonial history are used as instruments for bureaucratic quality, control of corruption and law and order, following La Porta *et al*. (1999). Dummies used for religion: Muslim, catholic, protestant and other religions have strong influence on state capacity. According to La Porta *et al*. (1999), Catholic and Muslim show less efficient government performance, highly interventionist and more corrupt countries as compared to protestant. More interventionist countries have less efficient institutions. Second important instrument is ethno-linguistic fractionalization which indicates the redistribution tendency of a state (Mauro, 1995). When such group comes into power, try to benefit them and deter their opposition.

Similarly, La Porta *et al*. (1999) suggest that law and order, tax revenue, corruption and bureaucratic quality are affected by English, Socialist, French and German legal origins. Socialist countries have low level of bureaucracy with high level of intervention than English, French and German legal origin countries. Even though Scandinavian countries are more interventionist yet they have efficient government. Colonial history has strong impact on bureaucratic quality, corruption and law and order (Barro, 1996; Treisman, 1997). British colonies have better bureaucratic quality, limited government, and high political freedom as compared to French colonies (Brewer, 1990).

This paper takes data from WDI (2015) for health indicators and tax revenue while, for law and order, corruption and bureaucratic quality data is extracted from ICRG (2012). Five years interval data is used because health indicators do not respond quickly to organizational changes. Health outcomes change in over years rather than yearly.

4.1 Data Analysis

Table 2 indicates the summary statistic of data. Much variation is observed in life expectancy among countries. San Marino has the highest prevalence and Sierra Leone has the lowest prevalence comparative to other countries. Similarly, Sierra Leone, has maximum infant mortality rate while, Croatia has comparatively minimum infant mortality rate. Moreover, mostly developed countries have maximum Bureaucratic quality, control of corruption and law & order as compared to developing countries.

Table 2: State Capacity and Health Performance: Summary Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Dependent Variables				
Life Expectancy	65.40	9.86	39.54	81.49
Infant Mortality	47.99	36.64	3.89	147.86
Independent Variables				
Tax Revenue	16.35	8.02	0.02	53.58
Control of Corruption	2.96	1.13	.64	5.99
Law And Order	3.68	1.26	.99	6
Bureaucratic Quality	2.12	1.06	0	4
Safe Water	84.09	17.65	25.79	100
Control Variables				
Immunization	78.34	16.77	23.87	99
Urbanization	2.74	1.80	-0.10	8.56
Health Expenditure	6.19	2.42	1.90	18.05
GDP Per Capita	9913.60	15475.65	167.08	106172.8
GDP Growth	3.82	2.06	-1.20	16.31

Malaysia, Somalia, Chad, Latvia, United Arab Emirates have minimum urban population, improved water, immunization, urban population growth and GDP growth respectively whereas Singapore, Andorra, Hungary, United Arab Emirates and Equatorial Guinea have minimum urban population, improved water, immunization, urban population growth and GDP growth respectively.

Table 3: Correlation Matrix between Health, State Capacity and Control Variables

	1	2	3	4	5	6	7	8	9
1. Life Expectancy	1								
2. Infant Mortality	-0.9533	1							
3. State Capacity	0.5042	-0.4661	1						
4. Improved Water	0.8567	-0.8527	0.4264	1					
5 .Immunization	0.7534	-0.7843	0.3501	0.7677	1				
6. Health Expenditures	0.3314	-0.3099	0.3574	0.2985	0.3111	1			
7. Urbanization	-0.6674	0.67	-0.2397	-0.563	-0.5488	-0.4171	1		
8. GDP Per Capita	0.5918	-0.5621	0.6717	0.5079	0.41	0.3593	-0.2525	1	
9. GDP Growth	-0.1269	0.1242	-0.1461	-0.1071	-0.1068	-0.1129	0.0192	-0.1734	1

Table 3 indicates the correlation analysis. According to observations, bureaucratic quality, tax revenue, control of corruption and law & order, improved water, immunization, health expenditures and GDP per capita have positive correlation with life expectancy while negative correlation with infant mortality.

Graphical analysis labels the relationship between different dimensions of state capacity and health performance. Figure 2 indicates that there is positive relationship between state capacity and life expectancy (Durden, 1990; Shughart *et al*., 2003; Savedoff & Hussmann, 2006;

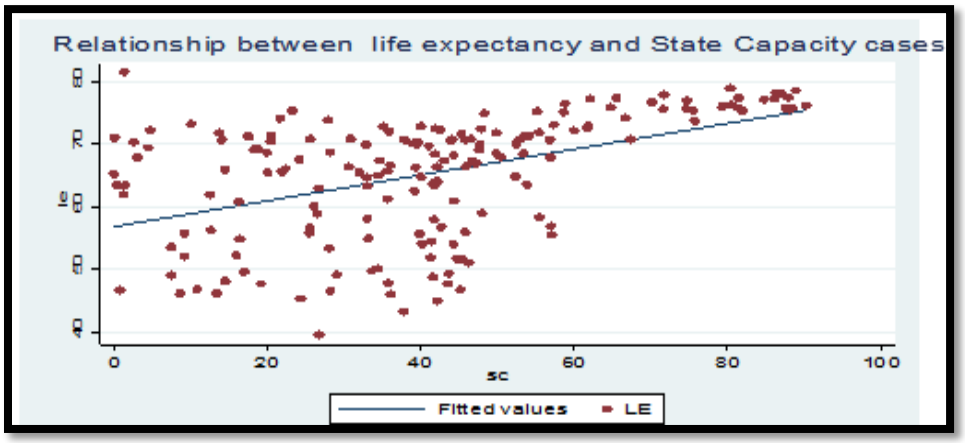

Figure 2: Graphical Analysis between State Capacity and Life Expectancy

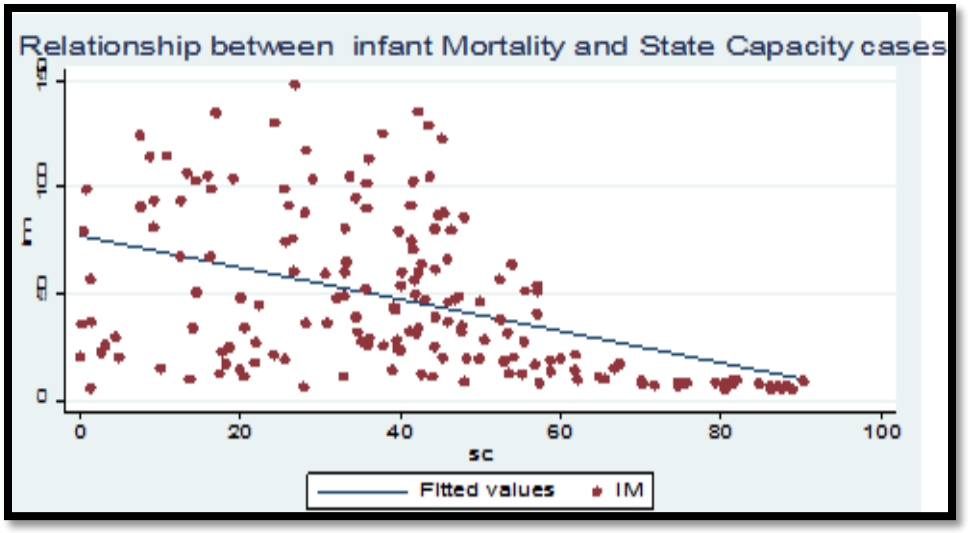

Figure 3: Graphical Analysis between State Capacity and Infant Mortality

Nadpara & Samanta, 2015). Whereas, Figure 3 indicates that there is negative relationship between state capacity and infant mortality (Cingolani *et al.*, 2015).

5. Empirical Results

Before proceeding towards estimations, we provide some diagnostic tests. The results of Link test, VIF test and Breusch-Pagan test indicate that model is correctly specified, there are no traces of multicollinearity and heteroscedasticity. Table 5 reports results using life expectancy as health proxy. Columns (1-4) of Table 5 present the empirical results obtained using Ordinary Least Squares (OLS) while columns (5-8) show results using Two Stage Least Squares (2SLS). Column 1 shows that state capacity has positive impact on life expectancy. Its coefficient indicates that a person on average lives two years more in countries where state capacity is strong. This finding is consistent with the argument that strong state capacity plays a vital role in providing health services (Gupta *et al*., 2002).

Column 3 reports the results of state 'ability' comprising the indicators of control of corruption and law and order. The coefficients of both indicators are positive and significant implying that state capacity in terms of 'ability' provides a situation where a person on average can live two more years. This finding is consistent with the studies of Savedoff & Hussmann (2006) and Nadpara & Samanta (2015). Corruption negatively affects the construction of social spending at the cost of the poor to subsidies the rich. Law and order that is rational use of force (Weber, 1978) provides peaceful and tension free environment to state's citizens. Similarly, law and order is helpful in enforcing policies in efficient way (Soifer, 2008). In the presence of weak law and order situation societies are unable to function efficiently. Consequently, crime rate raises creating fear about better future which engenders population health status. Similarly, 'position' has positive impact on life expectancy because strong bureaucracy embraces of experts

equipped with efficient policies which lead to better health performance. (Durden, 1990; Evans and Rauch, 1999; Rauch and Evans, 2000; Shughart *et al*., 2003; Hanson, 2015).

Improved water has positive and significant effect on life expectancy. Similarly, positive relationship exists between life expectancy and immunization that is as vaccinations increase, risk associated with infectious diseases reduces and life expectancy improves (Leipziger *et al*., 2003; Mondal et al., 2009). There exists a negative relationship between urban population growth and life expectancy. Such relationship is consistent with the argument that over crowdedness causes social deprivation (see, for details, Rogers & Wofford, 1989). Social deprivation negatively affects health status of an individual. Estimated coefficients of health expenditures are negatively associated with life expectancy which may be the result of inefficient health expenditures, conditioned on quality of efficient way of delivery (Lewis, 2006; Lin *et al*., 2014; Makuta & O'Hare 2015). In short state capacity has positive impact on life expectancy. All control variables have significant positive impact on life expectancy except economic growth and urban population growth. In our model, problem of endogeneity is likely to arise due to simultaneous linkages between the dimensions of state capacity and health and there could be the problem of omitted variables bias as well.

Table 4: Cross Sectional Results for Life Expectancy

Dependent Variable: Life Expectancy								
	OLS Results				2SLS Results			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
State capacity	1.813***				1.139*			
	(0.509)				(0.599)			
Amount		-0.00579				0.0115		
		(0.0488)				(0.0523)		
Ability			1.775***				2.472**	
			(0.542)				(0.998)	
Position				1.484***				0.971*
				(0.490)				(0.585)
Improved water	0.306***	0.332***	0.337***	0.311***	0.317***	0.330***	0.321***	0.317***
	(0.0393)	(0.0359)	(0.0367)	(0.0393)	(0.0403)	(0.0352)	(0.0378)	(0.0405)
Immunization	0.0980**	0.0933**	0.0582	0.0995**	0.0974**	0.0931**	0.0363	0.100**
	(0.0396)	(0.0387)	(0.0410)	(0.0386)	(0.0392)	(0.0379)	(0.0468)	(0.0394)
Urbanization	-0.962***	-1.274***	-1.122***	-1.037***	-1.104***	-1.281***	-1.263***	-1.101***
	(0.277)	(0.249)	(0.278)	(0.279)	(0.295)	(0.246)	(0.293)	(0.294)
Health expenditures	-0.193	-0.00332	-0.279	-0.214	-0.108	-0.0264	-0.354	-0.108
	(0.201)	(0.184)	(0.208)	(0.204)	(0.201)	(0.181)	(0.231)	(0.201)
GDP growth	-0.244	-0.198	-0.377*	-0.277	-0.200	-0.192	-0.334	-0.201
	(0.207)	(0.168)	(0.209)	(0.210)	(0.213)	(0.164)	(0.216)	(0.213)
Constant	36.85***	34.14***	38.77***	33.53***	35.65***	34.21***	42.46***	33.22***
	(3.740)	(3.178)	(4.058)	(3.482)	(3.873)	(3.122)	(5.315)	(3.479)
Observations	120	151	130	130	117	148	128	117
R-squared	0.838	0.803	0.824	0.822	0.835	0.806	0.823	0.834
Link test	0.614	**Estat Endogenous**		Durbin	(p = 0.0245)	(p = 0.0570)	(p = 0.4205)	(p = 0.0242)
VIF	2.11			Hausman	(p = 0.0285)	(p = 0.0630)	(p = 0.4357)	(p = 0.0282)
Hetero	0.0014	**Estat Overid**		Sagan	(p = 0.0586)	(p = 0.0876)	(p = 0.0539)	(p = 0.1179)
Normality	0.149			Basmann	(p = 0.0617)	(p = 0.0939)	(p = 0.0576)	(p = 0.1297)

Note: Robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1

To address the potential problem of endogeneity, this study uses 2SLS and System GMM by incorporating lag of dependent variable on the right side of estimated equations and external instruments: legal origin, colonial legacy, religion dummy and ethno-linguistic

fractionalization index. Legal origin such as English, Socialist, French and German legal origin also has impact on the quality of institutions. Socialist countries have low level of bureaucracy, highly interventionist than English, French and German legal origin countries. Although Scandinavian countries are more interventionist yet they have efficient government. The process of colonization was greatly affected by geography of the land being colonized which in turn affected the whole setup (bureaucratic quality, corruption, taxes and law and order) of a country (Acemoglu *et al*., 2001).

Colonial history has strong impact on bureaucratic quality, corruption and law & order (Barro, 1996; Treisman, 1997). British colonies have better bureaucratic quality, limited government, and high political freedom as compared to French colonies (Brewer, 1990). According to La Porta *et al.* (1999) Catholic and Muslim reveal less efficient government performance, highly interventionist and more corrupt countries as compared to protestant. Last important instrument is ethno linguistic fractionalization which indicates the redistribution tendency of a state (Mauro, 1995). When such societies/groups come into power, they try to benefit themselves at the cost their opponents. Results of System GMM are consistent with that of two stage least squares.

Table 5 (below) indicates the results of cross sectional OLS and 2SLS to measure the impact of state capacity on infant mortality for equations 2 to 2.3. In column 1, estimated regression results direct that state capacity has negative impact on infant mortality. The coefficient of state capacity, 0.2, indicates that one unit increase in state capacity can save the life of 200 infants annually. Columns 2, 3 and 4 contain OLS results of amount, ability and position, respectively. They imply negative impact on infant mortality. In column 2, the results indicate the negative impact of amount on infant mortality implying that amount (higher revenue) increases public spending and improves health performance (Knutsen, 2013). The coefficient of ability, comprises control of corruption and law and order, indicates negative impact on infant mortality as high corruption has positive correlation with high infant mortality (Gupta *et al*., 2000; Nadpara & Samanta, 2015). Similarly, poor law and order condition takes economy away from development goals.

In column 4, coefficient of position turns out to be negative and significant indicating that improvement in state position leads to decline in infant mortality. Such negative relationship is persistent with Liu *et al*. (2012) and Cingolani *et al.* (2015). State capacity in terms of position assures the implementation of productive health programs which have positive impact on health outcomes.

Table 5: Cross Sectional Results for Infant Mortality

Dependent variable: Log of Infant Mortality								
	OLS Results				2SLS Results			
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
State Capacity	-0.193***				-0.154**			
	(0.0501)				(0.0764)			
Amount		-0.00524				-0.00936**		
		(0.00373)				(0.00404)		
Ability			-0.189***				-0.480***	
			(0.0513)				(0.162)	
Position				-0.163***				-0.170***
				(0.0464)				(0.0598)
Improved Water	-0.00905***	-0.0135***	-0.0127***	-0.00959***	-0.00986***	-0.0134***	-0.0138***	-0.00942***
	(0.00316)	(0.00288)	(0.00302)	(0.00307)	(0.00320)	(0.00285)	(0.00337)	(0.00308)
Immunization	-0.0116***	-0.00867***	-0.00647**	-0.0109***	-0.0106***	-0.00854***	0.00119	-0.0110***
	(0.00314)	(0.00294)	(0.00324)	(0.00297)	(0.00307)	(0.00291)	(0.00538)	(0.00293)
Urbanization	0.146***	0.158***	0.162***	0.152***	0.120***	0.152***	0.165***	0.154***
	(0.0235)	(0.0194)	(0.0224)	(0.0228)	(0.0274)	(0.0194)	(0.0255)	(0.0235)
Health Expenditures	-0.000568	-0.00495	0.00382	-0.00147	0.00757	-0.00529	0.0154	-0.00181
	(0.0166)	(0.0146)	(0.0164)	(0.0163)	(0.0175)	(0.0146)	(0.0190)	(0.0161)
Economic Growth	-2.41e-05***	-3.25e-05***	-2.43e-05***	-2.49e-05***	-2.97e-05***	-3.22e-05***	-1.14e-05	-2.43e-05***
	(3.41e-06)	(2.67e-06)	(3.42e-06)	(3.39e-06)	(5.24e-06)	(2.66e-06)	(7.56e-06)	(3.86e-06)
Constant	4.925***	5.250***	4.770***	5.270***	5.015***	5.316***	4.061***	5.268***
	(0.299)	(0.249)	(0.307)	(0.289)	(0.323)	(0.248)	(0.497)	(0.287)
Observations	122	156	132	132	102	153	130	130
R-Squared	0.891	0.871	0.886	0.885	0.907	0.869	0.860	0.885
Link Test	0.517	Estat Endogenous		Durbin	(p = 0.3374)	(p = 0.0092)	(p = 0.0352)	(p = 0.8517)
VIF	2.59			Hausman	(p = 0.3573)	(p = 0.0104)	(p = 0.0400)	(p = 0.8565)
Hetero	0.7775	Estat Overid		Sagan	(p = 0.3573)	(p = 0.7203)	(p = 0.2743)	(p = 0.4000)
Normality	0.9901			Basmann	(p = 0.5397)	(p = 0.7385)	(p = 0.2963)	(p = 0.4263)

Note: Robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1

The results of 2SLS regression method are reported in columns 5 to 8 indicate that state capacity negatively influences infant mortality. Over identification results indicate that instruments are valid for all dimensions of state capacity. Control variables economic growth, improved water and immunization have negative and significant effect on infant mortality. The impact of health expenditures on infant mortality is also negative. Similar relationship is setup by Asafu-Adjaye (2004), Drabo (2010) and Yaqub et al. (2012) indicating that health expenditures provide basic health facilities, thereby improving health performance. The negative relationship exists between infant mortality rate and improved water source implying that pure water protects infants from many infective harmful diseases (Cingolani *et al.*, 2015). Similarly, negative relationship exists between infant mortality rate and immunization (Leipziger *et al*., 2003; Mondal et al., 2009), as vaccinations increase infant mortality rate decreases. In short the results of 2SLS indicate that state capacity has negative impact on infant mortality. All control variables are significantly related to infant mortality except urban population growth. We obtain similar results in pooled OLS and system GMM, reported in Table 6 (below).

Table 6: Panel Results for Life Expectancy and Infant Mortality

Dependent Variable: Life Expectancy			**Dependent Variable: Log of Infant Mortality**		
	OLS	**System GMM**		**OLS**	**System GMM**
Variables	(1)	(2)	**Variables**	(3)	(4)
L2.Le		0.819***	**L2.Lim**		0.824***
		(0.0671)			(0.0682)
State Capacity	1.578***	0.372*	**State Capacity**	-0.0446	-0.0747***
	(0.317)	(0.192)		(0.0345)	(0.0274)
Improved Water	0.373***	-0.131**	**Improved Water**	-0.0215***	0.00190
	(0.0264)	(0.0600)		(0.00243)	(0.00400)
Immunization	0.116***	0.189***	**Immunization**	-0.0139***	-0.0194***
	(0.0284)	(0.0553)		(0.00247)	(0.00351)
Urbanization	0.122	0.382**	**Urbanization**	-0.00977	0.00645
	(0.124)	(0.157)		(0.0112)	(0.0204)
Health Expenditures	-0.139	0.179	**Health Expenditures**	0.104***	0.0338**
	(0.167)	(0.279)		(0.0153)	(0.0156)
Economic Growth	0.0123	-0.0388	**Economic Growth**	-3.02e-05***	-9.04e-07
	(0.0932)	(0.0830)		(2.19e-06)	(2.09e-06)
Constant	26.58***	7.151**	**Constant**	6.092***	1.623***
	(2.463)	(3.535)		(0.219)	(0.590)
Observations	361	280	**Observations**	380	186
R-Squared	0.741		**R-Squared**	0.839	
Number of Coding		110	**Number of Coding**		75
AR(1)		0.088	**AR(1)**		0.080
AR(2)		0.492	**AR(2)**		0.531
Hansen		0.125	**Hansen**		0.439

Note: Robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1

5.1 Sensitivity Analysis

In sensitivity analysis, we attempt to check robustness of results by adding some other determinants of health one by one in 2SLS regression. Table 7 (below) shows the results of sensitivity analysis for life expectancy in presence of other determinants of life expectancy. It is observed that the results of state capacity are insensitive. Column 1 reports original model while column 2 includes an additional control of trade openness.

Table 7: Sensitivity Analysis for Life Expectancy

Dependent Variable: Life Expectancy							
Variables	(1) Original	(2)	(3)	(4)	(5)	(6)	(8)
State Capacity	1.139*	1.782***	1.964***	1.874***	2.241***	1.392***	1.901***
	(0.599)	(0.534)	(0.487)	(0.627)	(0.505)	(0.514)	(0.506)
Improved Water	0.317***	0.179***	0.158***	0.185***	0.164***	0.114***	0.177***
	(0.0403)	(0.0416)	(0.0347)	(0.0365)	(0.0353)	(0.0396)	(0.0359)
Immunization	0.0974**	0.0693**	0.0331	0.0590*	0.0515*	0.0339	0.0610*
	(0.0392)	(0.0317)	(0.0314)	(0.0320)	(0.0312)	(0.0318)	(0.0317)
Urbanization	-0.108	0.138	0.228	0.118	0.0773	0.223	0.158
	(0.201)	(0.176)	(0.172)	(0.185)	(0.175)	(0.173)	(0.177)
Health Expenditures	-1.104***	-0.174	-0.0501	-0.0927	-0.0358	-0.0573	-0.181
	(0.295)	(0.299)	(0.286)	(0.308)	(0.296)	(0.290)	(0.297)
Economic Growth	-0.200	-0.116	-0.118	-0.157	-0.102	-0.111	-0.132
	(0.213)	(0.167)	(0.158)	(0.166)	(0.161)	(0.159)	(0.165)
South Asia		-3.925	-2.694	-4.131	-3.033	-1.407	-3.730
		(3.007)	(2.881)	(3.030)	(2.940)	(3.000)	(2.999)
Europe And Central Asia		-0.326	0.476	-0.00307	-0.849	0.366	0.154
		(2.338)	(2.251)	(2.359)	(2.336)	(2.274)	(2.351)
Middle East And North Africa		-1.043	-0.360	-1.027	-0.675	-1.002	-0.671
		(2.572)	(2.456)	(2.617)	(2.505)	(2.491)	(2.567)
East Asia		-0.575	-0.471	-0.433	-0.171	0.426	-0.192
		(2.663)	(2.485)	(2.575)	(2.525)	(2.558)	(2.587)
Sub-Saharan Africa		-10.78***	-9.971***	-10.39***	-9.514***	-7.701***	-10.34***
		(2.787)	(2.537)	(2.657)	(2.604)	(2.712)	(2.647)
Latin America		-0.405	-0.295	-0.0590	0.605	0.465	0.0968
		(2.492)	(2.390)	(2.530)	(2.420)	(2.400)	(2.474)
Trade Openness		0.0122					
		(0.00759)					
School Enrollment			0.0661***				
			(0.0203)				
Democracy				0.0105			
				(0.103)			
Physicians					1.049**		
					(0.441)		
Improved Sanitation						0.0962***	
						(0.0295)	
Constant	35.65***	47.87***	45.16***	48.22***	48.85***	47.45***	48.45***
	(3.873)	(4.819)	(4.233)	(4.275)	(4.196)	(4.182)	(4.299)
Observations	117	110	115	112	117	116	117
R-Squared	0.835	0.852	0.854	0.838	0.845	0.879	0.906

Note: Robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1

The coefficient of trade openness is positive and significant implying that more openness to trade provides access to health related information (Owen & Wu, 2002) and more flow of doctors (Bhagwati, 1998) which improve life expectancy. Column 3 includes an additional control of school enrollment because better knowledge about health comes from better education (Chong & Calderon, 2000; Mondal et al., 2009; Drabo, 2010). School enrollment has positive and significant impact on life expectancy which is consistent with Ross & Wu (1995).

Next, this study includes democracy because democracy provides public services like health maintenance, fresh water and healthier nutrition. Democratic leaders give more importance to health programs to reelect in the next period. That's why democracy is positively associated with life expectancy. Primary health care such as role of physicians is also very important for health performance because people get better medical treatment (Bunker *et al*., 1994; Shi & Starfield, 2000). Relationship between physicians and life expectancy is positive. Improved sanitation also positively affects life expectancy (World Health Organization (WHO), 2001). Results are robust in presence of improved sanitation variable. Lastly, we include regional dummies by taking North America as base dummy and the original results remain intact. The sensitivity analysis confirms the robustness of benchmark results.

Table 8: Sensitivity Analysis for Infant Mortality

Dependent Variable: Log Of Infant Mortality							
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Original						
State Capacity	-0.154**	-0.152*	-0.154*	-0.0828	-0.160**	-0.0786	-0.141*
	(0.0764)	(0.0909)	(0.0794)	(0.0925)	(0.0794)	(0.0783)	(0.0817)
Improved Water	-0.00986***	-0.0113***	-0.00878**	-0.00988***	-0.00969***	-0.00348	-0.0101***
	(0.00320)	(0.00415)	(0.00342)	(0.00351)	(0.00350)	(0.00374)	(0.00354)
Immunization	-0.0106***	-0.00891***	-0.00613**	-0.00902***	-0.00782**	-0.00465	-0.00827***
	(0.00307)	(0.00306)	(0.00306)	(0.00307)	(0.00306)	(0.00304)	(0.00307)
Urbanization	0.00757	-0.00917	-0.0173	0.00778	0.000342	-0.0125	-0.00582
	(0.0175)	(0.0188)	(0.0186)	(0.0196)	(0.0195)	(0.0179)	(0.0189)
Health Expenditures	0.120***	0.0970***	0.0843***	0.0865***	0.0922***	0.0834***	0.102***
	(0.0274)	(0.0308)	(0.0304)	(0.0311)	(0.0317)	(0.0298)	(0.0311)
Economic Growth	-2.97e-05***	-2.75e-05***	-2.81e-05***	-2.89e-05***	-2.84e-05***	-2.87e-05***	-2.94e-05***
	(5.24e-06)	(6.17e-06)	(5.40e-06)	(5.48e-06)	(5.42e-06)	(5.20e-06)	(5.52e-06)
South Asia		0.161	0.102	0.312	0.171	-0.0625	0.176
		(0.291)	(0.283)	(0.291)	(0.290)	(0.283)	(0.293)
Europe And Central Asia		-0.0978	-0.161	-0.0723	-0.0590	-0.140	-0.118
		(0.222)	(0.217)	(0.221)	(0.230)	(0.212)	(0.225)
Middle East And North Africa		-0.0700	-0.108	-0.0864	-0.0507	-0.0216	-0.0782
		(0.248)	(0.240)	(0.250)	(0.249)	(0.237)	(0.249)
East Asia		-0.289	-0.305	-0.285	-0.313	-0.427*	-0.342
		(0.256)	(0.241)	(0.244)	(0.249)	(0.241)	(0.250)
Sub Saharan Africa		-0.00302	0.0220	0.0862	0.00712	-0.259	0.0282
		(0.266)	(0.246)	(0.251)	(0.253)	(0.252)	(0.255)
Latin America		-0.0730	-0.0913	0.0167	-0.0950	-0.115	-0.0958
		(0.242)	(0.235)	(0.245)	(0.240)	(0.229)	(0.242)
Trade Openness		-0.00174**					
		(0.000709)					
School Enrollment			-0.00419**				
			(0.00195)				
Democracy				-0.0199*			
				(0.0112)			
Physicians					-0.0607		
					(0.0498)		
Improved Sanitation						-0.0114***	
						(0.00284)	
Constant	5.015***	5.259***	5.304***	5.053***	5.040***	5.193***	5.070***
	(0.323)	(0.480)	(0.424)	(0.416)	(0.421)	(0.403)	(0.426)
Observations	102	94	100	97	102	101	102
R-Squared	0.907	0.920	0.923	0.920	0.918	0.926	0.917

Note: Robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1

Table 8 shows results of sensitivity analysis for infant mortality. Original model is represented in column 1. Next, trade openness is included because trade openness provides access to medical supplies such as vaccines (Owen & Wu, 2002) which reduce infant mortality. In column 3, the results indicate that school enrollment negatively influences infant mortality as schooling has favorable impact in improving health (Chong & Calderon, 2000; Mondal et al., 2009; Drabo, 2010)**.** In column 4, democracy is negatively associated with infant mortality because democratic leaders provide more public services. Primary health care such as the role of physicians is also very important for health performance. Relationship between physicians and infant mortality is negative (Bunker *et al*., 1994; Shi & Starfield, 2000). In column 5, improved sanitation is included which also negatively affects infant mortality (World Health Organization, 2001). The results are consistent in the presence of improved sanitation variable while sensitive in the case of democracy and improved sanitation.

6. Conclusion

Although from last 50 years noteworthy progress has been observed in health indicators, yet the marginalized groups could not get enough health benefits till the end of Millennium Development Goals and still health improvement goal has third priority in Sustainable Development Goals. Health is the main driving force of economic growth (Barro & Sala- i-Martin, 1995) and development (World Bank, 1993; Smith, 1999). What causes better health outcomes? The literature has identified many socioeconomic factors that improve population health. However, the extant literature has paid little attention to the role of political factors in explaining health outcomes.

This study determines the impact of state capacity on health outcomes using life expectancy and infant mortality as proxies of health outcomes. State capacity is measured in terms of amount, ability and position. The empirical analysis is based on OLS, 2SLS, Fixed Effects, Random Effects and System GMM econometric techniques. The sample size for this study covers 156 countries over the period 1970-2015.

The results indicate that overall impact of state capacity on health outcomes is favorable and significant in both cross-sectional and panel data analysis. The Principal Component Analysis also confirms the favorable impact of state capacity. In a disaggregated analysis of different measures of state capacity, it is revealed that state capacity in terms of 'ability' has the largest impact on health outcomes while in terms of 'position' this effect is limited. We conclude that improvement in state capacity is necessary for better health outcomes.

7. Research Limitations

This study has certain limitations:. The ICRG dataset used in this study comprises a small sample of 139 countries over the period 1884-2012. Moreover this data set relies on subjective measures of the state capacity. Future research work can explore more authentic and objective measures of the data which cover more countries with up to date time span. This study shows the overall impact of state capacity on life expectancy and infant mortality for a large set of countries. However, many country specific factors can also influence state capacity and health indicators. Finally, the role of non-state (private sector) health care services is not considered in this study due to data limitations.

8. Contribution of the Study

In recent years, increasing global health disparities and disease burden have inspired many researchers to find out the effective solutions to narrow down health disparities and overcome global disease burden. The literature has identified many health related factors to improve global health performance. These factors are largely linked with socioeconomic, cultural and religious variables. However, surprisingly, sparse attention has been paid to the political side of this issue. In particular, the importance of state capacity for health indicators has been relatively ignored. This research is an important step towards finding the effective solutions of health problems, as it identifies the importance of state capacity in improving health indicators. To the best of our knowledge, this research is novel as it untangles effective ways to ensure better population health trough investing in state capacity. In addition this study estimated the effect of different dimensions of state capacity to assess the relative strength of the dimensions. Finally, this research uses PCA to capture the maximum variation of different measures of state capacity.

9. Future Research Recommendations

Future studies can use structural equation modeling to analyze the role of mediating variables such as quality of institutions in shaping the relationship of state capacity with health outcomes. Future work can incorporate the role of aid to discover either it is beneficial for state capacity or health at the same time. Moreover, future research can use different measures of health outcomes such as maternal health, mental health and different diseases.

10. Policy Recommendations

Since state capacity in terms of ability, control of corruption, turns out to be more significant in all models, domestic government needs to focus policies which help to fight against corruption. In this regard, quality of bureaucracy may be focused. A focus on the improvement of bureaucratic quality will affect health outcomes directly by ensuring efficient utilization of health related resources and indirectly by enhancing tax revenues and fighting against corruption.

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